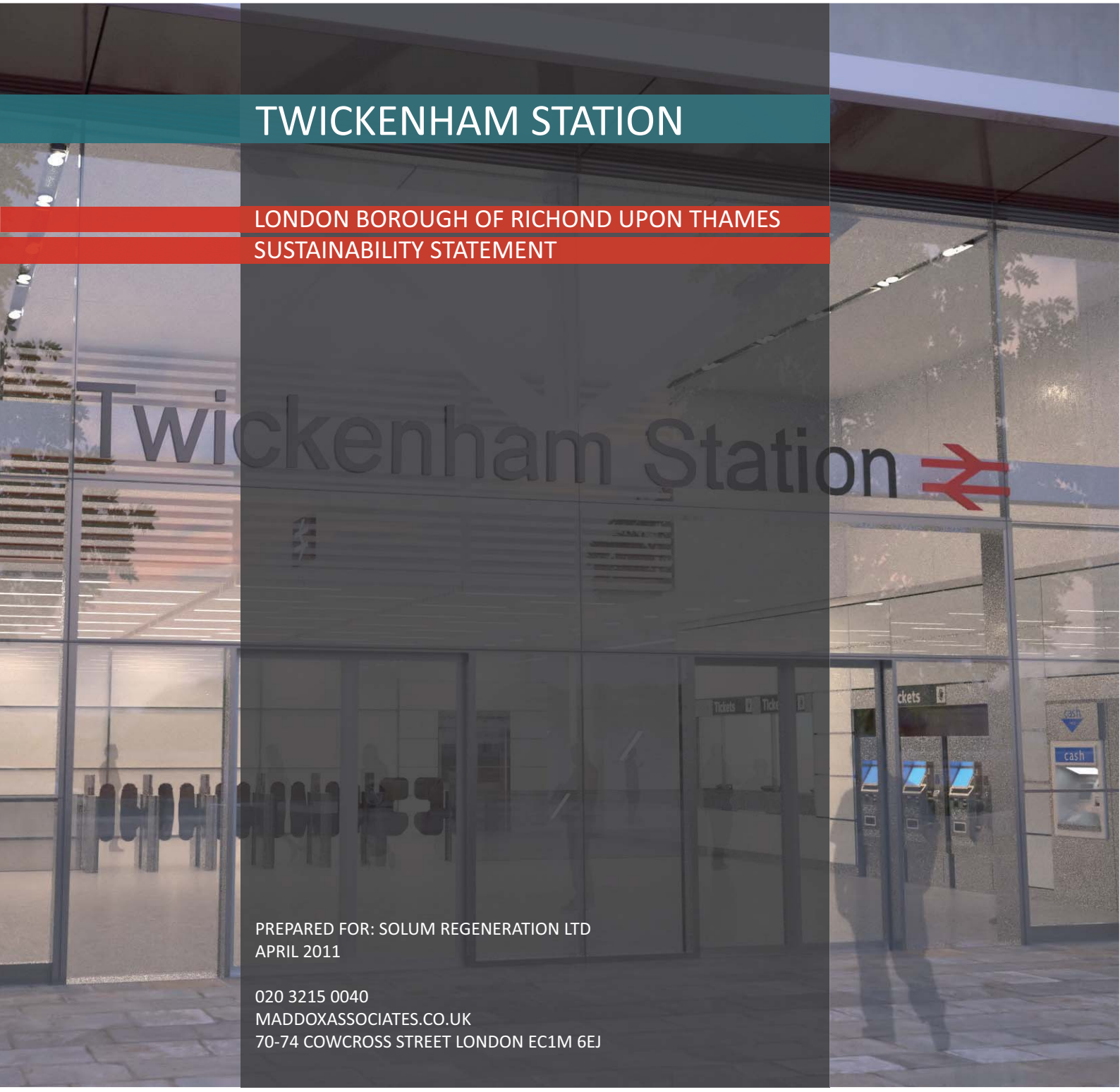
MADDOX & ASSOCIATES



TWICKENHAM STATION

LONDON BOROUGH OF RICHOND UPON THAMES
SUSTAINABILITY STATEMENT

PREPARED FOR: SOLUM REGENERATION LTD
APRIL 2011

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1.0 Sustainability Overview

1.1 The Proposed Development will provide a high quality new residential led scheme and enhance the public transport facilities and public realm to make pedestrian movement more attractive and safe around the site.

1.2 The Proposals will comply with all sustainability policy and guidance at national, regional and local level. Additionally the applicant has undertaken sustainability assessments which demonstrate the scheme has been designed to target:

- Code for Sustainable Homes Level 4
- BREEAM Excellent

1.3 The proposals aim to respond positively to the climate change policies as set out in the London Plan and the London Borough of Richmond upon Thames SPD on Sustainable Design and Construction. Through its design the scheme aims to the mitigate and adapt to climate change and minimise carbon dioxide emissions.

1.4 The London Plan Energy Hierarchy principles are embedded in the scheme and include:

Be Lean: energy efficient design including:

- Improved building fabric and glazing U values
- Improved air permeability standards
- Improved thermal bridging
- Improved equipment efficiency
- Whole house mechanical ventilation with heat recovery
- Reduced water consumption
- Energy efficient lighting

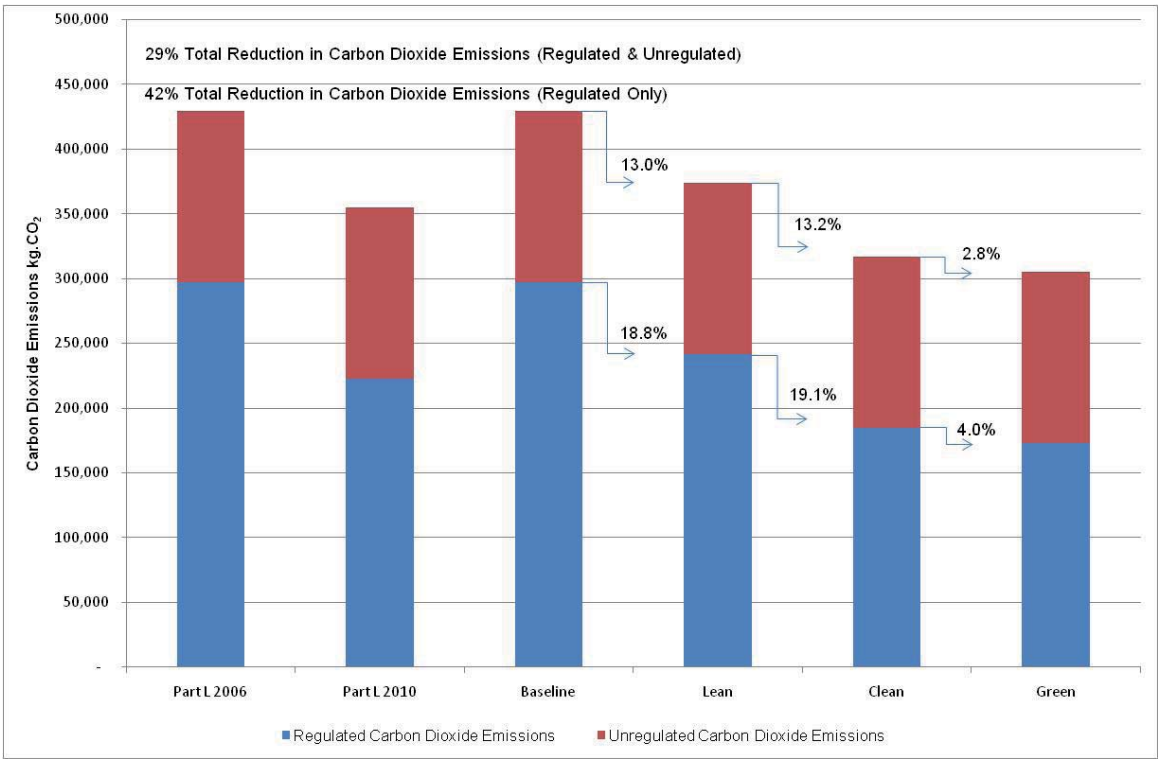
Be Clean: the development proposes decentralised energy through:

- Communal CHP (supplemented by high efficiency gas boilers)
- Single Energy Centre
- Future proofed for potential connection to district energy system

Be Green: renewable energy technologies are proposed through the integration of on site photovoltaic electricity generation

1.5 The Energy Statement proposes to reduce the site-wide total carbon dioxide emissions by a total of 29% and the regulated emissions by a total of 42% (See Figure 1-1).

Figure 1-1 Proposed Carbon Savings Graph



1.6 This Sustainability Statement has drawn information relating to the Development specifically from the following sources:

- Design and Access Statement
- Environmental Statement
- Transport Assessment
- Energy Statement (See Appendices)
- Code for Sustainable Homes Assessment (See Appendices)
- BREEAM Assessment (See Appendices)

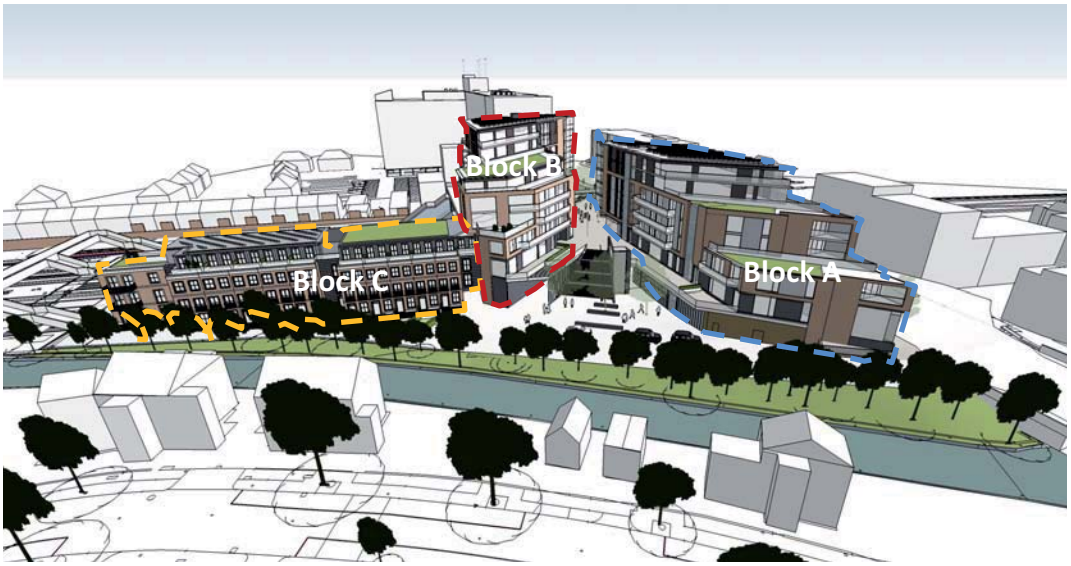
2.0 Proposed Development

2.1 The proposed development has been designed for the Applicant by Rolfe Judd Architects. The proposed development is for a new station ticket office and concourse, 115 residential units with elements of retail at the ground floor, improved public realm and riverside walk link to Moormead Park.

2.2 The development comprises three elements (Blocks A, B and C) and ranges in height from 2 to 7 storeys, with the highest element to the south west of the site on London Road (see Figure 3). The proportions of the buildings aim to respond to the large bulk of Regal House, pin-point the station at the centre of the site and step-down in height to the residential scale of Cole Park Road.

2.3 Access to the station will be improved with the inclusion of a staircase and lift link from the interchange and car parking facilities to the podium level station ticket hall.

Figure 2-1 Proposed Development View from the North



2.4 The station ticket hall will be relocated directly above the railway tracks to provide a simple and more direct access to the platforms for all passengers including the mobility impaired. The ticket hall is located within Block B, and adjacent to the entrance are two retail units. The location of the station will be prominently identified by signposting on London Road.

2.5 Vehicular access to the site will be from the existing access point along London Road. There will be a 'Kiss and Ride' facility located within the area of shared open space alongside a taxi rank. The car park will provide 35 replacement car parking spaces (including 3 disabled spaces) for station users and staff. For the residential element of the scheme 3 disabled spaces are proposed with 3 additional car club spaces.

2.6 A total of 250 cycle parking spaces will be provided for station passengers and visitors.

2.7 In summary the proposed development will include the following:

- New station facility (492.2m^2) - repositioning and enlarging of the station building including a new concourse and ticket office;
- 115 residential units;
- The existing car parking for station users is being re-provided (35 spaces on site with the remained on the Station Yard site) with the inclusion of 3 car club spaces and 3 disabled bays for residents;
- 734m^2 of commercial space (A1/A2/A3 and D2);
- A new pedestrian route along the River Crane, linking the town and station to Moormead Park.

3.0 Policy Requirements

3.1 The Proposals will comply with all sustainability policy and guidance at national, regional and local level.

- **National Policy**
  - Sustainable Development (SD) Strategy - Securing the Future
  - PPS1 (Delivering Sustainable Development);
  - PPS3 (Housing);
  - PPS6 (Planning for Town Centres);
  - PPS9 (Biodiversity and Geological Conservation);
  - PPS10 (Planning for Sustainable Waste Management);
  - PPS25 (Development and Flood Risk);
  - PPG13 (Transport);
  - PPG15 (Planning and Historic Environment);
  - PPG16 (Archaeology and Planning);
  - PPG17 (Planning for Open Space, Sports and Recreation); and
  - PPG24 (Planning and Noise).
- **Regional Policy**
  - The London Plan, Consolidated with Alterations since 2004
  - Planning for a Better London
  - The London Plan Spatial Development Strategy for Greater London – Consultation Draft Replacement Plan
  - Mayor's Transport Strategy – Public draft
- **Local Policy**
  - London Borough of Richmond Upon Thames Core Strategy
  - Sustainable Construction Checklist Supplementary Planning Document

3.2 The Sustainable Construction Checklist Supplementary Planning Document describes the key principles of sustainable design and construction the Council expects all applicants to follow for schemes providing one or more residential units, or for commercial or other development of 100 square meters or more.

3.3 Policy CP1 of the adopted Core Strategy April 2009 requires development to meet the Code for Sustainable Homes level 3 (for new homes), or BREEAM "excellent" (for other types of development).

3.4 The Energy and Sustainable design statement should set out how the proposed development addresses the principles of the London Plan Policies 4A.1, 4A.4, 4A.6 and 4A.7 on Energy and 4A.3 on Sustainable Design and Construction.

4.0 Energy

4.1 The proposed development aims to make the fullest contribution to the mitigation of and adaptation to climate change and to minimise emissions of carbon dioxide.

4.2 The following hierarchy has been applied to the proposed development to minimise CO2 emissions:

- using less energy, in particular by adopting sustainable design and construction measures (Policy 4A.3)
- supplying energy efficiently, in particular by prioritising decentralised energy generation (Policy 4A.6), and
- using renewable energy (Policy 4A.7).

Energy Assessment

4.3 The Energy Statement has included an energy assessment in line with Policy 4A.4 of the London Plan (Full Energy Statement is presented in the Appendices).The assessment demonstrates that the proposals will reduce the site-wide total carbon dioxide emissions by a total of 29% and the regulated emissions by a total of 42%. The development has been designed and registered to comply with 2006 Building Regulations and Table 3-1 shows the energy reduction against the 2006 Building Regulation Baseline.

Table 3-1 Energy Assessment Results

	Tonnes CO_2 per annum		Carbon Dioxide (%)	
	Regulated	Total Energy	Regulated	Total Energy
Baseline Emissions	297.2	429.5		
Savings from Energy Demand Reduction (Lean)	55.9	55.9	18.8	13.0
Savings from CHP (Clean)	56.7	56.7	19.1	13.2
Savings from Renewable Energy (Green)	11.8	11.8	4.0	2.8
Total Savings	124.4	124.4	41.8	29.0

4.4 The proposed reduction in regulated emissions for the residential units exceeds the Mayor's proposed carbon reduction target of 44% for new developments between 2010 and 2013 as set out in the draft replacement London Plan (October 2009). The Dwelling Emission Rate (DER) is calculated at approximately 44-49% below the Target Emission Rate (TER), based on the initial SAP2005 calculations undertaken to ensure the Code for Sustainable Homes Level 4 requirements for Energy will be met.

Energy Efficiency measures

4.5 Energy efficiency measures include improvements in the thermal performance of the building fabric to achieve U-values of 20 - 55%, and air permeability of 50%, improvement over the minimum 2006 Building Regulations requirements along with improved detailing to reduce thermal bridging, energy efficient lighting and whole house ventilation including heat recovery.

Details of space heating, hotwater systems

4.6 Heating and power will be delivered efficiently to the whole of the proposed development, including all building uses and areas, through a site-wide heat distribution network and gas-fired Combined Heat and Power (CHP) system. The plant room is located in Block B and will allow sufficient space and a connection point to link to a future district heating network if such a scheme develops within the Twickenham area.

4.7 The proposed CHP design is based on a CHP engine with a heat efficiency of 58.4% and an electrical efficiency of 24.1. The initial CHP design meets 67% of the site-wide domestic hot water and space heating demand when the CHP engine is operating 24 hrs per day.

4.8 The initial design has assumed a modular approach using three CHP engines, each with an output of 5.5 kW power and 13.3 kW heat when operating at an assumed return temperature of 60°C. Full details are provided within the Energy Statement

Cooling

4.9 The only areas where comfort cooling has been assumed are the 4 large retail units. These will be speculative and not fitted out by the developer. This can limit the control of the developer to ensure high standards of energy efficiency within the building fit-out.

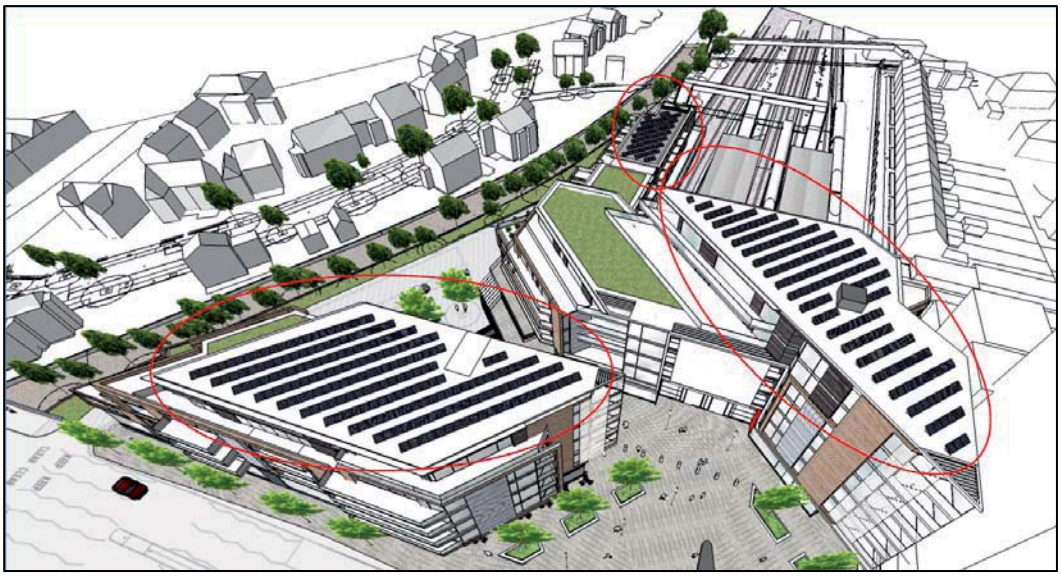
4.10 However, it is proposed that a Green Lease Agreement and Green Building Guide will be used to ensure that the retail units can achieve a BREEAM Excellent rating.

4.11 The Green Lease Agreement and Green Building Guide will specify that the fit out will include only A-rated energy efficient equipment for any comfort cooling to these areas. Further details are provided within the Energy Statement.

Details of renewable energy technologies

4.12 A total of 25 kWp photovoltaic (PV) capacity is proposed within an area of 660m^2. The total PV capacity is made up of roof-top arrays of optimally orientated PV panels located across Block A (10 kWp), Block B (8 kWp) and Block C (7 kWp) roofs. Figure 3-1 shows the location of the proposed PV array.

Figure 3-1 Proposed PV Array



5.0 Waste

5.1 The management of waste is an important issue within the London Borough of Richmond upon Thames and across the UK. It is recognised that there is a need to increase the level of re-use and recycling, and manage waste more sustainably and reduce disposal to landfill. Key waste principles through the construction and operation of he development are:

- Manage the waste arising and maximise recycling
- Manage waste more sustainably and closer to the source
- Reduce litter

5.2 The proposed development comprises redevelopment of the station facilities, residential accommodation and commercial activities. It is considered that all waste arisings from the proposed development will be managed in accordance with current legislation.

Construction

5.3 A site waste management plan (SWMP) will be implemented by the principle contractor to ensure that the site preparation and construction waste is managed in a sustainable manner. The SWMP will be developed in accordance with The Site Waste Management Plan Regulations 2008 and will include measures to reduce and re-use the waste generated on site. The SWMP will also include measures to maximise recycling opportunities and ensure that waste which cannot be re-used or recycled is disposed of appropriately.

5.4 During the site preparation and construction works there is the potential for hazardous waste arisings from contaminated soil or the potential of asbestos containing materials.

5.5 Hazardous material will be treated and disposed of in accordance with the relevant legislation (Environmental Protection Act 1990, Duty of Care Regulations 1991, Landfill Regulations 2002 and Hazardous Waste Regulations 2005), and the Environment Agency requirements.

5.6 Where Asbestos is identified appropriate Health and Safety Plans would be developed as required by the Control of Substances Hazardous to Health (COSHH) Regulations 2003 and the Construction (Design and Management) Regulations 2007 (CDM), which would be mandatory for the demolition works.

Operation

5.7 The proposed development is situated within the London Borough of Richmond upon Thames which assumes responsibility for the collection and disposal of municipal waste management. Dedicated bin areas and recycling storage is provided for the residential units.

5.8 It is intended that through provision of internal recycling storage recycling will be maximised and it is intended that the proposed scheme will be included within the London Borough of Richmond upon Thames Black and Blue Box Recycling scheme.

5.9 The station and commercial activities will ensure that waste is collected by licensed and appropriate waste collectors. It is anticipated that the commercial uses will contract out waste activities (collection, handling, treatment and disposal) to a private waste management company. The commercial occupiers will expected to segregate waste to facilitate recycling.

6.0 Richmond Sustainability Checklist

Checklist Item		Compliance
1	Code Level 4 / BREEAM 'Excellent' rating for design	A Preliminary assessment has been undertaken and submitted in support of the planning application (See Appendices). The pre-assessment score for the proposed residential elements of the development is a Code Level 4. The pre-assessment score for the proposed commercial elements of the development is a BREEAM Excellent.
2	Investigate potential contamination of site	The Environmental Statement provides a detailed assessment of the site conditions.
3	Undertake ecological assessment	A full Ecology Impact assessment has been undertaken and is presented in the ES.
4	Design building and its services for minimum energy use	As detailed above an Energy Assessment has been undertaken following the London Plan Hierarchy. A full Energy Statement including sample SAP calculations has been submitted in support of the Planning Application. *Lean* Energy efficiency will be designed into the development. Energy efficiency measures include improvements in the thermal performance of the building fabric to achieve U-values of 20 - 55%, and air permeability of 50%, improvement over the minimum 2006 Building Regulations requirements along with improved detailing to reduce thermal bridging, energy efficient lighting and whole house ventilation including heat recovery. *Clean* Energy, both heating and power, will be delivered efficiently to the whole of the proposed development including all building uses and areas. This will be achieved through a site-wide heat distribution network and gas-fired Combined Heat and Power (CHP), which will allow connection with a future district heating network if such a scheme develops within the Twickenham area. Green roofs are proposed which help to minimise the 'Urban Heat Island' effect anticipated to be a significant effect of climate change.

Checklist Item		Compliance
5	Reduce predicted site CO2 emissions by at least 10% through the use of on site renewable energy	Carbon emissions from the total energy needs (heat and power) of the development have been reduced through energy efficiency and decentralised energy technologies. Due to the incorporation of a CHP system as the primary supply of space heating and hot water the integration of renewable energy technologies are limited. The Energy Statement details the renewable energy technology options considered. A PV array is proposed to reduce CO_2 emissions by 3%. The PV array has been maximised and will have the following characteristics: 660m^2 25kWp
6	Specify environmentally-friendly construction materials	Where possible materials used in the development shall be sourced locally. The majority of timber products shall be obtained from sustainable sources. In accordance with the Code for Sustainable Homes and BREEAM requirements, insulation materials will not contain substances known to contribute to stratospheric ozone depletion or have the potential to contribute to global warming. Low emission finishes, construction materials, carpets and furnishings shall be used wherever practical. Recycled aggregates shall be used wherever possible.
7	Use water conservation devices and recycling techniques	Water saving devices are to be installed throughout the development including: low flush toilets; aerated shower heads; spray taps. In compliance with meeting Code Level 4 mandatory requirements, the maximum potable water consumption per person per day is no more than 105 litres as calculated by the Water Efficiency calculator. In accordance with the Code requirements, water run-off rates and volumes post-development will be no greater than the previous conditions on site.

Checklist Item		Compliance
8	Provide internal/ external recycling facilities	It is assumed that there will be a Local Authority recycling collection scheme in place serving the proposed development. The residential units will be provided with; • either a single 30 litre bin in an adequate internal space Or • at least three separate bins with a total capacity of 30 litres and a single capacity of at least 7 litres in an adequate internal space. Whether several bins or a single bin is required depends on whether the Local Authority recycling scheme in this area is sorted before or after collection. If a Local Authority Recycling and Household Waste Collection Service is not provided then three internal bins with a total capacity of 30 litres and at least 7 litres are required and external waste storage should be sized according to guidance from the private recycling and waste scheme operator.
9	Prevent water pollution and overburdening of drainage systems	The site will be predominantly hard paved with an impermeable surface and positive drainage system incorporating hydrocarbon interception. Thames Water has a responsibility to ensure adequate water supplies and drainage capacity.
10	Design out negative microclimatic effects	Detailed assessment of the wind microclimate and impacts on daylight, sunlight, overshadowing and solar glare have been undertaken as part of the Environmental Impact Assessment. The proposed development is anticipated to have a negligible impact on the microclimate on and surrounding the site.
11	Facilitate the use of public transport	Proposal is for the improvement of public transport facilities. The development will result in an enhancement to the public transport network.
12	Ensure development design encourages cycling and walking	A total of 250 covered cycle spaces will be located for station users, whilst a total of 208 covered cycle spaces will be provided for the residential element of the proposal. A new pathway is proposed linking Moor Mead park to the station which will encourage access to the station through cycling and walking.

Checklist Item		Compliance
13	Enable easy access to the natural environment/ open spaces and provide new and enhanced green spaces to serve the community	A new pathway is proposed linking Moor Mead park gardens to the station creating a direct link to open space. Pedestrian accessibility across the site will be significantly enhanced. A direct route from the river level and interchange and car parking facilities will be provided to the station ticket hall, via a set of stairs that link the station plaza with the riverside walk.
14	Adopt best practice in the secure design of the development	The Scheme has been designed with consideration to the principles of Secure by Design. Consultations have been undertaken with the British Transport Police to ensure requirements are integrated into the scheme. Physical security standards as set out within the Secured by Design New Homes Checklist have been design into the scheme where necessary. In particular Physical Security measures such as passive surveillance of streets, communal spaces and parking will be incorporated.
15	Mitigate light pollution	Development of the site will be used as an opportunity to reduce the level of artificial lighting by keeping it to a minimum. Lighting that is proposed for security and safety reasons will use low pressure sodium lights of no greater than 2000 lumes (150 W), directed to where it is needed with minimal light spillage onto the River Crane and its associated habitats. Where lighting is needed to meet health and safety requirements, impacts will be overcome by using low column lights, angling the lights downwards and placing shields over them so that the light is directed downwards. Where areas of habitat that are of value to bats require lighting (i.e. the riverside footpath), low level bollard lighting will be used. Artificial lighting will not directly illuminate any mature trees or the River Crane. Furthermore, additional trees will be planted along the River Crane to provide screening and reduce light spillage and a fence line will be installed to define the footpath that will prevent pedestrians straying into adjacent habitats.
16	Apply the principles of flood resistant design (where applicable)	The site is located in a low-risk zone where the annual probability of fluvial flooding is less than 1 in 1000 in any given year. A Flood Risk Assessment (FRA) has been undertaken as part of the Environmental Impact Assessment which identifies that the site is in a low flood risk area from all sources of flooding. This report has been prepared according to good practice guidance as outlined in PPS25Development and Flood Risk.

Checklist Item		Compliance
17	Ensure that the building is accessible to all	A Design and Access Statement has been produced and submitted in support of the planning application which provides full details of accessibility. In summary: *Pedestrian accessibility* – A direct route from the river level and interchange and car parking facilities will be provided to the station ticket hall, via a set of stairs that link the station plaza with the riverside walk. *Public transport* - The station will continue to be served by bus services. The existing bus stops adjcaent to the ticket hall will be retained and will provide a convenient interchange with rail services. The taxi rank will be relocated at the river level. *Vehicle Access* - Access into the site will be from the existing access point from London Road. The Kiss and Ride facility will be located within the area of shared open space *Disabled access to residential units* - Disabled access is provided for all residential units, station concourse and platforms, commercial units, car parking, drop off and match day traffic. The scheme has been designed to take into account the changes to pedestrian flows that occur on match days at Twickenham Stadium. Additional, high quality space will be provided that provides improved access to the station platforms, prevents overcrowding and will assist in dispersing crowds quickly.
18	Reduce adverse impact of construction process on quality of site and its surroundings	The disposal of all waste or other materials will be carried out in accordance with all current legislation. A Site Waste Management Plan will be produced and agreed prior to any works commencing – this will set out the steps to be taken to avoid waste production, reduce waste removal and to re-cycle waste. Where space on site permits, all waste will be segregated at source. All sub-contractors and suppliers will be involved in the waste minimisation process. The main construction contractors will make a commitment to go significantly beyond best practice within the Considerate Constructors Scheme (CCS) and achieve a score of at least 32.

7.0 Appendices

Energy Statement

Code for Sustainable Homes

BREEAM Assessment

Energy Statement

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Church House Building Sustainability

ENERGY STATEMENT

SOLUM REGENERATION PARTNERSHIP

Proposed Mixed-Use Development
Twickenham Station
London

28/04/2011

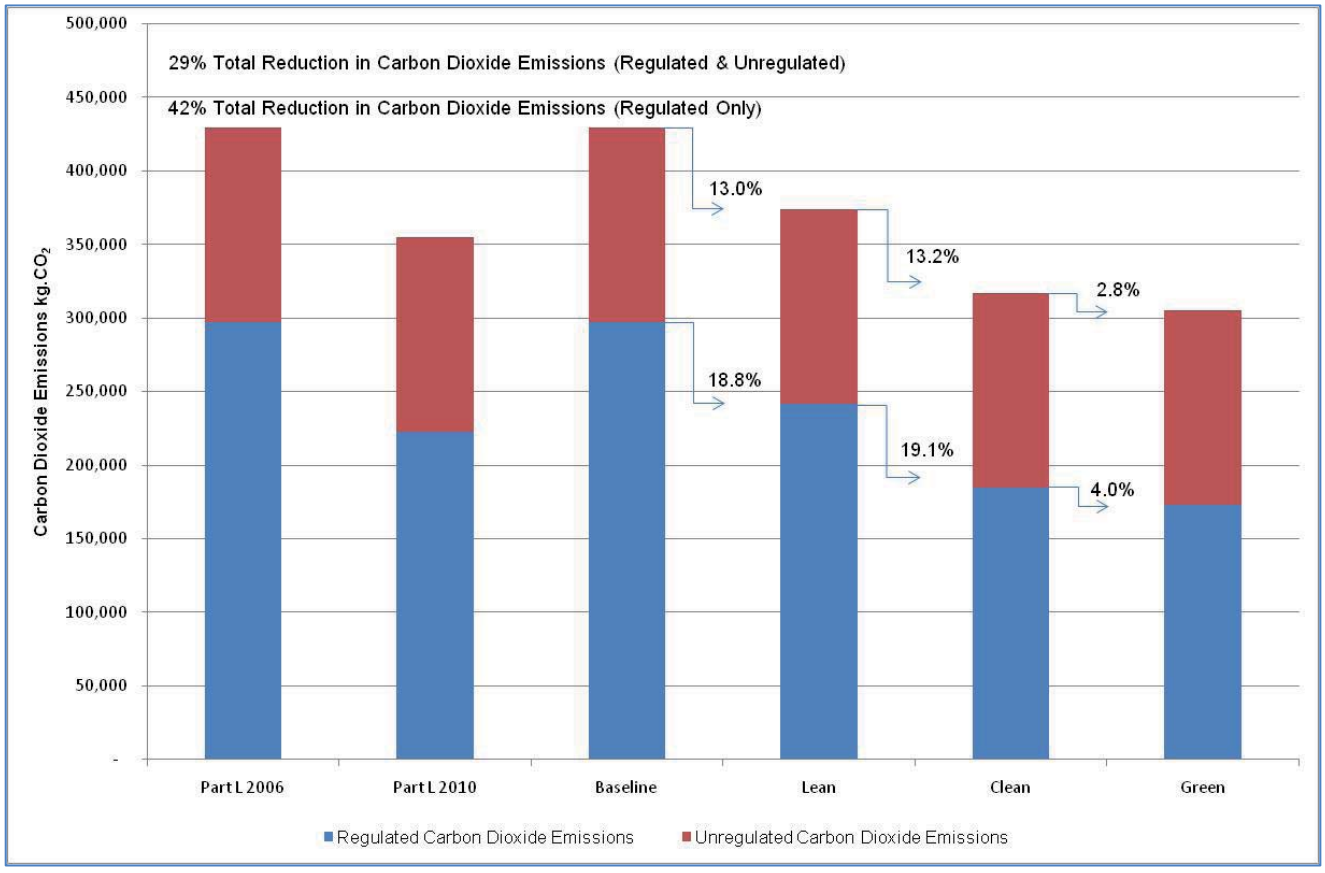
Revision B

PB/JL/9090

CHB Design Services Ltd T/A
Church House Building Sustainability (CHBS)
Reg. No: 5945817
Reg. Office: As above

Executive Summary

The proposed mixed-use development at Twickenham Station has an Energy Strategy developed according to the requirements of the London Plan 2008 Energy Hierarchy.



The Energy Strategy proposes to reduce the site-wide total carbon dioxide emissions by a total of **29%** and the regulated emissions by a total of **42%.**

	Tonnes CO_2 per annum		Carbon Dioxide (%)	
	Regulated	**Total Energy**	**Regulated**	**Total Energy**
Baseline Emissions	297.2	429.5		
Savings from Energy Demand Reduction (Lean)	55.9	55.9	18.8	13.0
Savings from CHP (Clean)	56.7	56.7	19.1	13.2
Savings from Renewable Energy (Green)	11.8	11.8	4.0	2.8
Total Savings	124.4	124.4	41.8	29.0

The Energy Strategy includes the following steps of Carbon Dioxide emissions reduction; Lean, Clean and Green:

Lean

Energy efficiency will be designed into the development.

Energy efficiency measures include improvements in the thermal performance of the building fabric to achieve U-values of 20 - 55%, and air permeability of 50%, improvement over the minimum 2006 Building Regulations requirements along with improved detailing to reduce thermal bridging, energy efficient lighting and heating, and whole house ventilation including heat recovery.

Compared to 2010 Building Regulations the improvement in U-values are between 15 – 50%, air permeability remains a 50% improvement.

Clean

Energy, both heating and power, will be delivered efficiently to the whole of the proposed development including all building uses and areas.

This will be achieved through a site-wide heat distribution network and gas-fired Combined Heat and Power (CHP), which will allow connection with a future district heating network if such a scheme develops within the Twickenham area.

Green

A total of 25 kW_p photovoltaic (PV) capacity is proposed. The total PV capacity is made up of roof-top arrays of optimally orientated PV panels located across Block A, Block B and Block C roofs.

Contents

Appendices

Appendix A: Baseline and Lean Modelling Outputs

A1 Residential Baseline Block Compliance Summary
A2 Retail and Station Baseline and Lean BRUKL Documents

Appendix B: Clean Modelling Outputs

B1 Residential Clean Block Compliance Summary
B2 Retail and Station Baseline Clean BRUKL Documents

Appendix C: Green Modelling Outputs

C1 Residential Green Block Compliance Summary
C2 Retail Green BRUKL Documents

1. Introduction

This energy statement considers the proposed Solum Regeneration mixed use development at Twickenham Station.

The proposed mixed use development comprises of approximately 115 residential units (Class C3), 734 m^2 of retail (A1, A2, A3) and 492.2 m^2 of railway station and associated areas with associated amenity space, access, landscaping and boundary treatment.

It should be noted that the majority of the 492.2 m^2 of railway station is to be unconditioned.

The purpose of the Energy Statement is to demonstrate that climate change mitigation measures are integral to the scheme's design and evolution, and that they are appropriate to the context of the development.

This document will describe the policy context in which the Energy Statement has been developed and demonstrate how it is proposed that the energy, and associated carbon dioxide emissions, will be reduced through energy efficient design, efficient energy supply and onsite renewable energy generation.

Standard Assessment Procedure (SAP) and Simplified Building Energy Model (SBEM) calculations have been performed to ensure that the baseline site emissions and the proposed energy-efficiency measures are modelled in the most accurate and relevant methodology available.

The calculation methods used are SAP 2005 and SBEM V3.5 both designed to demonstrate compliance with 2006 Building Regulations as the proposed development is already registered with Building Control under the 2006 Regulations. A comparison with the 2010 Target Emission Rate is shown on the graphs in the Executive Summary and each section. A site-wide average 25% reduction in emissions rate over 2006 Building Regulations is assumed for this purpose.

The report is based on plans and building layouts provided in the following drawings provided on 21/04/11 by Rolfe Judd;

4674 / T(20)E01 B; 4674 / T(20)E02 B; 4674 / T(20)E03 B; 4674 / T(20)E04 C; 4674 / T(20)E05 B; 4674 / T(20)E06 B

4674 / T(20)P -1 D; 4674 / T(20)P -1M B; 4674 / T(20)P00 B; 4674 / T(20)P0M B; 4674 / T(20)P01 B; 4674 / T(20)P02 B; 4674 / T(20)P03 B; 4674 / T(20)P04 B; 4674 / T(20)P05 B; 4674 / T(20)P06 B; 4674 / T(20)P07 B

4674 / T(20)S01 B; 4674 / T(20)S02 B; 4674 / T(20)S03 B; 4674 / T(20)S04 B

2. Policy Background

The London Plan 2008 is the core policy document to which this Energy Statement responds. The relevant London Plan 2008 policies considered within this statement are summarised as follows;

Policy 4A.4 Energy assessment sets out the minimum requirements for assessing the baseline energy and carbon dioxide emissions of the development and demonstrating how these figures can be reduced through applying the Energy Hierarchy. This particular Energy Statement document is designed to follow the guidance set-out in *Policy 4A.4*.

Policy 4A.1 Tackling Climate Change sets out the overriding strategy of the Energy Hierarchy:

Using less energy	*Be Lean*
Supplying energy efficiently	*Be Clean*
Using renewable energy	*Be Green*

More information on each section of the hierarchy is provided in *Policy 4A.3 Sustainable Design and Construction, Policy 4A.6 Decentralised Energy: Heating, Cooling and Power* and *Policy 4A.7 Renewable Energy*; each is used to inform the relevant sections of this Energy Statement.

The London Plan is due to be replaced; the October 2009 London Plan Consultation draft replacement plan is not an adopted document but will, however, be a material consideration to this Energy Statement.

The London Plan (2009) Draft continues to encourage the Energy Hierarchy, as defined above. However, it also sets quantitative targets for overall reductions in carbon dioxide emissions over a 2006 Building Regulations baseline. The carbon dioxide reduction target for 2010 - 2013 is a 44% reduction over Part L 2006 and for 2013 - 2016 is a 55% reduction over Part L 2006.

3. Baseline Energy Demand and Carbon Dioxide Emissions

Figure 1 demonstrates the results of the SAP and SBEM calculations for the Target Emissions Rate (TER) calculation, which is the worst allowable performance under Building Regulations Approved Document L1A and L2A, in terms of energy and carbon dioxide emissions; these are the baseline energy demand and carbon dioxide emissions for the development.

Not all domestic energy end-uses are accounted for within the SAP methodology; therefore the following equation referred to in the Code for Sustainable Homes Technical Guide (May 2009) and the procedure set out in SAP 2005 Section 14 is used to account for the carbon dioxide emissions due to cooking and appliances (unregulated emissions) within dwellings:

$$99.9 \times (TFA \times N)^{0.4717} - (3.267 \times TFA) + (32.23 \times N) + 72.6 = \text{Cooking \& Appliance Emissions}$$

Where $N = 2.844 \times (1 - \exp(-0.000391 \times TFA^2))$

The equation above is used over the BREDEM-12 (2001) Model as it has been developed much more recently therefore is expected to have become more accurate.

Non-domestic operational energy consumption due to appliances, including cooking and small power, is calculated within the SBEM method in a separate category entitled equipment; although this is unregulated within ADL2A, for the purposes of determining a more accurate account of the site energy demands these end-uses must be included. The figures provided within the SBEM calculation for equipment energy is based on BRE estimates.

Figure 1 shows the baseline carbon dioxide emissions through regulated emissions, based on the Target Emission Rate (TER) from approved modelling software, and unregulated emissions not assessed within Building Regulations.

Figure 2 shows how the site energy demands which result in the baseline carbon dioxide emissions are divided into heating, cooling and power for the site.

Building	Regulated Carbon Dioxide Emissions ($kg.CO_2$/year)	Non-Regulated Carbon Dioxide Emissions ($kg.CO_2$/year)	Total Carbon Dioxide Emissions ($kg.CO_2$/year)
Residential Block A	61,815	40,106	101,921
Residential Block B	85,108	55,525	140,633
Residential Block C	40,831	26,189	67,020
Retail Unit 1	19,946	1,298	21,244
Retail Unit 2	18,533	1,297	19,830
Retail Unit 3	18,733	1,152	19,885
Retail Unit 4	32,027	2,129	34,155
Conditioned Station + Small Retail Units	20,251	4,517	24,768
Site-wide Total			**429,456**

Figure 1: Baseline Regulated and Non-Regulated Carbon Dioxide Emissions

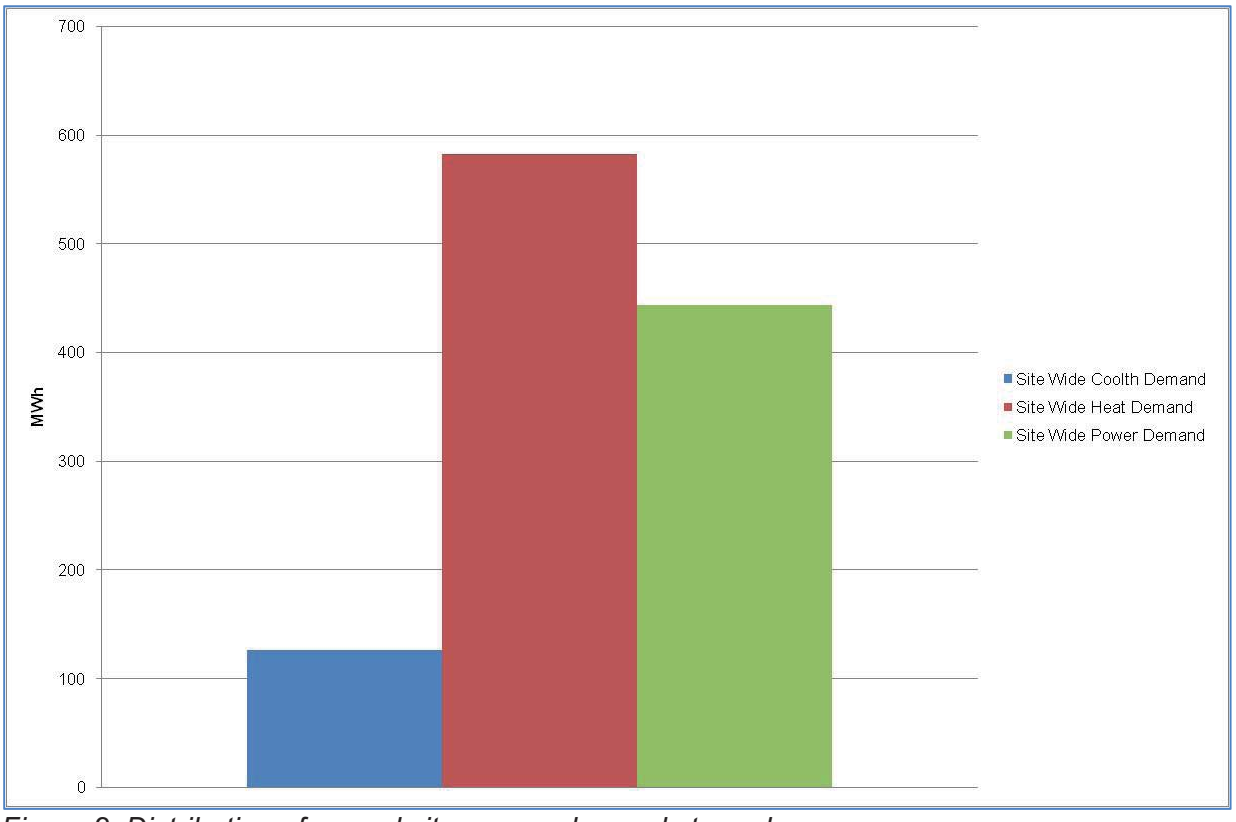


Figure 2: Distribution of annual site energy demands to end-uses.

4. Be Lean: Proposals for Reducing Energy Demand and Carbon Dioxide Emissions

In accordance with good practice environmental design, *Policy 4A. 1* and *Policy 4A.3 Sustainable Design and Construction,* the first priority is to reduce the site baseline emissions through energy efficient design measures.

In order to include all specific measures proposed, each building type will be considered in detail following descriptions of the site-wide improvements in building fabric thermal performance.

The reductions in carbon dioxide emissions against the baseline are shown in figures 4 and 5 at the end of this chapter.

4.1 Site-Wide Energy Efficiency Proposals

a. Layout

The development has been laid out with a compact form to try and reduce the heat loss areas of all building types.

Glazing to the north has been minimised throughout the development as north facing glazing has a high heat loss with negligible beneficial gains. However, some north facing glazing is present, as it is important to provide adequate daylighting to the buildings in order to minimise the use of artificial lighting during daytime hours.

The two retail units with south facing glazing have been designed to have significant overhangs on this façade to provide solar shading and reduce cooling demand. Solar shading is also provided to south west glazing on the retail units through balcony overhangs above the shop front glazing.

A similar strategy has been used throughout the apartments to use balconies as shading devices to reduce summertime solar gains to the apartments below and ensure that energy will not be required for comfort cooling. The design of the balconies will allow beneficial solar gains to penetrate during winter months when the sun is lower in the sky.

b. Building Fabric

It is proposed to make significant improvements to the thermal efficiency of the building fabric throughout all elements of the proposed development. Figure 3 details the proposed building fabric U-values and air infiltration along with comparisons made against the worst allowable Building Regulations Approved Document L1A standards for 2006 and 2010.

The thermal efficiency of the proposed development is intended to be further improved through the specification of Enhanced Construction Details in order to reduce thermal bridging.

For the residential areas of the development it is proposed to achieve a Global Y Value of 0.04 for the specified Enhanced Construction Details; this represents a 50% improvement on New Build Accredited Details which achieve a Global Y Value of 0.08 and has a significant reduction on the heat losses from the dwellings.

Element	Proposed	*Worst Allowable L1A 2006*	Improvement Over L1A 2006	*Worst Allowable L1A 2010*	Improvement Over L1A 2010
Floor U-value ($W/m^2.K$)	0.20	*0.25*	**20%**	*0.25*	**20%**
Roof U-value ($W/m^2.K$)	0.13	*0.25*	**48%**	*0.20*	**35%**
Glazing U-value ($W/m^2.K$)	1.70	*2.20*	**23%**	*2.00*	**15%**
External and Semi Exposed Wall U-value ($W/m^2.K$)	0.25	*0.35*	**29%**	*0.30*	**17%**
Front Door to Corridor ($W/m^2.K$)	1.00	*2.20*	**55%**	*2.00*	**50%**
Air Permeability ($m^3/(m^2.hr)$ @50Pa)	5	*10*	**50%**	*10*	**50%**

Figure 3: Proposed improvements in site-wide building fabric specification

c. External lighting

External lighting will be energy efficient and will be controlled through automatic photocells and time switches to ensure that it is not used during daylight hours.

4.2 Sector Specific Energy Efficiency Proposals

a. Residential

Lighting

It is proposed to specify at least 75% of all light fittings within the dwellings with low energy fittings, capable of only accepting lamps with an efficacy of no less than 40 lamp lumens per circuit Watt.

It is further proposed to specify energy efficient lighting in communal areas and exterior areas of the residential development, including controls to ensure that external lighting is only used when required.

Heat Recovery

Mechanical Ventilation with Heat Recovery (MVHR) is proposed to serve each dwelling; these systems ensure the required amount of ventilation is provided to the occupants and building fabric whilst reducing heat loss through ventilation. The heat recovery of the system will be at least 85% efficient at transferring heat from the discharged air into the fresh air supply and the specific fan power will be no more than 1 W/l/s, meeting the Energy Saving Trust Recommended Standard.

Heating

Heating will be supplied by a gas-fired CHP system providing for the heat base load; this is covered in detail within the 'Clean' section. Top-up heating will be provided by a condensing gas-fired boiler system with an efficiency of at least 90%, contributing towards the 'Lean' energy efficiency carbon dioxide savings.

The radiators within the apartments will have individual Thermostatic Radiator Valves (TRV's), along with a thermostat and programmer to enable occupants to control their energy use in providing thermal comfort.

Domestic hot water will be provided via a heat exchanger at each apartment therefore losses through domestic hot water storage will be minimised.

Individual heat meters will also be provided to each apartment to ensure accurate billing of the energy consumed by the occupants.

Holistic Measures

The apartments are to be designed to meet the requirements of the Code for Sustainable Homes to a standard of Level 4. Some of the holistic measures which will be taken to ensure compliance will have a significant impact on reducing the energy demand of the development, these will include;

- Provision of clothes drying space to reduce use of tumble dryers
- Informing residents about energy efficient white goods
- Ample cycle storage to encourage low carbon transport
- Reduced water consumption to no more than 105 litres per person, hence low-flow fittings and appliances which will reduce domestic hot water consumption.
- Specification of construction materials with a low environmental impact demonstrated by an A or A+ Green Guide Rating
- Provision of household recycling facilities
- Monitoring and targeting to reduce environmental impact of the construction site
- Reduction of construction waste

The main holistic measures proposed which can impact on reducing the unregulated carbon dioxide emissions of the residential aspect of the development are encouraging reduced use of tumble dryers and informing residents about purchasing energy-efficient white goods.

As the impact on unregulated emissions is behaviour dependent hence no reduction will be assumed in this assessment as it could have a high degree of error.

b. Retail Units

The 4 large retail units within the development will be speculative and not fitted out by the developer. This can limit the control of the developer to ensure high standards of energy efficiency within the building fit-out.

However, it is proposed that a Green Lease Agreement and Green Building Guide will be used to ensure that the retail units can achieve a BREEAM Excellent rating.

The Green Lease Agreement and Green Building Guide will specify that the fit out will include only A-rated energy efficient equipment for any comfort cooling to these areas, that the lighting installation will have to meet or exceed 3 W/m^2/100 lux for general lighting and 22 lumens per circuit Watt for display lighting and that the connection provided to the site-wide heat network must be utilised to provide both space heating and hot water efficiently.

It is ensured that a high standard of thermal performance is achieved for all of these areas as described in the *Site-Wide Building Fabric* section above.

c. Conditioned Station and Small Retail Units

Only a relatively small area of the station will be conditioned. As the further retail units adjacent to the station entrance and on the platforms are very small hence it is assumed that any Green Lease Agreement would not be appropriate, however, minimum services of space heating are expected to be provided as part of the tenancy.

It is assumed that space and water heating to these areas are also provided by the site-wide heat distribution network.

It is assumed that the lighting, including display lighting, to these areas has an average efficacy of at least 50 lumens per circuit watt.

It is ensured that a high standard of thermal performance is achieved for all of these areas as described in the *Site-Wide Building Fabric* section above.

4.3 Summary – Be Lean

Building	Baseline Total Emissions kg.CO_2/year	Lean Total Emissions kg.CO_2/year	Improvement Over Baseline %
Residential Block A	101,921	91,260	10
Residential Block B	140,633	126,553	10
Residential Block C	67,020	60,713	9
Retail Unit 1	21,244	16,422	23
Retail Unit 2	19,830	14,922	25
Retail Unit 3	19,885	15,632	21
Retail Unit 4	34,155	23,747	30
Conditioned Station + Small Retail Units	24,768	24,338	2
Site-wide Total	**429,456**	**373,586**	**13**

Figure 4: Summary of total (regulated and non-regulated) carbon dioxide emissions reduction through energy efficiency measures

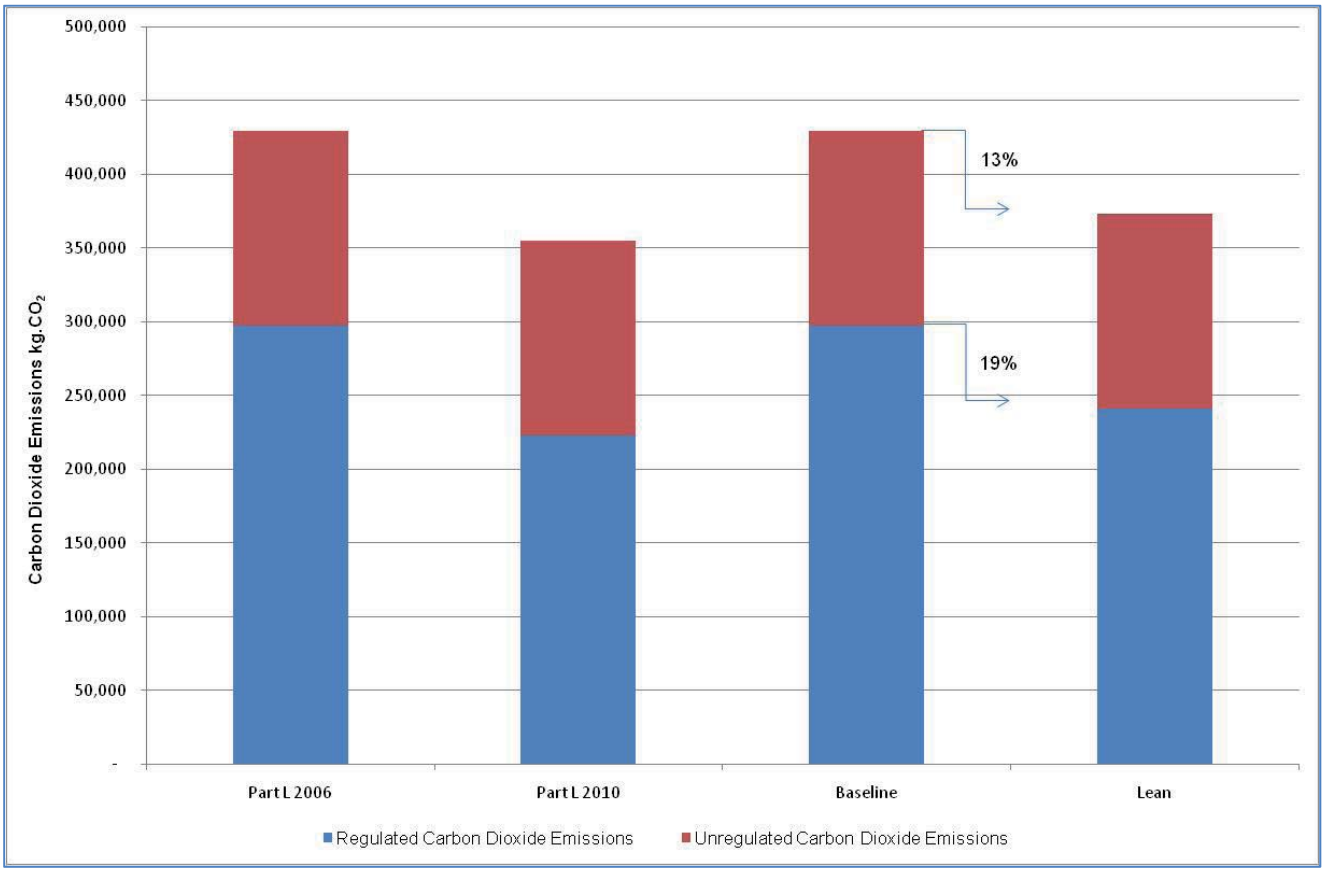


Figure 5: Summary of reduction in total and regulated emissions over the baseline through energy efficiency

5. Be Clean: Proposals for Supplying Energy Efficiently

In accordance with *Policy 4A. 1* and *Policy 4A. 6 Decentralised Energy: Heating, Cooling and Power* once the baseline emissions have been reduced the provision of decentralised energy systems are considered.

The energy demands of the site were considered and it was found that a significant heat base load was present in the form of hot water demand for the residential units. It was also found that active cooling requirements are predicted to be relatively low, as demonstrated in figure 2, therefore a decentralised energy scheme will be required to provide heat and power only.

5.1 Existing Energy Supply Networks

The online resource www.londonheatmap.org.uk was considered firstly to investigate whether an existing distribution network was in place close to the proposed site.

It was found that there were no existing distribution networks within the vicinity of the site hence this option is not feasible for further consideration.

The Evidence Base for Carbon Emissions Reduction Policies London Borough of Richmond on Thames 3rd November 2008 considers the potential for decentralised energy networks within the Local Housing Availability Assessment Potential Sites. The Twickenham Station site is nominated but no further details are provided.

Another of the sites nominated for such a scheme is the 109 London Road Post Office Sorting Office, which is adjacent to the Twickenham Station site considered within this report. Research has been unable to find evidence of a planning application for development of the Sorting Office site, hence it is assumed that the Twickenham Station development would be the first to establish a site-wide decentralised heat network that any future development on the Sorting Office site could connect and contribute to.

5.2 Renewable Energy CHP

A site-wide renewable energy powered CHP system was considered next. The main renewable fuels available for CHP engines are Woodchip, Liquid Biofuels, and Biogas.

Woodchip CHP is not considered suitable for the proposed site for the following reasons;

- A significant area of the site would be required for fuel storage, a bulk delivery vehicle will supply between 20 – 85 m^3 and it is recommended that fuel storage capacity is at least twice the delivery capacity.
- Deliveries could pose health and safety risks as they would involve access to public areas of the site by a heavy goods vehicle, the delivery vehicle will be a 6 or 8 wheel wagon or an articulated lorry depending on the system size and supply contract.
- The site is within an Air Quality Management Area (AQMA) hence a heating system with high particulate emissions would not be allowable.

Liquid biofuels are not considered suitable for the proposed development for the following reasons;

- There are question marks over the sustainability of first generation biofuels – BREEAM does not consider first generation biofuels such as biodiesel or vegetable oil an acceptable low carbon technology, this is due to uncertainty over the impact on biodiversity, global food production and greenhouse gas savings along with the ease of switching from first generation biofuels to fossil fuels.
- Second and third generation biofuels do not currently have a reliable and established supply chain in the UK hence there is not an established supply chain of biofuels with guaranteed sustainability credentials.
- The site is within an Air Quality Management Area (AQMA) hence a heating system with high particulate emissions would not be allowable.

Biogas is not considered suitable for the proposed development for the following reason:

- No easily accessible source of sewage gas has been found within the vicinity of the proposed site.
- It is not considered practical to have an on-site anaerobic digester producing biogas due to lack of available space and potential issues with health, safety and unpleasant aromas.

As a renewable energy fired CHP system is not considered a feasible or sustainable option for this site then the third priority for efficient delivery of heat and power to the site is the most suitable option.

5.3 Proposed Clean Energy Solution: Gas-Fired CHP

It is proposed that the site is served by a site-wide heating distribution network fed by a gas-fired CHP engine within the lower ground floor plant room in Block B. The proposed location of the Energy Centre and an indicative heat main distribution network is shown in figure 6.

The proposed site-wide heat distribution network will ensure that the infrastructure is in place for the proposed mixed use development to connect to any future district-wide energy schemes.

The centralised CHP unit will be designed to meet the base load heat demand and a high efficiency (min 90%) gas-fired boiler system will contribute to the communal heat distribution network when the site-wide demand exceeds the thermal output of the CHP engine.

It should be noted that the distribution network is proposed to serve both space heating and domestic hot water demand across all proposed building-uses with the development.

The proposed CHP design is based on a CHP engine with a heat efficiency of 58.4% and an electrical efficiency of 24.1. The initial CHP design meets 67% of the site-wide domestic hot water and space heating demand when the CHP engine is operating 24 hrs per day.

The initial design has assumed a modular approach using three CHP engines, each with an output of 5.5 kW power and 13.3 kW heat when operating at an assumed return temperature of 60°C.

The CHP unit will be designed to fully satisfy the requirements of the DEFRA GQCHP Scheme.

Figure 8 shows the monthly site-wide heat demands and the proposed output of the most appropriate gas-fired CHP engine to meet the base load demands.

The reduction in site carbon dioxide emissions over the baseline are shown in figures 9 and 10.

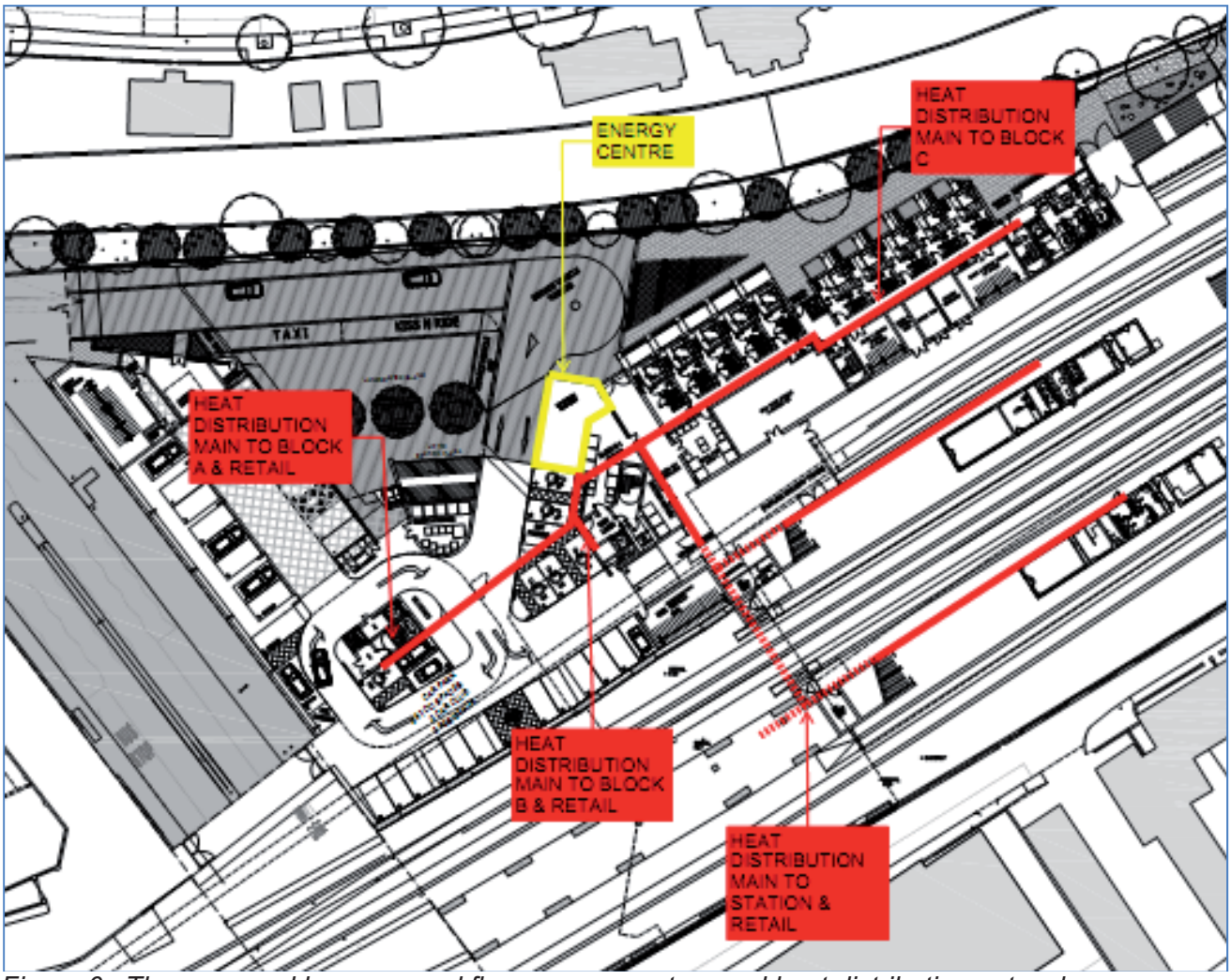


Figure 6: The proposed lower ground floor energy centres and heat distribution network.

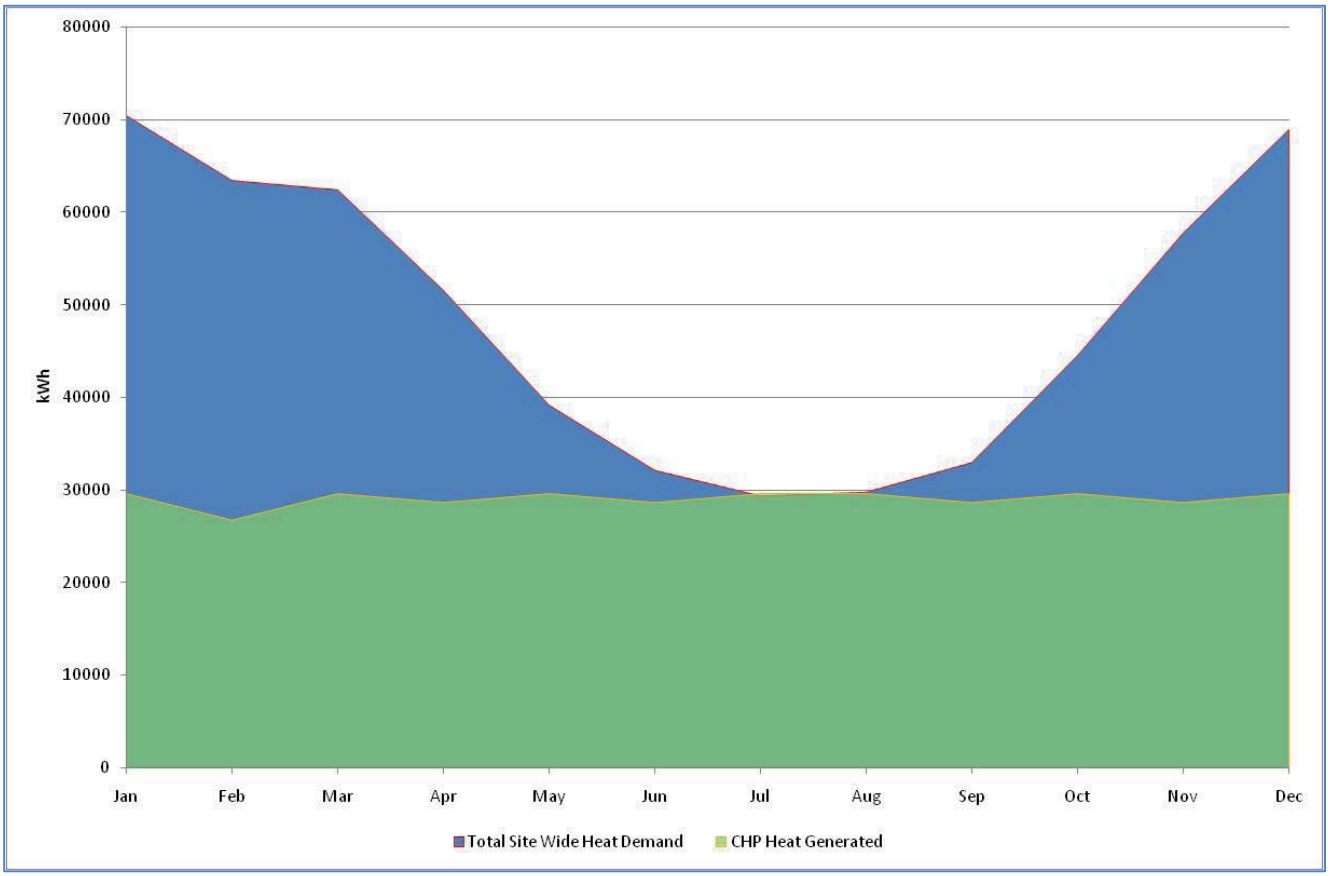


Figure 8: Summary of monthly site-wide heat demands and the proposed gas-CHP output.

5.4 CHP Operation

Initial discussions regarding the use of the ESCO model to operate the site-wide CHP system and heat distribution network have taken place. There are concerns that the scale of the development may not be sufficient for this approach to be viable, however, the feasibility of operating the Energy Centre and distribution network in this way will be assessed further.

5.5 Summary – Be Clean

Building	Lean Total Emissions kg.CO_2/year	Clean Total Emissions kg.CO_2/year	Improvement Over Baseline %
Residential Block A	91,260	76,156	15
Residential Block B	126,553	106,220	14
Residential Block C	60,713	50,532	15
Retail Unit 1	16,422	14,743	8
Retail Unit 2	14,922	14,069	4
Retail Unit 3	15,632	13,681	10
Retail Unit 4	23,747	22,446	4
Conditioned Station + Small Retail Units	24,338	19,089	21
Site-wide Total	**373,586**	**316,936**	**13**

Figure 9: Summary of total (regulated and non-regulated) carbon dioxide emissions reduction through efficient supply of energy

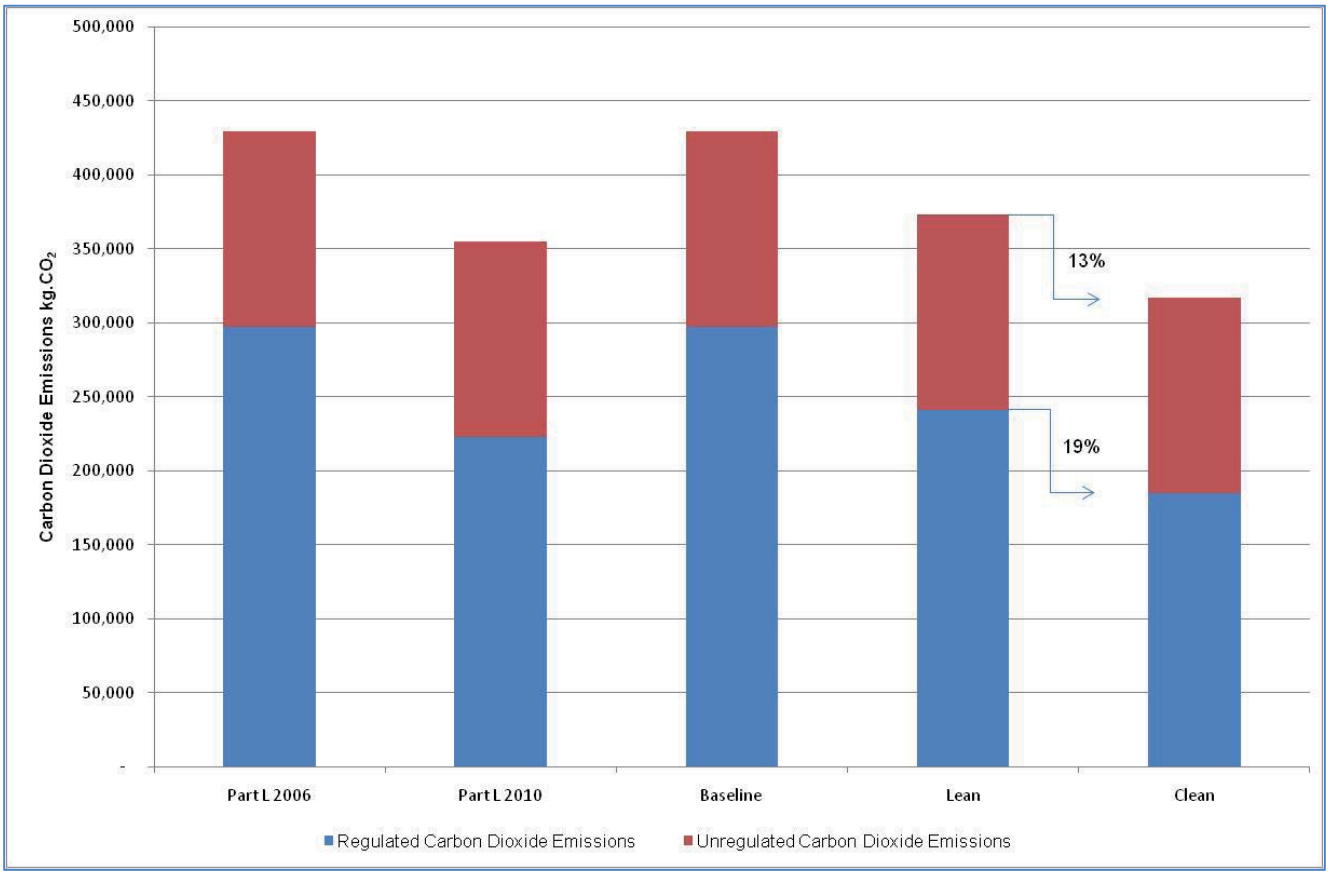


Figure 10: Summary of reduction in total and regulated emissions over the baseline through efficient supply of energy

6. Be Green: Proposals for Renewable Energy Generation

In accordance with *Policy 4A. 1* the site baseline emissions have been reduced through energy efficient design and energy efficient delivery of heat and power, it shall now be considered how the remaining energy demand and associated carbon dioxide emissions can be reduced through the generation of renewable energy.

Policy 4A.7 Renewable Energy states that a 20% reduction in site carbon dioxide emissions should be targeted wherever feasible.

6.1 Feasibility of Renewable Energy Technologies

A renewable energy pre-feasibility study has been performed (*CHBS Report: 9090 Solum Twickenham LZC Pre-Feasibility Study 29-01-10*). The reasons for discounting unfeasible renewable energy technologies are detailed within this report and are summarised below:

Wind Turbines	-	Insufficient predicted wind resource
Biomass	-	Insufficient space for fuel storage Issues of sustainable sourcing Air quality restrictions
Ground Source Heat Pumps	-	High cost of geological survey and limited space
Geothermal	-	Insufficient estimated geothermal heat resource at the site
Hydrogen Fuel Cells	-	Limited supply of hydrogen from renewable sources available

The renewable energy pre-feasibility study found that the most suitable renewable energy technologies for the site are;

Solar Thermal
Mechanical Ventilation with Heat Pump Heat Recovery
Photovoltaics
Air Source Heat Pumps
Water Source Heat Pump
Micro Hydro

Although gas-fired CHP offers significant reductions in carbon dioxide emissions it does however limit the feasible options for renewable heat generation.

It is difficult to integrate a Solar Thermal system with CHP as it would act to reduce the base heat load of the proposed development and could conflict with the CHP during summer months.

Use of Air Source Heat Pumps or Mechanical Ventilation with Heat Pump Heat Recovery to meet the excess heat demand not met by the CHP system is also difficult. Heat pumps cannot efficiently generate the high-grade heat required to feed into a district heating network

It has subsequently been discovered through further investigations that use of the River Crane as an energy resource through the potential energy of its flow or through the heat stored in the water would not be feasible due to issues with ownership of the river bank.

6.2 Proposed Renewable Energy Solution: Photovoltaics

Therefore the most appropriate renewable energy technology to the site is Photovoltaics (PV), which is the only feasible renewable power technology suitable for the site.

Figures 11 shows an indicative layout for an optimally orientated PV array, facing due south at approximately 30° elevation from horizontal. The roof space on Blocks A, B and C are utilised as much as possible although some areas are allocated as dedicated amenity space.

The roof layouts have been configured to ensure that the most un-shaded areas of roof have been made available for the PV panels and the more shaded areas have been allocated for amenity space.

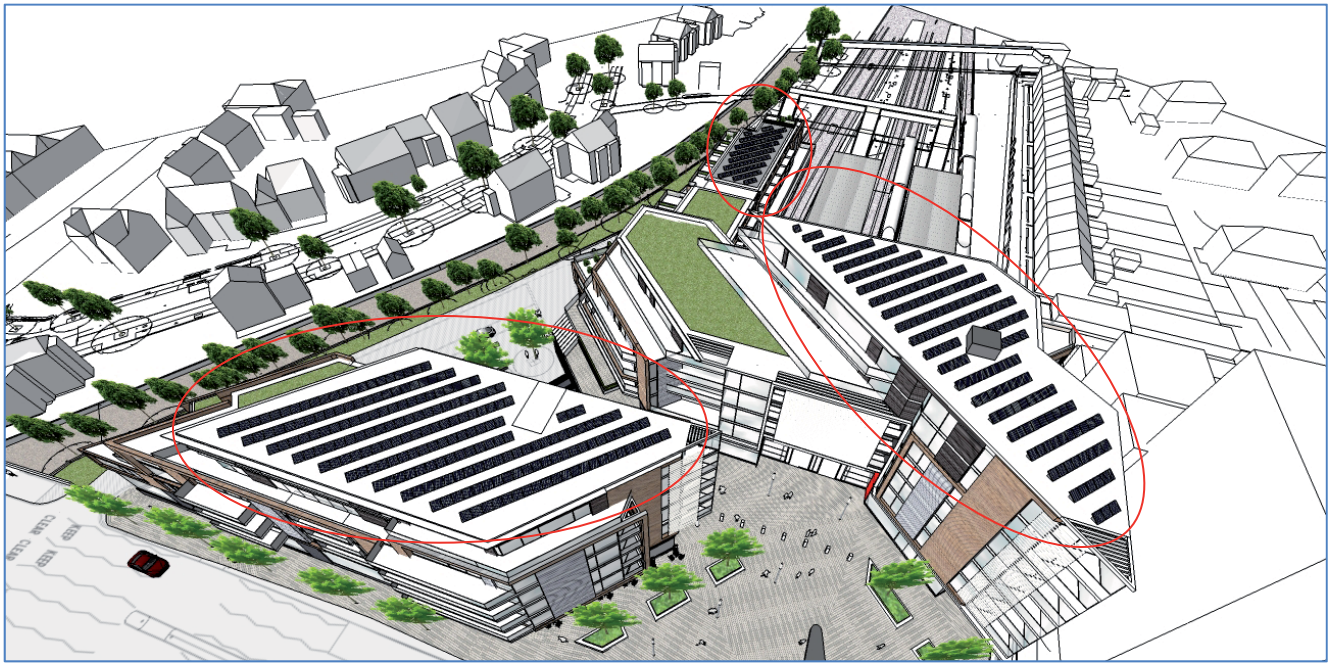


Figure 11: Architects indicative layout of the proposed PV arrays on Blocks A, B & C; optimally orientated PV panels on roof.

An initial assessment of the available roof area has found that there is sufficient space for a total of 25 kW_p PV capacity across the three locations as follows; Block A 10 kW_p, Block B 8 kW_p and Block C 7 kW_p. Maintenance areas and sufficient spacing to avoid panels and roof features causing shading have been considered.

In all proposed PV locations it is proposed that each individual PV panel will be angled at 30°, rather than the individual panels being mounted on a raised frame at 30°, which could increase the available area of solar electricity generation. The reason that a raised frame for mounting the PV array has not been assumed is that there are expected to be planning issues due to the additional height created by this approach and potential negative visual impacts on the architecture of the proposed scheme.

The emissions reductions through the PV arrays are summarised in figures 12 and 13.

6.3 Summary – Be Green

Building	Clean Total Emissions kg.CO_2/year	Green Total Emissions kg.CO_2/year	Improvement Over Baseline %
Residential Block A	76,156	73,329	3
Residential Block B	106,220	103,349	2
Residential Block C	50,532	47,213	5
Retail Unit 1	14,743	14,011	3
Retail Unit 2	14,069	13,428	3
Retail Unit 3	13,681	12,964	4
Retail Unit 4	22,446	21,445	3
Conditioned Station + Small Retail Units	19,089	19,089	0
Site-wide Total	**316,936**	**305,099**	**3**

Figure 12: Summary of total (regulated and non-regulated) carbon dioxide emissions reduction through renewable energy generation

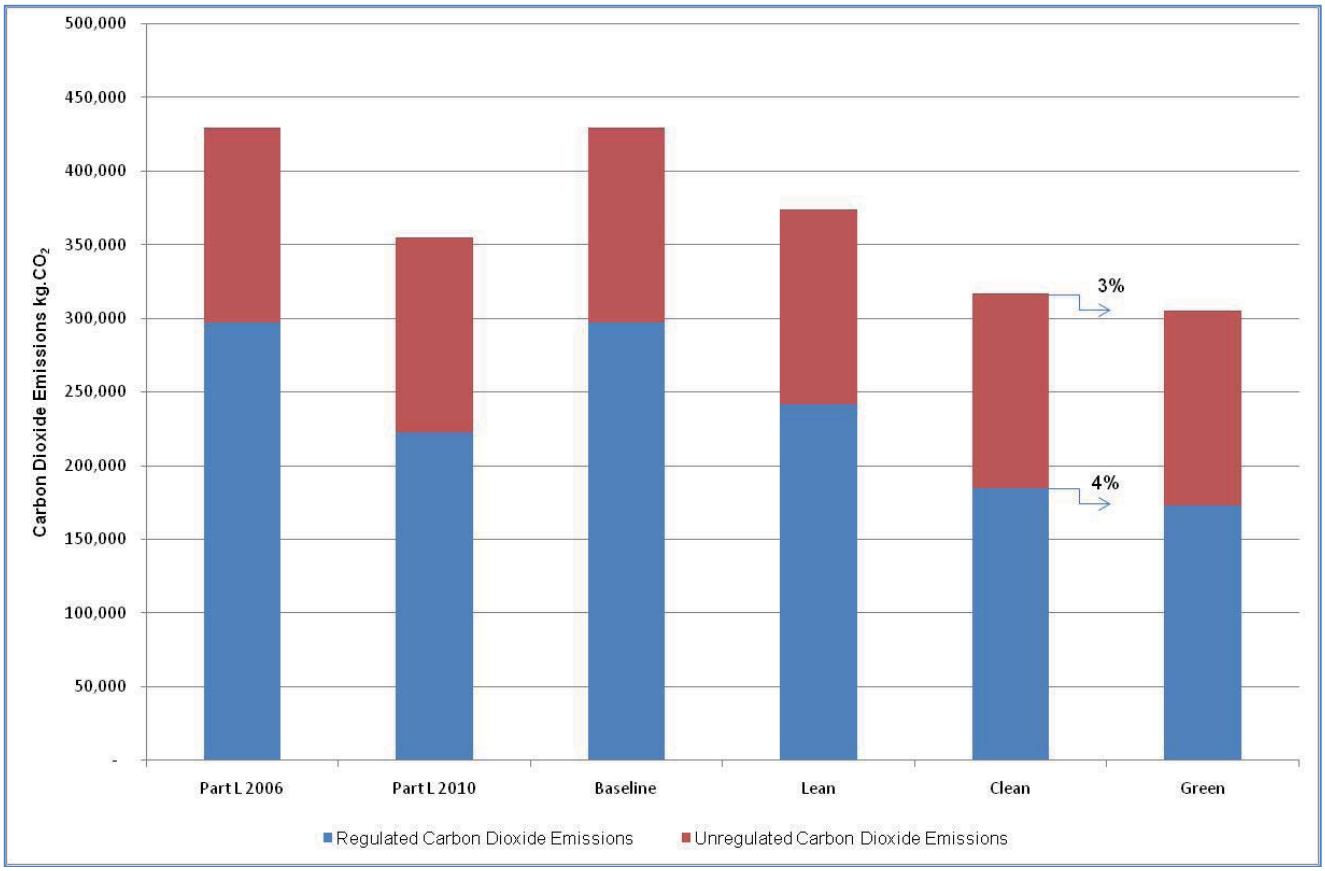


Figure 13: Summary of reduction in total and regulated emissions over the baseline through renewable generation of energy

7. Concluding Summary

This energy statement has been created following the guidance of London Plan Policy 4A.4; it demonstrates the proposed reductions in carbon dioxide emissions through implementation of the Lean / Clean / Green Energy Hierarchy stated in London Plan Policy 4A.1.

It has been shown in this Energy Statement that energy efficiency has been designed into the proposed mixed-use development through significant improvements in the building fabric thermal specification when compared to the minimum requirements of Building Regulations. It has also been demonstrated that building services will be specified with a strong consideration for energy efficiency.

The Energy Statement has described how a site-wide heat distribution network and gas-fired CHP system is proposed in order to supply the whole development with low carbon heat and power.

The Energy Statement has gone on to demonstrate that the site emissions are proposed to be reduced further through the specification of three separate photovoltaic arrays at optimum locations throughout the development in order to generate renewable electricity.

Figure 14 summarises the reductions in the site baseline emissions achieved through implementation of the *London Plan 2008 Policy 4A. 1* as described within this Energy Statement and shows that the Mayor's proposed future carbon reduction targets for new developments between 2010 and 2013 as set out in the draft replacement London Plan (October 2009) of a 44% reduction in regulated emissions over 2006 Building Regulations is almost met.

	Tonnes CO_2 per annum		Carbon Dioxide (%)	
	Regulated	**Total Energy**	**Regulated**	**Total Energy**
Baseline Emissions	297.2	429.5		
Savings from Energy Demand Reduction (Lean)	55.9	55.9	18.8	13.0
Savings from CHP (Clean)	56.7	56.7	19.1	13.2
Savings from Renewable Energy (Green)	11.8	11.8	4.0	2.8
Total Savings	124.4	124.4	41.8	29.0

Figure 14: Summary of carbon dioxide emissions reductions through implementation of energy efficiency, efficient supply of energy and renewable energy generation.

Appendices

Appendix A: Baseline and Lean Modelling Outputs

A1 Residential Baseline and Lean Block Compliance Summary

Block Compliance WorkSheet:
A

User Details

Assessor Name:	Peter Bartley	**Stroma Number:**	STRO001295
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
A00-01	23.52	28.47	47.93
A00-02	21.35	27.07	50.42
A00-03	20.23	25.74	66.25
A00-04	19.64	25.73	72.28
A01-05	20.45	25.41	64.09
A01-06	19.86	25.21	50.57
A01-07	17.06	19.77	70.92
A01-08	18.15	22.87	78.02
A01-09	16.86	22.08	77.08
A01-10	17.84	21.68	63.71
A01-11	16.8	22.47	81.35
A01-12	20.54	24.92	50.41
A01-13	17.83	23.41	91.15
A02-14	22.34	28.17	61.33
A02-15	19.56	22.83	64.09
A02-16	19.86	25.21	50.57
A02-17	16.63	18.51	70.92
A02-18	17.4	20.18	78.02
A02-19	16.25	19.36	77.08
A02-20	18	21.38	63.71
A02-21	16.76	19.84	70.64
A02-22	19.95	22.88	74.54
A03-23	19.56	22.83	64.09
A03-24	19.86	25.21	50.57
A03-25	16.73	18.68	70.92
A03-26	17.4	20.18	78.02

Block Compliance WorkSheet:
A Cont...

Dwelling	DER	TER	TFA
A03-27	16.43	19.71	77.08
A03-28	18.83	22.83	63.71
A03-29	17.66	21.6	70.64
A03-30	21.74	25.84	74.54
A04-31	19.56	22.83	64.09
A04-32	20.92	26.7	50.57
A04-33	18.25	20.23	96.83
A04-34	18.25	21.73	60.58
A04-35	18.98	20.64	78.47
A05-36	21.3	25.7	64.09
A05-37	20.99	24.07	83.71
A05-38	22.27	27.48	52.54
A05-39	20.19	25.76	50.89
A05-40	21.61	24.58	65.88

Calculation Summary

Total Floor Area	2692.30
Average TER	22.96
Average DER	19.00
Compliance	Pass

Block Compliance WorkSheet: B

User Details

Assessor Name:	Peter Bartley	**Stroma Number:**	STRO001295
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
B00-01	21.45	27.15	51.75
B00-02	19.18	22.71	73.13
B00-03	17.92	22.68	74.73
B01-04	20.28	25.08	64.9
B01-05	20.08	25.22	54
B01-06	18.19	22.52	82.9
B01-07	21.16	27.6	51.44
B01-08	20.52	24.97	70.18
B01-09	15.7	20.47	101.8
B01-10	19.4	26.09	62.39
B01-11	18.37	23.38	65.03
B01-12	19.57	23.18	50.44
B01-13	17.46	19.98	72.61
B02-14	19.13	22.46	64.9
B02-15	18.52	22.48	54
B02-16	17.32	20.7	70.75
B02-17	18.11	22.39	75.95
B02-18	19.24	22.3	70.18
B02-19	17.69	21.69	79.49
B02-20	14.29	16.61	105.5
B02-21	16.97	20.72	83.88
B02-22	16.66	19.81	76.92
B02-23	17.95	20.14	96.73
B03-24	19.13	22.46	64.9
B03-25	18.52	22.48	54
B03-26	17.32	20.7	70.75

Block Compliance WorkSheet:
B Cont...

Dwelling	DER	TER	TFA
B03-27	17.29	21.17	75.95
B03-28	19.24	22.3	70.18
B03-29	16.23	18.96	79.49
B03-30	14.29	16.61	105.5
B03-31	16.97	20.72	83.88
B03-32	16.66	19.81	76.92
B03-33	17.95	20.14	96.73
B04-34	20.42	24.57	64.9
B04-35	18.55	22.54	54
B04-36	17.33	20.72	70.75
B04-37	17.29	21.17	75.95
B04-38	19.25	22.31	70.18
B04-39	17.18	20.84	79.49
B04-40	15.47	18.93	105.5
B04-41	18.53	23.56	83.88
B04-42	18.23	22.63	76.92
B04-43	19.72	23.06	96.73
B05-44	17.24	19.47	107.2
B05-45	18.2	21.53	79.63
B05-46	16.44	19.53	88.12
B05-47	19.45	20	86.39
B06-48	18.99	22.41	107.2
B06-49	19.95	24.45	79.63
B06-50	18.06	22.34	88.12
B06-51	21.14	22.85	86.39

Block Compliance WorkSheet:
B Cont...

Calculation Summary

Total Floor Area	3932.88
Average TER	21.64
Average DER	18.06
Compliance	Pass

Block Compliance WorkSheet:
C

User Details

Assessor Name:	Peter Bartley	**Stroma Number:**	STRO001295
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
CLG-01	18.03	21.24	79.27
CLG-02	17.81	20.61	73.15
CLG-03	17.81	20.61	73.15
CLG-04	17.81	20.61	73.15
CLG-05	19.48	23.57	83.79
CLG-06	19.39	23.69	74.99
CLG-07	18.59	21.6	66.54
CLG-08	18.59	21.6	66.54
CLG-09	18.59	21.6	66.54
CLG-10	21.36	24.65	69.07
CLG-11	23.52	29.29	52.25
CLG-12	21.64	25.34	52.25
CLG-13	23.33	28.29	52.25
CUG-14	16.33	19.85	109.12
CUG-15	17.4	20.19	86.9
CUG-16	17.4	20.19	86.9
CUG-17	17.4	20.19	86.9
CUG-18	17.4	20.19	86.9
CUG-19	18.23	22.43	101.34
CUG-20	19.17	23.74	87.17
CUG-21	18.43	21.26	78.26
CUG-22	18.43	21.26	78.26
CUG-23	18.43	21.26	78.26
CUG-24	20.43	24.65	81.26

Block Compliance WorkSheet:
C Cont...

Calculation Summary

Total Floor Area	1844.21
Average TER	22.14
Average DER	18.72
Compliance	Pass

Appendices

Appendix A: Baseline and Lean Modelling Outputs

A2 Retail and Station Baseline and Lean BRUKL Documents

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 1 Lean

As designed

Date: Wed Apr 27 17:01:14 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	181.5 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	130.7 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	99.1 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 1_W_6
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 1_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	153	153
External area (m2)	285	285
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	391.69	3531.26
Average U-value (W/m2K)	1.37	12.39
Alpha value (%)	3.13	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	251.3	494.4	83.2	60.4	0	0.84	2.27	0.9	3.2
	Notional	216.5	847.3	72.5	140.9	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 2 Lean

As designed

Date: Wed Apr 27 17:01:55 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	168.9 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	121.6 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	89.4 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 2_W_6
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 2_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	152	152
External area (m2)	226	226
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	226.01	227.68
Average U-value (W/m2K)	1	1.01
Alpha value (%)	3.01	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	126.3	462.1	41.8	56.5	0	0.84	2.27	0.9	3.2
	Notional	101.8	773.8	34.1	128.7	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 3 Lean

As designed

Date: Wed Apr 27 17:02:53 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	192 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	138.3 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	106.9 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 3_W_5
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 3_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	135	135
External area (m2)	270	270
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	455.57	445.07
Average U-value (W/m2K)	1.69	1.65
Alpha value (%)	3.02	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	329.9	547.1	109.2	66.9	0	0.84	2.27	0.9	3.2
	Notional	276.9	940.6	92.7	156.4	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 4 Lean

As designed

Date: Wed Apr 27 17:03:38 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	177.8 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	128 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	86.4 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block B - Retail 4_W_6
Floor	0.25	0.2	0.7	0.2	Block B - Retail 4_S_3
Roof	0.25	0.13	0.35	0.13	Block B - Retail 4_R_5
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	250	250
External area (m2)	493	493
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	300.26	957.48
Average U-value (W/m2K)	0.61	1.94
Alpha value (%)	5.6	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	117.6	414.1	38.9	50.6	0	0.84	2.27	0.9	3.2
	Notional	124.7	878.4	41.7	146.1	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Station Inc Ret 5 6

As designed

Date: Wed Apr 27 17:07:32 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	92.3 KgCO2/m2.annum
1.2	Improvement factor	0.15
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	70.6 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	69.1 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Main Station Building - Managers Office_W_5
Floor	0.25	0.2	0.7	0.2	Main Station Building - Managers Office_S_3
Roof	0.25	0.13	0.35	0.13	Platform 2 A - WC 1_R_4
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	1	3	1	Main Station Building - Circulation_D_6
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat Only HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	287	287
External area (m2)	1123	1123
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	931.73	1629.84
Average U-value (W/m2K)	0.83	1.45
Alpha value (%)	8.38	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
39	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
61	**Bus station/train station/seaport terminal**
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas										
	Actual	398.9	551.3	138	0	6.8	0.8	0	0.9	0
	Notional	606.2	976	230.7	0	3.7	0.73	0	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Appendices

Appendix B: Clean Modelling Outputs

B1 Residential Clean Block Compliance Summary

Block Compliance WorkSheet:
A

User Details

Assessor Name:	Peter Bartley	**Stroma Number:**	STRO001295
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
A00-01	16.19	28.47	47.93
A00-02	14.96	27.07	50.42
A00-03	14.05	25.74	66.25
A00-04	13.68	25.73	72.28
A01-05	14.17	25.41	64.09
A01-06	14.19	25.21	50.57
A01-07	12.25	19.77	70.92
A01-08	12.74	22.87	78.02
A01-09	12.03	22.08	77.08
A01-10	12.72	21.68	63.71
A01-11	11.98	22.47	81.35
A01-12	14.56	24.92	50.41
A01-13	12.51	23.41	91.15
A02-14	15.27	28.17	61.33
A02-15	13.74	22.83	64.09
A02-16	14.19	25.21	50.57
A02-17	12.01	18.51	70.92
A02-18	12.38	20.18	78.02
A02-19	11.74	19.36	77.08
A02-20	12.87	21.38	63.71
A02-21	12.1	19.84	70.64
A02-22	13.85	22.88	74.54
A03-23	13.74	22.83	64.09
A03-24	14.19	25.21	50.57
A03-25	12.06	18.68	70.92
A03-26	12.38	20.18	78.02

Block Compliance WorkSheet:
A Cont...

Dwelling	DER	TER	TFA
A03-27	11.84	19.71	77.08
A03-28	13.33	22.83	63.71
A03-29	12.61	21.6	70.64
A03-30	14.88	25.84	74.54
A04-31	13.74	22.83	64.09
A04-32	14.77	26.7	50.57
A04-33	12.78	20.23	96.83
A04-34	13.1	21.73	60.58
A04-35	13.26	20.64	78.47
A05-36	14.71	25.7	64.09
A05-37	14.39	24.07	83.71
A05-38	15.51	27.48	52.54
A05-39	14.37	25.76	50.89
A05-40	14.88	24.58	65.88

Calculation Summary

Total Floor Area	2692.30
Average TER	22.96
Average DER	13.39
Compliance	Pass

Block Compliance WorkSheet: B

User Details

Assessor Name:	Peter Bartley	**Stroma Number:**	STRO001295
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
B00-01	14.99	27.15	51.75
B00-02	13.4	22.71	73.13
B00-03	12.7	22.68	74.73
B01-04	14.08	25.08	64.9
B01-05	14.18	25.22	54
B01-06	12.81	22.52	82.9
B01-07	14.84	27.6	51.44
B01-08	14.18	24.97	70.18
B01-09	11.36	20.47	101.8
B01-10	13.62	26.09	62.39
B01-11	13.02	23.38	65.03
B01-12	14.03	23.18	50.44
B01-13	12.48	19.98	72.61
B02-14	13.49	22.46	64.9
B02-15	13.36	22.48	54
B02-16	12.41	20.7	70.75
B02-17	12.81	22.39	75.95
B02-18	13.52	22.3	70.18
B02-19	12.49	21.69	79.49
B02-20	14.26	16.61	105.5
B02-21	12.13	20.72	83.88
B02-22	11.99	19.81	76.92
B02-23	12.65	20.14	96.73
B03-24	13.49	22.46	64.9
B03-25	13.36	22.48	54
B03-26	12.41	20.7	70.75

Block Compliance WorkSheet:
B Cont...

Dwelling	DER	TER	TFA
B03-27	12.35	21.17	75.95
B03-28	13.52	22.3	70.18
B03-29	11.77	18.96	79.49
B03-30	10.56	16.61	105.5
B03-31	12.13	20.72	83.88
B03-32	11.99	19.81	76.92
B03-33	12.65	20.14	96.73
B04-34	14.22	24.57	64.9
B04-35	13.38	22.54	54
B04-36	12.41	20.72	70.75
B04-37	12.35	21.17	75.95
B04-38	13.52	22.31	70.18
B04-39	12.26	20.84	79.49
B04-40	11.23	18.93	105.5
B04-41	13.01	23.56	83.88
B04-42	12.88	22.63	76.92
B04-43	13.66	23.06	96.73
B05-44	12.25	19.47	107.2
B05-45	12.83	21.53	79.63
B05-46	11.81	19.53	88.12
B05-47	13.5	20	86.39
B06-48	13.25	22.41	107.2
B06-49	13.82	24.45	79.63
B06-50	12.72	22.34	88.12
B06-51	14.44	22.85	86.39

Block Compliance WorkSheet:
B Cont...

Calculation Summary

Total Floor Area	3932.88
Average TER	21.64
Average DER	12.89
Compliance	Pass

Block Compliance WorkSheet: C

User Details

Assessor Name: Peter Bartley
Stroma Number: STRO001295
Software Name: Stroma FSAP
Software Version: Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
CLG-01	12.75	21.24	79.27
CLG-02	12.68	20.61	73.15
CLG-03	12.68	20.61	73.15
CLG-04	12.68	20.61	73.15
CLG-05	13.59	23.57	83.79
CLG-06	13.57	23.69	74.99
CLG-07	13.19	21.6	66.54
CLG-08	13.19	21.6	66.54
CLG-09	13.19	21.6	66.54
CLG-10	14.7	24.65	69.07
CLG-11	16.14	29.29	52.25
CLG-12	15.08	25.34	52.25
CLG-13	16.03	28.29	52.25
CUG-14	11.75	19.85	109.12
CUG-15	12.42	20.19	86.9
CUG-16	12.42	20.19	86.9
CUG-17	12.42	20.19	86.9
CUG-18	12.42	20.19	86.9
CUG-19	12.84	22.43	101.34
CUG-20	13.4	23.74	87.17
CUG-21	13.02	21.26	78.26
CUG-22	13.02	21.26	78.26
CUG-23	13.02	21.26	78.26
CUG-24	14.13	24.65	81.26

Block Compliance WorkSheet:
C Cont...

Calculation Summary

Total Floor Area	1844.21
Average TER	22.14
Average DER	13.20
Compliance	Pass

Appendices

Appendix B: Clean Modelling Outputs

B2 Retail and Station Clean BRUKL Documents

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 1 Clean

As designed

Date: Wed Apr 27 16:52:36 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	181.5 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	130.7 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	88.1 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 1_W_6
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 1_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	153	153
External area (m2)	285	285
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	391.69	3531.26
Average U-value (W/m2K)	1.37	12.39
Alpha value (%)	3.13	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	82.9	494.4	27.5	60.4	0	0.84	2.27	0.9	3.2
	Notional	216.5	847.3	72.5	140.9	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 2 Clean

As designed

Date: Wed Apr 27 16:50:23 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	168.9 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	121.6 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	83.8 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 2_W_6
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 2_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	152	152
External area (m2)	226	226
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	226.01	227.68
Average U-value (W/m2K)	1	1.01
Alpha value (%)	3.01	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	41.7	462.1	13.8	56.5	0	0.84	2.27	0.9	3.2
	Notional	101.8	773.8	34.1	128.7	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 3 Clean

As designed

Date: Wed Apr 27 16:48:55 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	192 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	138.3 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	92.5 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 3_W_5
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 3_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	135	135
External area (m2)	270	270
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	455.57	445.07
Average U-value (W/m2K)	1.69	1.65
Alpha value (%)	3.02	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	108.9	547.1	36	66.9	0	0.84	2.27	0.9	3.2
	Notional	276.9	940.6	92.7	156.4	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 4 Clean

As designed

Date: Wed Apr 27 16:44:18 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	177.8 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	128 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	81.2 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block B - Retail 4_W_6
Floor	0.25	0.2	0.7	0.2	Block B - Retail 4_S_3
Roof	0.25	0.13	0.35	0.13	Block B - Retail 4_R_5
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	250	250
External area (m2)	493	493
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	300.26	957.48
Average U-value (W/m2K)	0.61	1.94
Alpha value (%)	5.6	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	38.8	414.1	12.9	50.6	0	0.84	2.27	0.9	3.2
	Notional	124.7	878.4	41.7	146.1	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Station Inc Ret 5 6

As designed

Date: Wed Apr 27 17:05:54 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	92.3 KgCO2/m2.annum
1.2	Improvement factor	0.15
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	70.6 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	50.8 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Main Station Building - Managers Office_W_5
Floor	0.25	0.2	0.7	0.2	Main Station Building - Managers Office_S_3
Roof	0.25	0.13	0.35	0.13	Platform 2 A - WC 1_R_4
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	1	3	1	Main Station Building - Circulation_D_6
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat Only HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	287	287
External area (m2)	1123	1123
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	931.73	1629.84
Average U-value (W/m2K)	0.83	1.45
Alpha value (%)	8.38	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
39	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
61	**Bus station/train station/seaport terminal**
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas										
	Actual	131.7	551.3	45.5	0	6.8	0.8	0	0.9	0
	Notional	606.2	976	230.7	0	3.7	0.73	0	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Appendices

Appendix C: Green Modelling Outputs

C1 Residential Green Block Compliance Summary

Block Compliance WorkSheet:
A

User Details

Assessor Name:	Peter Bartley	**Stroma Number:**	STRO001295
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
A00-01	15.1	28.47	47.93
A00-02	13.93	27.07	50.42
A00-03	12.98	25.74	66.25
A00-04	12.63	25.73	72.28
A01-05	13.14	25.41	64.09
A01-06	13.16	25.21	50.57
A01-07	11.18	19.77	70.92
A01-08	11.71	22.87	78.02
A01-09	10.99	22.08	77.08
A01-10	11.68	21.68	63.71
A01-11	10.93	22.47	81.35
A01-12	13.53	24.92	50.41
A01-13	11.47	23.41	91.15
A02-14	14.19	28.17	61.33
A02-15	12.7	22.83	64.09
A02-16	13.16	25.21	50.57
A02-17	10.94	18.51	70.92
A02-18	11.35	20.18	78.02
A02-19	10.7	19.36	77.08
A02-20	11.83	21.38	63.71
A02-21	11.03	19.84	70.64
A02-22	12.77	22.88	74.54
A03-23	12.7	22.83	64.09
A03-24	13.16	25.21	50.57
A03-25	10.99	18.68	70.92
A03-26	11.35	20.18	78.02

Block Compliance WorkSheet:
A Cont...

Dwelling	DER	TER	TFA
A03-27	10.8	19.71	77.08
A03-28	12.29	22.83	63.71
A03-29	11.54	21.6	70.64
A03-30	13.8	25.84	74.54
A04-31	12.7	22.83	64.09
A04-32	13.74	26.7	50.57
A04-33	11.75	20.23	96.83
A04-34	12.08	21.73	60.58
A04-35	12.23	20.64	78.47
A05-36	13.68	25.7	64.09
A05-37	13.32	24.07	83.71
A05-38	14.43	27.48	52.54
A05-39	13.35	25.76	50.89
A05-40	13.8	24.58	65.88

Calculation Summary

Total Floor Area	2692.30
Average TER	22.96
Average DER	12.34
Compliance	Pass

Block Compliance WorkSheet: B

User Details

Assessor Name:	Peter Bartley	**Stroma Number:**	STRO001295
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
B00-01	14.25	27.15	51.75
B00-02	12.69	22.71	73.13
B00-03	11.94	22.68	74.73
B01-04	13.35	25.08	64.9
B01-05	13.48	25.22	54
B01-06	12.07	22.52	82.9
B01-07	14.1	27.6	51.44
B01-08	13.44	24.97	70.18
B01-09	10.62	20.47	101.8
B01-10	12.86	26.09	62.39
B01-11	12.29	23.38	65.03
B01-12	13.28	23.18	50.44
B01-13	11.76	19.98	72.61
B02-14	12.76	22.46	64.9
B02-15	12.66	22.48	54
B02-16	11.67	20.7	70.75
B02-17	12.07	22.39	75.95
B02-18	12.77	22.3	70.18
B02-19	11.78	21.69	79.49
B02-20	13.54	16.61	105.5
B02-21	11.39	20.72	83.88
B02-22	11.25	19.81	76.92
B02-23	11.92	20.14	96.73
B03-24	12.76	22.46	64.9
B03-25	12.66	22.48	54
B03-26	11.67	20.7	70.75

Block Compliance WorkSheet:
B Cont...

Dwelling	DER	TER	TFA
B03-27	11.6	21.17	75.95
B03-28	12.77	22.3	70.18
B03-29	11.01	18.96	79.49
B03-30	9.84	16.61	105.5
B03-31	11.39	20.72	83.88
B03-32	11.25	19.81	76.92
B03-33	11.92	20.14	96.73
B04-34	13.49	24.57	64.9
B04-35	12.68	22.54	54
B04-36	11.68	20.72	70.75
B04-37	11.6	21.17	75.95
B04-38	12.77	22.31	70.18
B04-39	11.55	20.84	79.49
B04-40	10.51	18.93	105.5
B04-41	12.27	23.56	83.88
B04-42	12.14	22.63	76.92
B04-43	12.92	23.06	96.73
B05-44	11.5	19.47	107.2
B05-45	12.12	21.53	79.63
B05-46	11.06	19.53	88.12
B05-47	12.78	20	86.39
B06-48	12.5	22.41	107.2
B06-49	13.11	24.45	79.63
B06-50	11.97	22.34	88.12
B06-51	13.73	22.85	86.39

Block Compliance WorkSheet:
B Cont...

Calculation Summary

Total Floor Area	3932.88
Average TER	21.64
Average DER	12.16
Compliance	Pass

Block Compliance WorkSheet: C

User Details

Assessor Name: Peter Bartley
Stroma Number: STRO001295
Software Name: Stroma FSAP
Software Version: Version: 1.1.0.214

Calculation Details

Dwelling	DER	TER	TFA
CLG-01	10.96	21.24	79.27
CLG-02	10.87	20.61	73.15
CLG-03	10.87	20.61	73.15
CLG-04	10.87	20.61	73.15
CLG-05	11.78	23.57	83.79
CLG-06	11.8	23.69	74.99
CLG-07	11.41	21.6	66.54
CLG-08	11.41	21.6	66.54
CLG-09	11.41	21.6	66.54
CLG-10	12.91	24.65	69.07
CLG-11	14.33	29.29	52.25
CLG-12	13.26	25.34	52.25
CLG-13	14.22	28.29	52.25
CUG-14	9.97	19.85	109.12
CUG-15	10.62	20.19	86.9
CUG-16	10.62	20.19	86.9
CUG-17	10.62	20.19	86.9
CUG-18	10.62	20.19	86.9
CUG-19	11.06	22.43	101.34
CUG-20	11.6	23.74	87.17
CUG-21	11.2	21.26	78.26
CUG-22	11.2	21.26	78.26
CUG-23	11.2	21.26	78.26
CUG-24	12.33	24.65	81.26

Block Compliance WorkSheet:
C Cont...

Calculation Summary

Total Floor Area	1844.21
Average TER	22.14
Average DER	11.40
Compliance	Pass

Appendices

Appendix C: Green Modelling Outputs

C2 Retail and Station Green BRUKL Documents

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 1 Green

As designed

Date: Wed Apr 27 16:59:15 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	181.5 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	130.7 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	83.3 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 1_W_6
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 1_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	153	153
External area (m2)	285	285
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	391.69	3531.26
Average U-value (W/m2K)	1.37	12.39
Alpha value (%)	3.13	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	82.9	494.4	27.5	60.4	0	0.84	2.27	0.9	3.2
	Notional	216.5	847.3	72.5	140.9	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 2 Green

As designed

Date: Wed Apr 27 16:57:53 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	168.9 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	121.6 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	79.6 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 2_W_6
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 2_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	152	152
External area (m2)	226	226
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	226.01	227.68
Average U-value (W/m2K)	1	1.01
Alpha value (%)	3.01	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	41.7	462.1	13.8	56.5	0	0.84	2.27	0.9	3.2
	Notional	101.8	773.8	34.1	128.7	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 3 Green

As designed

Date: Wed Apr 27 16:56:14 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	192 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	138.3 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	87.2 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block A 2011 - Zone 3_W_5
Floor	0.25	0.2	0.7	0.2	Block A 2011 - Zone 3_S_3
Roof	0.25	0	0.35	0	"No heat loss roofs"
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

2.4	Does fixed internal lighting comply with England and Wales Building Regulations Part L paragraphs 49 to 61?	Separate submission
2.5	Are energy meters installed in accordance with GIL65?	Separate submission

Criterion 3: The spaces in the building without air-conditioning have appropriate passive control measures to limit the effects of solar gains

3.1	Method of showing compliance with England and Wales Building Regulations Part L in paragraph 64?	Separate submission

Criterion 4: The performance of the building, as built, is consistent with the BER

4.1	Have the key features of the design been included (or bettered) in practice?	Separate submission
4.2	Is the level of thermal bridging acceptable?	Separate submission
4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	135	135
External area (m2)	270	270
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	455.57	445.07
Average U-value (W/m2K)	1.69	1.65
Alpha value (%)	3.02	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	108.9	547.1	36	66.9	0	0.84	2.27	0.9	3.2
	Notional	276.9	940.6	92.7	156.4	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
Cool dem (MJ/m2)	= Cooling energy demand
Heat con (kWh/m2)	= Heating energy consumption
Cool con (kWh/m2)	= Cooling energy consumption
Aux con (kWh/m2)	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L

Project name

Retail 4 Green

As designed

Date: Wed Apr 27 16:54:54 2011

Administrative information

Building Details

Address: Retail Unit, Twickenham Station, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v3.5.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v2.3.6

BRUKL compliance check version: v3.5.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Julian Leese

Telephone number: 0161 341 0088

Address: Nelson House Park Road Timperley Altrincham, Altrincham, WA14 5BZ

Criterion 1: Predicted CO2 emission from proposed building does not exceed the target

1.1	Calculated CO2 emission rate from notional building	177.8 KgCO2/m2.annum
1.2	Improvement factor	0.2
1.3	LZC benchmark	0.1
1.4	Target CO2 Emission Rate (TER)	128 KgCO2/m2.annum
1.5	Building CO2 Emission Rate (BER)	77.2 KgCO2/m2.annum
1.6	Are emissions from building less than or equal to the target?	BER =< TER
1.7	Are as built details the same as used in BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services systems should be no worse than the design limits

2.1 Are the U-values better than the design limits? Better than design limits

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Limit}$	$U_{i\text{-}Calc}$	Surface where this maximum value occurs*
Wall**	0.35	0.25	0.7	0.25	Block B - Retail 4_W_6
Floor	0.25	0.2	0.7	0.2	Block B - Retail 4_S_3
Roof	0.25	0.13	0.35	0.13	Block B - Retail 4_R_5
Windows***, roof windows, and rooflights	2.2	0	3.3	0	"No heat loss windows/rooflights"
Personnel doors	2.2	0	3	0	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	0	4	0	"No heat loss vehicle access doors"
High usage entrance doors	6	0	6	0	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface exceeding the limiting standards.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standards are similar to those for windows.
*** Display windows and similar glazing are not required to meet the standard given in this table.

2.2 Is air permeability no greater than the worst acceptable standard? No greater than worst acceptable standard

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

2.3 Are all building services standards acceptable?

2.3a-1 Gas Heat AC Coolth HVAC system standard is acceptable

Efficiency check	Limiting heat source seasonal efficiency	This building
Heat source efficiency	0.84	0.9
0.84 is the overall limiting efficiency for a single or a multiple boiler system. For a multiple boiler system the limiting efficiency for any individual boiler is 0.80.		
Efficiency check	**Limiting Cooling Nominal efficiency**	**This building**
Cooling efficiency	2.4	3.2

2.3b- "No HWS in project, or hot water is provided by HVAC system"

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4.3	Has satisfactory documentary evidence of site inspection checks been produced?	Separate submission

4.4 Design air permeability

Air Permeability	Worst acceptable standard	This building (Design value)
m3/(h.m2) at 50 Pa	10	5

4.5	Has evidence been provided that demonstrates that the design air permeability has been achieved satisfactorily?	Separate submission
4.6	Has commissioning been completed satisfactorily?	Separate submission
4.7	Has evidence been provided that demonstrates that the ductwork is sufficiently airtight?	Separate submission

Criterion 5: Providing information

5.1	Has a suitable building log-book been prepared?	Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area (m2)	250	250
External area (m2)	493	493
Weather	LON	LON
Infiltration (m3/hm2 @ 50Pa)	5	10
Average conductance (W/K)	300.26	957.48
Average U-value (W/m2K)	0.61	1.94
Alpha value (%)	5.6	10

Building Use

% area	Building Type
	Office
	Primary school
	Secondary school
	Further education universities
	Primary health care buildings
	Nursing residential homes and hostels
	Hospital
	Hotel
	Restaurant/public house
	Sports centre/leisure centre
	Sports ground arena
100	**Retail**
	Warehouse and storage
	Theatres/cinemas/music halls and auditoria
	Social clubs
	Community/day centre
	Libraries/museums/galleries
	Prisons
	Emergency services
	Crown and county courts
	Airport terminals
	Bus station/train station/seaport terminal
	Workshops/maintenance depot
	Telephone exchanges
	Industrial process building
	Launderette
	Dwelling
	Retail warehouses
	Miscellaneous 24hr activities

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Grid Supplied Electricity										
	Actual	38.8	414.1	12.9	50.6	0	0.84	2.27	0.9	3.2
	Notional	124.7	878.4	41.7	146.1	35.7	0.83	1.67	----	----

Key to terms

Alpha value (%)	= percentage of the building's average heat transfer coefficient which is due to thermal bridging
Heat dem (MJ/m2)	= Heating energy demand
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Heat gen SSEFF	= Heating generator seasonal efficiency
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ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Code for Sustainable Homes

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Church House Building Sustainability

THE CODE FOR SUSTAINABLE HOMES PRE-ASSESSMENT

SOLUM REGENERATION PARTNERSHIP

Proposed Mixed-Use Development
Twickenham Station
London

28/04/11

Revision C

PB/JL/9090

CHB Design Services Ltd T/A
Church House Building Sustainability
Reg. No: 5945817 Reg. Office: As above

CONTENTS

1.0 INTRODUCTION

This Code for Sustainable Homes pre-assessment has been prepared on behalf of Solum Regeneration Partnership. The report summarises the results of, and assumptions made, within the production of a Code for Sustainable Homes pre-assessment for 115 residential units within a proposed mixed use development at Twickenham Station, London.

The report is based on plans and building layouts provided in the following drawings provided on 21/04/11 by Rolfe Judd;

4674 / T(20)E01 B
4674 / T(20)E02 B
4674 / T(20)E03 B
4674 / T(20)E04 C
4674 / T(20)E05 B
4674 / T(20)E06 B

4674 / T(20)P -1 D
4674 / T(20)P -1M B
4674 / T(20)P00 B
4674 / T(20)P0M B
4674 / T(20)P01 B
4674 / T(20)P02 B
4674 / T(20)P03 B
4674 / T(20)P04 B
4674 / T(20)P05 B
4674 / T(20)P06 B
4674 / T(20)P07 B

4674 / T(20)S01 B
4674 / T(20)S02 B
4674 / T(20)S03 B
4674 / T(20)S04 B

The report will explain the importance of, and methodology behind, the Code for Sustainable Homes.

The report will detail which credits are likely to be achieved based on the experience of the assessor and any preliminary information provided.

Throughout the report, reference will be made to evidence required to prove credits, although more detail of these evidential requirements will be outside of the scope of this report and provided in an initial design stage assessment report.

Due to the nature of the pre-assessment being undertaken at an early stage assumptions have been made and these will all be clearly noted within the body of this report.

2.0 THE CODE FOR SUSTAINABLE HOMES

Context

The Code for Sustainable Homes is a holistic measure of the sustainability of new dwellings. The Code was developed not only to reduce the carbon dioxide emissions from new dwellings, in order to meet the Government requirements to try and mitigate the worst impacts of climate change, but also to minimise other environmental impacts due to the construction and use of dwellings such as waste generation, water consumption and pollution.

The importance of developing dwellings with a Code Rating of at least a Level 3 now is that this both future-proofs our buildings and also prepares developers and construction professionals for the proposed changes to the Building Regulations which will require the equivalent energy performance of Level 3 in 2010, Level 4 by 2013 and Level 5/6 by 2016.

A Code Level 4 is mandatory for funding of Affordable Housing Developments and some Local Authorities have planning policy stating a requirement for Level 3, or Level 4 in some cases, for all new dwellings.

How the Code Works

The Code for Sustainable Homes is made up of nine categories, and several issues are covered within each category, with credits available for meeting the particular criteria of that issue.

Each category has a weighting factor for which the proportion of the maximum credits achieved in that category is multiplied by, and then summed across, all categories to achieve the final Code Rating percentage.

Category	Weighting	Approximate weighted value of 1 credit
Energy & CO_2 Emissions	36.4%	1.26
Water	9.0%	1.50
Materials	7.2%	0.30
Surface Water Run-off	2.2%	0.55
Waste	6.4%	0.91
Pollution	2.8%	0.70
Health & Wellbeing	14.0%	1.17
Management	10.0%	1.11
Ecology	12.0%	1.33

The Code levels can be achieved through scoring percentage points as follows (assuming mandatory requirements are met), it should be noted that decimals are always rounded down to the nearest integer.

Percentage Points	Code Rating
36	Level 1
48	Level 2
57	Level 3
68	Level 4
84	Level 5
90	Level 6

Mandatory criteria will be discussed in chapter 3.0 before consideration of the tradable credits, which will be summarised in chapter 4.0. The full Code for Sustainable Homes calculation is shown in the Appendix.

3.0 MANDATORY REQUIREMENTS

3.1 ENERGY AND CO_2 EMISSIONS

Initial SAP2005 calculations have been performed as a part of developing an Energy Strategy for the site and initial proposals indicate that reductions in DER over TER in the region of 44 - 49% will be achieved. This level of carbon dioxide emissions reduction is sufficient to meet the mandatory 44% reduction required in order to achieve Code Level 4.

3.2 WATER – INTERNAL CONSUMPTION

In order to meet Code Level 4 it is a mandatory requirement that the maximum potable water consumption per person per day is no more than 105 litres as calculated by the Water Efficiency calculator for new Dwellings. Typical figures for flow rates and capacities of water consuming fixtures and fittings in order to meet this requirement are provided in Section 4.2.

3.3 MATERIALS

In order to meet any level of the Code then at least three of the following elements must achieve a Green Guide (2008) Rating of A+ to D; Roof, External Walls, Internal Walls, Upper and Ground Floors, and Windows.

The proposed construction details/building materials list should be provided to the Code Assessor at an early stage of the design process to allow for feedback to be included into the designs in order to maximise the Green Guide Ratings for the main building elements.

3.4 WATER – SURFACE RUN-OFF

In order to meet any level of the Code, it must be shown that water run-off rates and volumes post-development will be no greater than the previous conditions on site.

Compliance with this mandatory requirement can be proven by ensuring that a suitably qualified engineer's Flood Risk Assessment (FRA) Report or Surface Water Drainage Report includes the required calculations of surface water run-off rates and volumes to the specific requirements of the Code for Sustainable Homes.

If the report shows that the peak rate of runoff and volume of runoff have increased due to developing the site then Sustainable Drainage Solutions (SUDs) are likely to be necessary in order to meet this mandatory requirement.

3.5 WASTE – HOUSEHOLD

In order to meet any level of the Code, space must be provided for either; all of the containers provided by the Local Authority Recycling Scheme, without stacking; or the minimum capacity of waste storage calculated under BS5906, whichever is the greatest.

The Local Authority will have to be consulted to confirm the waste and recycling service which they provide to ensure that the household waste storage provision is sufficient to meet this mandatory requirement.

The storage area must be sited on a hard, level surface to allow easy access to disabled people, especially wheelchair users.

3.6 WASTE – CONSTRUCTION

In order to meet any level of the Code a Site Waste Management Plan (SWMP) is required.

The SWMP must be developed and implemented to set targets and monitor waste generated on site in defined waste groups. The targets for waste management should be designed to encourage resource efficiency in accordance with guidance provided by WRAP, Envirowise, BRE and DEFRA.

4.0 TRADABLE REQUIREMENTS

4.1 ENERGY AND CO_2 EMISSIONS

DWELLING EMISSION RATE

8 OF 15 CREDITS AWARDED

Initial SAP2005 calculations have been performed as a part of developing an Energy Strategy for the site and initial proposals indicate that reductions in DER over TER in the region of 44 - 49% will be achieved.

Detailed design stage SAP calculations should be used to ensure that the dwellings are designed to meet the mandatory reduction in carbon dioxide emissions with a sufficient margin to ensure that as-built compliance can be achieved.

The evidence required to achieve these credits include full SAP 2005 worksheets.

BUILDING FABRIC

2 OF 2 CREDITS AWARDED

Initial SAP2005 calculations have been performed as a part of developing an Energy Strategy for the site and initial proposals indicate that the area weighted dwelling Heat Loss Parameter (HLP) is 1.04, hence two credits can be achieved.

A low HLP is achieved as the Energy Strategy utilises energy efficiency design principles such as specifying high levels of insulation and a low air tightness to reduce the carbon dioxide emissions of the proposed dwellings. The HLP is also a product of the geometry of the dwellings, including the heat loss area to floor area ratio and proportion of glazing.

The evidence required to achieve these credits include full SAP 2005 worksheets.

INTERNAL LIGHTING

2 OF 2 CREDITS AWARDED

It has been assumed that 75% or more of the light fittings in each dwelling will be dedicated energy efficient, only capable of accepting lamps with an efficacy greater than 40 lumens per circuit watt.

For the design stage assessment; the evidence can be met if this requirement is stated within the specification.

DRYING SPACE

1 OF 1 CREDIT AWARDED

At least 4 m of washing line for 1-2 bed dwellings and at least 6 m of washing line for dwellings of 3 beds or more is assumed to be provided. The drying space can be provided in the form of a permanently fixed bathroom dryer.

It should be ensured that the ventilation in the room where the dryer is located is in compliance with both Building Regulations Approved Document Part F and the Energy Saving Trust recommendations regarding ventilation of indoor spaces supplied with drying fixings.

For the design stage assessment; the evidence can be met if this requirement is stated within the specification.

ENERGY LABELLED WHITE GOODS

1 OF 2 CREDITS AWARDED

It is assumed that no white goods will be provided, but information will be provided to the homeowner regarding the EU Energy Efficiency Labelling Scheme of efficient white goods.

For the design stage assessment; the evidence can be met if the specification states that an information leaflet on the EU Energy Efficiency Labelling Scheme of efficient white goods is provided to each dwelling and a copy of the leaflet is provided.

EXTERNAL LIGHTING

2 OF 2 CREDITS AWARDED

It is assumed that all external space lighting is provided by dedicated energy efficient fittings. If security lighting is not provided then a further credit can be awarded by default as long as energy efficient space lighting is provided. If security lighting is provided it must be energy efficient and controlled to ensure that it does not operate during daylight hours.

For the design stage assessment; the evidence can be met if this requirement is stated within the specification in detail ensuring that all of the specific requirements of this Code for Sustainable Homes issue are met.

LOW OR ZERO CARBON (LZC) TECHNOLOGIES

2 OF 2 CREDITS AWARDED

The Energy Strategy includes the use of gas-fired Combined Heat and Power (CHP) and Photovoltaic (PV) panels in order to significantly reduce the carbon dioxide emissions of the dwelling beyond the reductions achieved through energy efficient design alone.

The proposals within the Energy Statement would reduce the dwelling carbon dioxide emission rates by in excess of 15% allowing all credits to be achieved for this issue.

The design stage evidence required for this issue includes a Renewable Energy Feasibility Study and compliant SAP2005 calculation of carbon dioxide emissions reduction. Either specification text or drawings are also required to confirm the installation of LZC technologies.

CYCLE STORAGE

1 OF 2 CREDITS AWARDED

It is assumed that secure and weatherproof cycle storage facilities are provided for each dwelling. Communal cycle storage must have fittings set into concrete to allow both frame and wheel to be locked securely and a permanent entrance lock which conforms to BS 3621:2004.

The minimum requirement to achieve one credit is to provide one cycle store for every two studio or one bedroom dwellings, one cycle store for every two or three bedroom dwelling and two cycle stores for every four bedroom dwelling.

The drawings T(20)P-1 D and T(20)P00 B indicate that provision for sufficient number of cycles has been allocated to each of the proposed residential blocks.

In the case of Block C an additional credit is available here as this block is served by sufficient cycle storage to allow one space for each one bed dwelling and two spaces for each two or three bed dwelling.

If a proprietary system is not used then it must be ensured that the dimensions of the cycle storage areas comply with the guidance within the New Metric Handbook.

The design stage evidence can be satisfied with drawings and specification text.

HOME OFFICE

0 OF 1 CREDIT AWARDED

In order to achieve this credit a specific level of daylighting must be achieved within the dedicated home office space along with the provision of home office services.

It is assumed that this credit cannot be achieved due to the daylighting requirements. (See section 4.7)

4.2 WATER

INDOOR WATER USE

3 OF 5 CREDITS AWARDED

The mandatory Code Level 3 and 4 requirements for indoor water consumption, being no more than 105 litres per person per day, must be met.

Generally this may be achieved by using water efficient fittings and appliances. Typical values required in order to achieve this are as follows:

4.5 / 3 litres dual flush WCs
4 litres per min taps
155 litre capacity bath
6 litres per min shower

For the design stage assessment; the evidence can be met if the specification states specific performance capacity and flow rates for water consuming fittings.

EXTERNAL WATER USE

0 OF 1 CREDIT AWARDED

Some rooftop terraces are provided and the dwellings on the lower ground floor of Block C have a garden area, therefore the provision of outdoor space to the dwellings is not through private balconies alone, where the only outdoor space provided is through balconies this credit can be achieved by default.

This credit can be awarded by providing water butts to the several garden and terraces spaces proposed. Water butts should be at least 100 litres for a terrace/patio or at least 150 litres for a small private garden of a 1 or 2 bed dwelling. These minimum requirements can be halved if no planting is provided and all of the outdoor space is hard standing only. The water butts must be correctly specified in accordance with the Code for Sustainable Homes Technical Guide.

It is considered that there are potential difficulties in providing downpipes from rooftop drainage to several small individual water butts; therefore it is assumed that this credit is not achieved at this time but there is potential to pursue it at a later stage if required.

4.3 MATERIALS

ENVIRONMENTAL IMPACT OF MATERIALS

10 OF 15 CREDITS AWARDED

The BRE MAT1 calculator is used to calculate the credits for this issue depending on the Green Guide 2009 rating of the dwelling external walls, internal walls, roof, floors and windows.

It is assumed that a Green Guide rating as follows is achieved for the five key building elements;

Roof	A+
External Walls	A
Internal Walls	A
Upper & Ground Floors	B
Windows	A

These Green Guide ratings should be viewed as a minimum standard rather than a target as there is potential to achieve further credits in this issue through specifying construction materials with a higher Green Guide rating.

For further information on which construction materials achieve the required ratings see the BRE Green Guide 2009 (*www.bre.co.uk/greenguide*).

Drawings and/or specification documents detailing the proposed construction materials and areas for the key building elements are required for the design stage evidence.

RESPONSIBLE SOURCING OF MATERIALS-BASIC BUILDING ELEMENTS

4 OF 6 CREDITS AWARDED

It is assumed that the requirements of this issue are met in order to achieve 4 credits.

In order to meet the requirements of this credit all timber must be legally sourced and 80% of assessed materials within the frame, ground floor, upper floors, roof, external walls, internal walls, foundation/substructure and staircase must be responsibly sourced.

At least five of the basic building elements must be assessed.

The assessed materials are brick, resin based composites, concrete, glass, plastic and rubber, metals, dressed or building stone, timber, wood panels, wood based composites, plasterboard, plaster, bituminous materials, mineral based materials including fibre cement and calcium silicate and products with a recycled content.

Evidence must be provided for responsible sourcing, although a detailed commitment is sufficient for the design stage assessment, recognised schemes for responsible sourcing include FSC, BES 6001:2008 and certified EMS for key processes and the supply chain.

Further guidance on complying with the requirements of this issue will be provided at the design stage assessment, or can be found within the Code for Sustainable Homes Technical Guide May 2009.

RESPONSIBLE SOURCING OF MATERIALS-FINISHING ELEMENTS

2 OF 3 CREDITS AWARDED

It is assumed that the requirements of this issue are met in order to achieve 2 credits.

In order to meet the requirements of this credit all timber must be legally sourced and 80% of assessed materials within the stairs, windows, external & internal doors, skirting, panelling, furniture, fascias or any other significantly used finishing element must be responsibly sourced.

At least five of the finishing elements must be assessed.

The assessed materials are brick, resin based composites, concrete, glass, plastic and rubber, metals, dressed or building stone, timber, wood panels, wood based composites, plasterboard, plaster, bituminous materials, mineral based materials including fibre cement and calcium silicate and products with a recycled content.

Evidence must be provided for responsible sourcing, although a detailed commitment is sufficient for the design stage assessment, recognised schemes for responsible sourcing include FSC, BES 6001:2008 and certified EMS for key processes and the supply chain.

Further guidance on complying with the requirements of this issue will be provided at the design stage assessment, or can be found within the Code for Sustainable Homes Technical Guide May 2009.

4.4 SURFACE WATER RUN-OFF

MANAGEMENT OF SURFACE WATER RUN-OFF FROM DEVELOPMENTS

2 OF 2 CREDITS AWARDED

It is assumed that the mandatory requirements are met for this credit as described in Section 3.4.

To achieve the credits Sustainable Urban Drainage Solutions (SUDS) must be used to ensure that there will be no surface run-off to a watercourse at rainfalls of 5 mm, or agreements must be established for the long term operation and maintenance of all sustainable drainage elements.

For the design stage evidence a copy of the consultant's report detailing the design of SUDs to meet the requirements, or plans for establishing an agreement for the long term operation and maintenance of all sustainable drainage elements are required.

FLOOD RISK

2 OF 2 CREDITS AWARDED

From the Environment Agency Flood Map, shown above, it can be seen that the site is located in a low-risk zone where the annual probability of fluvial flooding is less than 1 in 1000 in any given year.

A Flood Risk Assessment (FRA) report by an appropriately qualified hydrological consultant or engineer will be required to clarify that the site is in a low flood risk area from all sources of flooding. This report should be prepared according to good practice guidance as outlined in *PPS25 Development and Flood Risk*.

With the current evidence available it is assumed that the site is in a low flood risk zone, therefore these credits can be awarded based on a Flood Risk Assessment (FRA) report clarifying that the site is within a low flood risk zone.

4.5 WASTE

STORAGE OF NON-RECYCLABLE WASTE AND RECYCLABLE HOUSEHOLD WASTE

4 OF 4 CREDITS AWARDED

It is assumed that the mandatory requirements are met as described in section 3.5.

It is assumed that there will be a Local Authority recycling collection scheme in place serving the proposed development.

The full credits can be achieved for this issue if;

- there is either a single 30 litre bin in an adequate internal space

Or

- there are at least three separate bins with a total capacity of 30 litres and a single capacity of at least 7 litres in an adequate internal space.

Whether several bins or a single bin is required depends on whether the Local Authority recycling scheme in this area is sorted before or after collection.

If a Local Authority Recycling and Household Waste Collection Service is not provided then three internal bins with a total capacity of 30 litres and at least 7 litres each are required and external waste storage should be sized according to guidance from the private recycling and waste scheme operator.

For the design stage assessment; the evidence can be met if this requirement is stated within the specification in detail ensuring that all of the specific requirements of this Code for Sustainable Homes issue are met.

CONSTRUCTION SITE WASTE MANAGEMENT

2 OF 2 CREDITS AWARDED

The mandatory requirement of developing a Site Waste Management Plan (SWMP) is assumed, see section 3.6.

Credits can be achieved if the SWMP includes procedures and commitments for actively reducing waste generated on site in accordance with best practice for each waste group and includes procedures and commitments to sort and divert waste from landfill.

A fully compliant SWMP is required for the design stage evidence; the Code for Sustainable Homes Technical Guide should be referred to for the detailed requirements of a compliant SWMP.

It is recommended that meeting these requirements is written into the contractor's specification.

COMPOSTING

0 OF 1 CREDIT AWARDED

It is assumed there will be no composting scheme available.

4.6 POLLUTION

GLOBAL WARMING POTENTIAL OF INSULANTS

1 OF 1 CREDIT AWARDED

It is assumed that all insulation materials used within the roof, walls, floors, hot water cylinder, pipe insulation, cold water storage and external doors have a GWP<5.

Meeting this requirement should be added to all relevant specification documents.

Checklist POL1 should be completed in order to meet the design stage evidence and will be provided at the initial stage of the design stage assessment.

NO_X EMISSIONS

3 OF 3 CREDITS AWARDED

The Energy Strategy for the site utilises centralised gas-fired CHP and high efficiency gas-fired condensing boilers feeding a site-wide heat network to distribute heat for space and water heating throughout the site.

Initial calculations provided by a manufacturer of gas-fired CHP systems demonstrates that a negative NO_x Emission can be achieved for the heat delivered from the system, therefore when coupled with a high efficiency gas-fired condensing boiler it is anticipated that maximum credits can be achieved for this issue by demonstrating a NO_x emission of less than or equal to 40 mg/kWh.

For the design stage assessment; the evidence can be met if the specification includes a commitment to achieve a combined dry NO_x emission of less than or equal to 40 mg/kWh arising from the operation of space and water heating systems within the dwellings.

4.7 HEALTH AND WELLBEING

DAYLIGHTING

0 OF 3 CREDITS AWARDED

It is assumed that no credits can be awarded for achieving average daylight factors as follows;

Kitchen 2%
Other habitable rooms 1.5%
It is also assumed that a view of the sky cannot be achieved from 80% of all habitable room areas.

These credits are typically difficult to achieve on city-centre mixed use redevelopments where there are several buildings closely adjacent to one another.

SOUND INSULATION

3 OF 4 CREDITS AWARDED

Building Regulations Approved Document E states minimum requirements for sound insulation between habitable rooms of adjacent dwellings. It is assumed that the minimum requirements can be surpassed with airborne sound insulation values at least 5 dB higher and impact sound insulation values at least 5 dB lower.

Use of enhanced details can have a large impact in achieving this target and good performance for sound insulation often goes hand-in-hand with high levels of air tightness and thermal insulation.

Pre-completion testing by a Compliant Test Body or use of relevant constructions assessed and approved by Robust Details Limited (RDL) will be required to ensure that this requirement is met.

Design stage evidence can be satisfied by specification text committing to the detailed requirements of this Code for Sustainable Homes issue.

PRIVATE SPACE

0 OF 1 CREDIT AWARDED

The drawings provided indicate that all but one dwelling is provided with a private balcony, winter garden, terrace or garden which is sufficient to meet the minimum space requirement of 1.5 m^2 of private outdoor space per bedroom.

However, winter gardens are assumed to not meet the criteria for compliant outdoor space as the requirements state that conservatories and other enclosed areas do not comply with the criteria.

It is therefore assumed that this credit cannot be awarded.

If this credit is to be targeted for those dwellings which do have compliant outdoor space then it must be ensured that all outdoor space provided is compliant with the relevant sections of BS 8300; this should be stated within specification text or annotated on the relevant drawings in order to meet all of the design stage evidential requirements of this issue.

LIFETIME HOMES

4 OF 4 CREDITS AWARDED

It is assumed that all of the principles of Lifetime Homes have been complied with for these dwellings; this is a minimum requirement of developments within London as required by the London plan

The Lifetime Homes checklist should be considered to clarify that all requirements are met, and can be found at www.lifetimehomes.org.uk

The Lifetime Homes Checklist HEA4 should be completed in order to meet the design stage evidence and will be provided at the initial stage of the design stage assessment.

4.8 MANAGEMENT

HOME USER GUIDE

3 OF 3 CREDITS AWARDED

It is assumed that a comprehensive user guide will be provided to the occupants of each dwelling providing information and instructions relating to the operation of the dwelling along with the site and surrounding area.

Design stage evidence can be satisfied by specification text committing to producing a Home User Guide which meets the detailed requirements of this Code for Sustainable Homes issue and providing the document to all dwellings at completion.

CONSIDERATE CONSTRUCTORS SCHEME

2 OF 2 CREDITS AWARDED

It has been assumed that the main construction contractors will make a commitment to go significantly beyond best practice within the Considerate Constructors Scheme (CCS) or any other nationally or locally recognised similar certification scheme. A CCS score of at least 32, with no less than 3, in each section must be achieved.

To meet the design stage evidence the main construction contractor should be bound by specification to achieve the required CCS score of at least 32 with no less than 3 in each section and confirmation of registration of the site with CCS prior to commencement of the construction phase must be provided.

CONSTRUCTION SITE IMPACTS

2 OF 2 CREDITS AWARDED

It is assumed that the main construction contractor will make a commitment and strategy to manage the site so that there are procedures for at least four of the items on the following list;

1. Monitor, report and set targets for CO_2 emissions or energy use arising from site activities.
2. Monitor and report CO_2 emissions or energy use arising from commercial transport to and from site.
3. Monitor, report and set targets for water consumption from site activities.
4. Adopt best practice policies in respect of air (dust) pollution arising from site activities.
5. Adopt best practice policies in respect of water (ground & surface) pollution occurring on site.
6. 80% of site timber is reclaimed, re-used or responsibly sourced.

The Checklist MAN3 should be completed and signed by the main contractor in order to meet the design stage evidence and will be provided at the initial stage of the design stage assessment.

SECURITY

2 OF 2 CREDITS AWARDED

The full credits are awarded as it is assumed that there has been a design stage consultation with the local police force via an Architectural Liaison Officer (ALO) or Crime Prevention Design Advisor (CPDA) and that recommendations will be incorporated into the dwelling designs to ensure that the requirements of Section 2 – Physical Security of Secured by Design – New Homes are met.

The design stage evidence requires detailed documentary evidence that consultation with an Architectural Liaison Officer (ALO) or Crime Prevention Design Advisor (CPDA) has occurred and that recommendations will be implemented.

4.9 ECOLOGY

ECOLOGICAL VALUE OF SITE

0 OF 1 CREDIT AWARDED

Extracts from the Ecological Survey Report, by Wardell Armstrong, indicate that there are areas of significant ecological value on the proposed site; these are mainly found along the River Crane site boundary.

At this stage it will be assumed that this credit cannot be achieved as it is expected that landscaping works will occur within these areas of significant ecological value.

However, this credit may be achievable if a detailed letter can be provided by the Ecologist confirming that:

a. they meet the requirements of a *Suitably Qualified Ecologist* and have submitted a *Verified Ecological Report*

b. the construction zone is of low ecological value

c. all land outside of the construction zone will remain undisturbed by the construction works in areas of ecological value.

ECOLOGICAL ENHANCEMENT

1 OF 1 CREDIT AWARDED

The Ecology Report extracts provided confirm that an Ecologist has been appointed hence this credit can be achieved if all of the Ecologist's key recommendations and 30% of additional recommendations are implemented, along with confirmation provided that the Ecologist meets the requirements to be *Suitably Qualified*.

The design stage evidence requires detailed documentary evidence of how the Ecologists recommendations will be incorporated into the design.

PROTECTION OF ECOLOGICAL FEATURES

1 OF 1 CREDIT AWARDED

The extracts from the Ecology Report provided indicate that some trees will be removed; however these are indicated to be of low-ecological value or of poor condition.

Evidence must be provided to show the all ecological features are adequately protected during site clearance, preparation and construction works in line with the Ecologists recommendations.

CHANGE IN ECOLOGICAL VALUE OF SITE

3 OF 4 CREDITS AWARDED

The Ecology Report extracts states that there will be a positive overall change in species per hectare between the undeveloped and developed site. Hence, it is assumed that 3 credits can be achieved for enhancing the site ecological value by at least 3 species per hectare.

The design stage evidence requires detailed documentary evidence of how the Ecologists recommendations will be incorporated into the design, including a planting schedule.

BUILDING FOOTPRINT

2 OF 2 CREDITS AWARDED

This credit is awarded on a site-wide basis. The drawings indicate that a total dwelling area to building footprint ratio of at least 4:1 will be achieved.

5.0 CODE FOR SUSTAINABLE HOMES VERSION

This pre-assessment is based on the May 2009 Technical Guide. The site has been registered against the May 2009 technical Guide, which means that the assessment will proceed on this version of the guide regardless of whether new versions are released hence forth. The site registration number is 001295 - 100913 - 01 - 1144

6.0 RESULTS

Section 3.0 shows how all of the mandatory credits for Code Level 4 can be met.

Section 4.0 indicates all of the tradable credits likely to be achieved for this site.

The Code for Sustainable Homes calculation, as shown in the Appendix results in a total points score of **71**.

This report demonstrates that considering both mandatory and tradable credits Code Level 4 is achieved for this pre-assessment.

However, a sufficient margin over the minimum number of credits (68) required to achieve Code Level 4 may not be achieved. Hence it is recommended that the Ecologist should be consulted in order to attempt to achieve the potential credits for ECO1: Ecological Value of Site; or targeting further credits as required could be discussed at an initial meeting once the Main Contractor has been appointed.

7.0 APPENDIX

Summary Score Sheet

Dwelling Type: Initial Representation

Plots: all

	Credit Score	Credits Available	Score Assessment Sub Total	Credits Available	%	Weighting Factor	Points Score
Energy & CO2 Emissions							
Ene 1 Dwelling Emission Rate	8	15	19	29	65.52	1.26	23.85
Ene 2 Building Fabric	2	2					
Ene 3 Internal Lighting	2	2					
Ene 4 Drying Space	1	1					
Ene 5 Energy Labelled White Goods	1	2					
Ene 6 External Lighting	2	2					
Ene 7 Low or Zero Carbon Energy Tech	2	2					
Ene 8 Cycle Storage	1	2					
Ene 9 Home Office	0	1					
Water							
Wat 1 Internal Potable Water Use	3	5	3	6	50.00	1.50	4.5
Wat 2 External Water Use	0	1					
Materials							
Mat 1 Environmental Impact of Materials	10	15	16	24	66.67	0.30	4.8
Mat 2 Responsible Sourcing (Basic Building Elements)	4	6					
Mat 3 Responsible Sourcing (Finishing Elements)	2	3					
Surface Water Run-off							
Sur 1 Reduction of Surface Water Run-off from Site	2	2	4	4	100.00	0.55	2.2
Sur 2 Flood Risk	2	2					
Waste							
Was 1 Household Waste Storage & Recycling Facilities	4	4	6	7	85.71	0.91	5.49
Was 2 Construction Site Waste Management	2	2					
Was 3 Composting	0	1					
Pollution							
Pol 1 Global Warming Potential of Insulants	1	1	4	4	100.00	0.70	2.8
Pol 2 NOx Emissions	3	3					
Health & Wellbeing							
Hea 1 Daylighting	0	3	7	12	58.33	1.17	8.17
Hea 2 Sound Insulation	3	4					
Hea 3 Private Space	0	1					
Hea 4 Lifetime Homes	4	4					
Management							
Man 1 Home User Guide	3	3	9	9	100.00	1.11	10
Man 2 Considerate Constructors Scheme	2	2					
Man 3 Construction Site Impacts	2	2					
Man 4 Security	2	2					
Ecology							
Eco 1 Ecological Value of Site	0	1	7	9	77.78	1.33	9.33
Eco 2 Ecological Enhancement	1	1					
Eco 3 Protection of Ecological Features	1	1					
Eco 4 Change of Ecological Value of Site	3	4					
Eco 5 Building Footprint	2	2					
	Level Achieved: 4				**Total Points Scored: 71.14**		

BREEAM Assessment

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Church House Building Sustainability

BREEAM RETAIL 2008
PRE-ASSESSMENT

SOLUM REGENERATION PARTNERSHIP

Proposed Mixed-Use Development
Twickenham Station
London

28/04/2011

Revision B

NB/JL/9090

CHB Design Services T/A
Church House Building Sustainability
Reg. No: 5945817 Reg. Office: As above

CONTENTS

1.0 INTRODUCTION

This report summarises the results of, and assumptions made, within the production of a BREEAM Pre-Assessment for the proposed build of four speculative retail units within the mixed use development at Twickenham Station, London. The assessment only considers those retail units with a floor area in excess of 100m^2 as follows: 244m^2, 156m^2, 144m^2 and 133m^2. The smaller retail units less than 100m^2 within the development are excluded from the BREEAM assessment.

The report is based on plans and building layouts provided in the following drawings provided on 21/04/11 by Rolfe Judd;

4674 / T(20)E01 B; 4674 / T(20)E02 B; 4674 / T(20)E03 B; 4674 / T(20)E04 C; 4674 / T(20)E05 B; 4674 / T(20)E06 B

4674 / T(20)P -1 D; 4674 / T(20)P -1M B; 4674 / T(20)P00 B; 4674 / T(20)P0M B; 4674 / T(20)P01 B; 4674 / T(20)P02 B; 4674 / T(20)P03 B; 4674 / T(20)P04 B; 4674 / T(20)P05 B; 4674 / T(20)P06 B; 4674 / T(20)P07 B

4674 / T(20)S01 B; 4674 / T(20)S02 B; 4674 / T(20)S03 B; 4674 / T(20)S04 B

The report will explain the importance of, and methodology behind, the BREEAM assessment criteria.

The report will detail the project specific requirements to achieve the mandatory credits to attain the desired Excellent BREEAM Rating, before going on to detail the recommended requirements for tradable credits which, within the experience of the assessor, represent the most efficient 'road-map' to achieving the required BREEAM Excellent Rating.

A summary of the recommended targeted credits is to be found in the Appendix.

Throughout the report, reference will be made to the evidence required for the successful delivery of each credit, although more detail of these evidential requirements will be outside of the scope of this report and provided in an initial design stage assessment report.

Due to the nature of the pre-assessment being undertaken at an early stage, assumptions have been made and these will all be clearly noted within the body of this report.

2.0 BREEAM

Context

BREEAM is a holistic measure of the sustainability of both new and majorly refurbished non-domestic buildings. BREEAM is the world's most widely used environmental method and sets the standard for best practice in sustainable design.

The aim of BREEAM is to mitigate the impacts of buildings on the environment, to enable buildings to be recognised for their environmental benefits, to provide a credible environmental label for buildings, and to stimulate demand for sustainable buildings.

The objectives of BREEAM are to provide market recognition for low environmental impact buildings, to ensure best environmental practice is incorporated in buildings, to set criteria and standards surpassing those required by regulations, to challenge the market to provide innovative solutions to minimise the environmental impact of the built environment, to raise awareness of the benefits of low environmental impact buildings to owners, occupants and operators, and to allow organisations to demonstrate progress towards corporate environmental objectives.

How BREEAM Works

BREEAM is made up of nine categories, and several issues are covered within each category, with credits available for meeting the particular criteria of that issue.

Each category has a weighting factor for which the proportion of the maximum credits achieved in that category is multiplied by and then summed across all categories to achieve the final BREEAM Rating percentage.

Category	Weighting	Approximate weighted value of 1 credit
Management	12.0%	1.20
Health & Wellbeing	15.0%	1.15
Energy	19.0%	0.83
Transport	8.0%	0.80
Water	6.0%	1.00
Materials	12.5%	0.96
Waste	7.5%	1.07
Land Use & Ecology	10.0%	1.00
Pollution	10.0%	0.83

There are three types of credit; mandatory, tradable and innovation.

The mandatory credits differ depending on the target BREEAM rating and must be achieved in order to attain the required rating.

The building must score the rest of the required credits from the tradable or innovation credits. There are no restrictions within BREEAM on which tradable credits are achieved.

Innovation credits are also available for certain categories and for innovation in areas not currently covered by any BREEAM categories; 1% is added to the overall percentage points score for each innovation credit achieved.

The mandatory criteria will be discussed in chapter 3.0 before consideration of the tradable credits in chapter 4.0 and the innovation credits in chapter 5.0.

The BREEAM levels can be achieved through scoring percentage points as follows (assuming mandatory requirements are met);

Percentage Points	Code Rating
<30	*UNCLASSIFIED*
≥30	*PASS*
≥45	*GOOD*
≥55	*VERY GOOD*
≥70	*EXCELLENT*
≥85	*OUTSTANDING**

*there are additional criteria required to achieve this rating, including providing information to formulate a case study and a regular post-occupancy assessment to maintain the *Outstanding* rating.

It is recommended to aim to surpass the minimum percentage points target at the pre-assessment stage as there are frequently credits targeted at this stage which may not be achievable for the completed building.

BREEAM Site Assessment of Multiple Units

A site assessment can be performed where multiple units are assessed together.

For this approach the worst case unit must be used for the basis of the assessment and the individual required measures to achieve each credit must be implemented on each unit where applicable, this approach is assumed for the basis of this pre-assessment.

BREEAM Shell & Core Assessments

The proposed development assessed within this report consists of shell units which are intended to be fitted out by the future occupier in order to meet the building occupiers' needs.

The future tenants are not known therefore there are two options available in order to achieve certain BREEAM credits. These are:

1. Green Lease Agreement

2. Green Building Guide

In some cases a non-legally binding Green Building Guide can be used, however only half of the available credits for an issue can be achieved with this approach and certain mandatory elements for BREEAM *Excellent* such as HEA 4, HEA 12, ENE 2 and WAT 2 require a Green lease Agreement in order to achieve the required credits.

It is recommended to produce a draft Green Lease Agreement and Green Building Guide at the earliest possible opportunity during the design stage to ensure that any technical or legal difficulties can be considered at an early stage where alternative credits may still be available.

3.0 MANDATORY REQUIREMENTS

3.1 MANAGEMENT – COMMISSIONING

In order to achieve any BREEAM Rating it is mandatory that one credit is achieved on this issue. It is proposed that the Green Building Guide is used for evidence on this issue and as such, it will be necessary to ensure that the Green Building Guide contains specific guidance regarding an appropriate team member being appointed to monitor the commissioning of the building and building services to ensure, and collect evidence to prove, that commissioning is carried out in line with current best practice. In addition, seasonal commissioning responsibilities should also be covered in full.

3.2 MANAGEMENT – CONSIDERATE CONSTRUCTORS

In order to achieve BREEAM *Excellent* it is required that at least one credit is obtained for this issue.

3.3 MANAGEMENT – BUILDING USER GUIDE

In order to achieve BREEAM *Excellent* it is required that a Building User Guide is produced to inform building occupants about the operation and environmental performance of the building.

3.4 HEALTH – HIGH FREQUENCY LIGHTING

In order to achieve any BREEAM Rating it is mandatory for high frequency ballasts to be fitted on all fluorescent and compact fluorescent lamps.

3.5 HEALTH – MICROBIAL CONTAMINATION

In order to achieve any BREEAM Rating it is mandatory to provide evidence which demonstrates that the risk of waterborne and airborne legionella contamination has been minimised.

3.6 ENERGY – REDUCTION OF CO_2 EMISSIONS

In order to achieve BREEAM *Excellent* it is required that all assessed units achieve an EPC rating of 40/B or better.

3.7 ENERGY – SUB-METERING OF SUBSTANTIAL ENERGY USES

In order to achieve at least a *Very Good* BREEAM Rating it is mandatory to provide direct sub-metering of energy uses within each retail unit. Accessible energy sub-meters labelled with the energy consuming end-use are required for the following; space heating, domestic hot water, cooling, lighting, small power and any other major energy consuming items.

3.8 ENERGY – REDUCTION OF CO_2 EMISSIONS

In order to achieve BREEAM *Excellent* it is required that an LZC feasibility study is carried out by an energy specialist to establish the most appropriate local LZC energy source and based on such recommendations, an LZC system is specified and installed.

3.9 WATER – WATER CONSUMPTION

In order to achieve a BREEAM Rating of *Good* or higher then it is mandatory to ensure that all WCs have an effective flush volume (based on a 1:3 *full flush:reduced flush* ratio) of 4.5 litres or less. It must also be ensured that where dual flush WCs are specified they have appropriate symbols or guidance instructing the user on the appropriate use of the flushing device.

3.10 WATER – WATER METER

A further mandatory water requirement, in order to achieve a BREEAM Rating of *Good* or higher, is to demonstrate that a pulsed output water meter is installed on the mains water supply to each unit.

3.11 WASTE – STORAGE OF RECYCLABLE WASTE

In order to achieve BREEAM *Excellent* it is required that dedicated recyclable material storage space is provided for the retail units.

3.12 ECOLOGY – MITIGATING ECOLOGICAL IMPACT

In order to achieve BREEAM *Very Good* or higher it is mandatory to demonstrate that the ecological change to the site due to the development is minimal. The evidence for demonstrating this mandatory credit is through the BREEAM Assessor or a Suitably Qualified Ecologist assessing the change in ecological value due to the construction of the development.

4.0 TRADABLE REQUIREMENTS

4.1 MANAGEMENT

MAN 1 - COMMISSIONING

1 OF 2 CREDITS TARGETED

Both credits are targeted as a part of meeting the Management mandatory requirements for all BREEAM ratings; details of which are provided in Chapter 3.0.

The requirements should be included in the Green Building Guide; hence only half the value (1 out of 2) of the credits is awarded.

MAN 2 – CONSIDERATE CONSTRUCTORS

2 OF 2 CREDITS TARGETED

It has been assumed that the main construction contractors will make a commitment to go significantly beyond best practice within the Considerate Constructors Scheme (CCS) or any other nationally or locally recognised similar certification scheme. A CCS score of at least 32, with no less than 3, in each section must be achieved.

To meet the design stage evidence the main construction contractor should be bound by specification to achieve the required CCS score of at least 32 with no less than 3 in each section and confirmation of registration of the site with CCS prior to commencement of the construction phase must be provided.

MAN 3 – CONSTRUCTION SITE IMPACTS

4 OF 4 CREDITS TARGETED

It is assumed that evidence will be available to demonstrate that 80% of the site timber is responsibly sourced and that 100% of the site timber is legally sourced, and so the first credit can be awarded.

It is also assumed that at least six of the following seven measures are implemented in order to minimise the environmental impact of the construction site; measures c through g are thought to be possible without significant additional cost implications:

a. Monitor, report and set targets for CO_2 or energy arising from site activities.
b. Monitor, report and set targets for CO_2 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. Main contractor has an environmental materials policy, used for sourcing of construction materials to be utilised on site.
g. Main contractor operates an Environmental Management System.

It is recommended that compliance with this issue is enforced within the main contractor's specification and by selecting a contractor with the relevant credentials.

MAN 4 – BUILDING USER GUIDE

1 OF 1 CREDIT TARGETED

It is assumed that a simple non-technical guide, meeting the BREEAM User Guide Contents specification, will be produced to inform building occupants about the operation and environmental performance of the building.

The guide must be developed as part of the shell contract and include all relevant sections in accordance with BREEAM guidelines and completed as far as possible given the services and fabric installed at shell stage, so that it can be handed over to the fit-out team who will then be able to complete the relevant sections of the fit-out strategy before handing over to the occupier.

Design stage evidence criteria can be satisfied by a specification clause confirming the requirement to develop a building user guide and that the scope of the guide's contents will meet the BREEAM criteria for this credit.

MAN 8 – SECURITY

1 OF 1 CREDIT TARGETED

It has been assumed that there has been a consultation with an Architectural Liaison Officer (ALO) or Crime Prevention Design Advisor (CPDA) from the Local Police Force regarding the design of the building and its parking facilities at the concept design stage (RIBA Stage C) and the recommendations made along with the principles and guidance of *Secured by Design* will be embodied into the final design.

The design stage criteria requires detailed documentary evidence confirming that this consultation has taken place and that recommendations are being implemented.

4.2 HEALTH AND WELLBEING

HEA 1 – DAYLIGHTING

1 OF 1 CREDIT TARGETED

It is assumed that, due to a high ratio of glazing to floor area in each of the retail units, a point daylight of greater than 2% can be achieved for more than 35% of sales and common spaces.

Daylight calculations will be required as design stage evidence for this credit.

HEA 4 – HIGH FREQUENCY LIGHTING

1 OF 1 CREDIT TARGETED

It is assumed that all lighting systems will be fitted with high frequency ballasts such that this mandatory credit can be achieved.

This requirement should be specified within the Green Lease Agreement.

HEA 5 – INTERNAL AND EXTERNAL LIGHTING LEVELS

0.5 OF 1 CREDIT TARGETED

It is assumed that all lighting will be designed and installed to meet CIBSE recommended illuminance levels. This credit requires that illuminance levels comply with CIBSE Code for Lighting 2006 in all

internal areas and with CIBSE Lighting Guide 6 *'The Outdoor Environment'* for all lighting in external areas within the construction zone.

This requirement should be included in the Green Building Guide for internal lighting and within the specification for external lighting; hence half the value of the credit is awarded.

HEA 8 – INDOOR AIR QUALITY

0 OF 1 CREDIT TARGETED

It is believed that the requirements to achieve this credit will be difficult to meet due to the sites proximity to sources of external pollution; notably nearby roads and railway lines. It is therefore recommended that this credit is given no further consideration.

HEA 9 – VOLATILE ORGANIC COMPOUNDS

0.5 OF 1 CREDIT TARGETED

It is assumed that evidence will be available to demonstrate that the emissions of Volatile Organic Compounds (VOCs) from all key internal finishes and fittings comply with best practice levels; hence, one credit can be awarded.

This requirement should be included in the Green Building Guide; hence half the value of the credit is awarded.

HEA 10 – THERMAL COMFORT

0.5 OF 1 CREDIT TARGETED

It is recommended that a computer simulated dynamic thermal analysis of each unit is carried out to demonstrate predicted levels of occupant thermal comfort. This should be done using software selected and applied in accordance with *CIBSE AM11 Building Energy and Environmental Modelling*.

This requirement should be included in the Green Building Guide; hence half the value of the credit is awarded.

HEA 12 – MICROBIAL CONTAMINATION

1 OF 1 CREDIT TARGETED

It is assumed that evidence will be available to show that the risks of waterborne and airborne legionella contamination will be minimised as compulsory to meet the mandatory requirement for all BREEAM ratings.

This requirement should be specified within the Green Lease Agreement.

4.3 ENERGY

ENE 1 – REDUCTION OF CO_2 EMISSIONS

6 OF 15 CREDITS TARGETED

It is assumed that the mandatory requirement of this issue to achieve an EPC rating of at least 40(B) will be achieved through energy efficient building design, gas-fired CHP and the use of the Green Lease Agreement, which can ensure energy efficient fit-out.

ENE 2 – SUB-METERING OF SUBSTANTIAL ENERGY USES

1 OF 1 CREDIT TARGETED

It is assumed that accessible energy sub-meters that are clearly labelled will be installed for the following; space heating, domestic hot water, cooling, lighting, small power and any other major energy consuming items in accordance with the mandatory requirements for a BREEAM *Very Good* rating.

In the case of lighting and small power, these may be sub-metered together where supplies are taken at floor or department level.

As the retail units are to be fitted out by future tenants, of which the works will be outside the main contract of the building development, it will be required that a legally binding Green Lease Agreement is drafted by the developers and signed by any future tenant such that they are obliged to meet the requirements of this BREEAM issue.

ENE 3 – SUB-METERING OF HIGH ENERGY LOAD AND TENANCY AREAS

1 OF 1 CREDIT TARGETED

It is assumed that accessible sub-meters covering the energy supply to all tenanted retail units will be provided and that all meters are labelled with the end-use. It will be required that all heat (for space heating and domestic hot water end-uses) provided by centralised plant is metered for each retail unit, as well as incoming electrical supplies.

Design stage evidence required includes marked-up drawings and site plan detailing building areas by department/function and/or tenancy and the location of meters. Also required is a specification document or technical drawing(s) confirming the metering arrangements for each tenancy area and the type of meter specified.

In addition, in the retail unit over 200m^2, sufficient sub-metering will be required to allow for monitoring of the relevant function areas/departments within the unit. This requirement should be included in the Green Lease Agreement.

ENE 4 – EXTERNAL LIGHTING

1 OF 1 CREDIT TARGETED

It is assumed that all external lighting is energy efficient with a luminous efficacy of at least 50 lamp lumens/circuit Watt, when Ra is greater than or equal to 60, or with luminous efficacy of at least 60 lamp lumens/circuit Watt, when Ra is less than 60.

It is also assumed that external lighting to the car park areas and associated roads has a luminous efficacy of at least 70 lamp lumens/circuit Watt, when Ra is greater than or equal to 60, or with luminous efficacy of at least 80 lamp lumens/circuit Watt, when Ra is less than 60.

There are also requirements for the energy efficiency of any illuminated signs, if provided.
Further to the efficacy of the external lighting provided, specific controls are also required to earn the credit. These involve use of either a time switch or daylight sensor to ensure that external lighting is only used outside of daylight hours.

Design stage evidence required includes marked-up site plan and building elevations showing the location and purpose of all external lighting fittings. Also required is a lighting specification or lighting

designer's calculations confirming the lamp lumens/circuit Watt for each type of fitting as well as the colour rendering index Ra and external lighting control strategy.

This requirement should be mentioned in the specification.

ENE 5 – LOW ZERO CARBON TECHNOLOGIES

2 OF 3 CREDITS TARGETED

The energy strategy for the development includes the use of a centralised gas-fired CHP plant and a roof-mounted photovoltaic array to reduce the Building Emission Rate (BER) of the retail units by an average of greater than 10% compared to the *LEAN* emissions baseline; hence it is assumed that two credits can be achieved for this issue.

Design stage evidence required includes a copy of the feasibility report by an energy specialist completed during the design stages, drawings and further detailed documentary evidence confirming the installation of the LZC technologies and calculations, normally produced in *approved energy modelling software*, demonstrating the achieved reduction in carbon dioxide emissions.

This requirement should be specified within the Green Lease Agreement to ensure that the connection provided to the site-wide heat network must be utilized to provide both space heating and hot water efficiently.

4.4 TRANSPORT

TRA 1 – PROVISION OF PUBLIC TRANSPORT

5 OF 5 CREDITS TARGETED

Due to its close proximity to Twickenham Central railway station and the bus services that link with it, it is anticipated that the retail development will achieve an Accessibility Index of 18 or greater; therefore achieving all five credits of this issue.

It is the responsibility of the BREEAM assessor to verify this information and make the final calculation.

TRA 2 – PROXIMITY TO AMENITIES

1 OF 1 CREDIT TARGETED

This credit can be achieved as all of the following amenities can be found within 500m of the proposed retail outlets:

1. Grocery shop and/or food outlet
2. Post box
3. Cash machine

It is the responsibility of the BREEAM assessor to verify and provide sufficient evidence of these facilites. Due to the town centre location it is assumed that these requirements can be met for the proposed development.

TRA 3 – CYCLIST FACILITIES

1 OF 2 CREDITS TARGETED

The drawings provided demonstrate that one credit can be awarded as covered, secured and well lit

cycle storage facilities will be provided within the grounds of the development and will be sufficient for 10% of each unit's occupants based upon an assumed occupancy of 1 person per 10m^2 net lettable area.

Further details of the proposed cycle storage facilities will be required for design stage evidence including information on the type, dimensions and layout of the cycle racks and confirmation that lighting for the facility is in accordance with BS5489 Part 1.

TRA 4 – PEDESTRIAN AND CYCLE SAFETY

2 OF 2 CREDITS TARGETED

It is assumed that two credits can be achieved for safe pedestrian and cyclist access.

The BREEAM criteria should be consulted to ensure that access is designed to meet the full requirements.

The design stage evidence can generally be satisifed through site plan and speciifciation documents, however, the requirements of this credit are detailed and the BREEAM handbook should be consulted to ensure that the site plan and specification include the required features to ensure pedestrian and cyclist safety.

TRA 5 – TRAVEL PLAN

1 OF 1 CREDIT TARGETED

It is anticipated that a Travel Plan is to be produced at the feasibility/design stage and will consider a range of travel options for users of each unit, and that a reduction of user reliance on forms of travel that have the highest environmental impact will be actively encouraged.

It is assumed that the Travel Plan will broadly address the following issues:

a. Existing travel patterns and opinions of the existing site users towards walking and cycling in order to identify constraints and opportunities.
b. Travel patterns of future building users.
c. Current local environment for walkers and cyclists, including visitors accompanied by young children.
d. Disabled access
e. Public transport links
f. Current cyclist facilities.

The travel plan should include a package of measures for the proposed development based on its findings in order to meet the travel plan objectives of reducing car-based transport.

The following are some site specific examples which may be appropriate:

a. Priority parking for car sharers
b. Dedicated and convenient cycle storage and changing facilities
c. Lighting, landscaping and shelter to make pedestrian and public transport areas pleasant

The travel plan is required for design stage evidence along with a marked up site plan demonstrating that the recommendations of the travel plan are implemnted within the design of the site.

4.5 WATER

WAT 1 – WATER CONSUMPTION

1.5 OF 3 CREDITS TARGETED

In order to achieve a BREEAM Rating of *Good* or higher then it is mandatory to ensure that All WCs have an effective flush volume (based on a 1:3 *full flush:reduced flush* ratio) of 4.5 litres or less. In order to achieve further credits it is assumed that this mandatory requirement is exceeded and all WCs have an effective flush volume of 3 litres or less.

It must also be ensured that where dual flush WCs are specified they have appropriate symbols or guidance instructing the user on the appropriate use of the flushing device.

In addition to the WC specification, it is assumed that the following measures will be specified:

- All taps except kitchen, cleaners sink and external taps have a maximum flow rate of less than 6 litres/min for a water pressure of 0.3 MPa and are at least one of the following; timed automatic shut off; electronic sensor taps; low-flow screw-down/lever taps; spray taps.

- All showers, where specified, have a measured flow rate not exceeding 9 litres/min for a water pressure of 0.3 MPa assuming a delivered water temperature of 37°C.

- All urinals are either waterless, ultra low flush or are fitted with individual presence detectors that operate the flushing control after each use.

This requirement should be included in the Green Building Guide; hence half the value of the credits is awarded.

WAT 2 – WATER METER

1 OF 1 CREDIT TARGETED

As it is a mandatory requirement in order to achieve a BREEAM Rating of *Good* or higher, it is assumed that a pulsed output water meter is installed on the mains supply to each retail unit and to shared common and service areas (covering any shared toilet blocks, storage, delivery and waste disposal areas).

This requirement should be specified; the specification and drawings marking the meter location are required for design stage evidence.

WAT 3 – MAJOR LEAK DETECTION

1 OF 1 CREDIT TARGETED

It is assumed that a leak detection system capable of detecting major leaks on the water supply will be installed and will be capable of the following:

a. Audible when activated
b. Activated when the flow of water passes through the water meter/data logger at a flow rate above a pre-set maximum for a pre-set period of time
c. Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods
d. Programmable to suit the owner/occupiers' water consumption criteria

e. Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.

The scope and performance of the leak detection system should be stated within the specification in order to satisfy the design stage evidence.

WAT 4 – SANITARY SUPPLY SHUT OFF

0.5 OF 1 CREDIT TARGETED

It is anticipated that shut-off solenoid valves, in communication with infra-red movement detectors or any other proximity sensors, will be installed to control water supply to toilet areas; hence a credit can be awarded.

This requirement should be included in the Green Building Guide; hence half the value of the credit is awarded.

WAT 5 – WATER RECYCLING

2 OF 2 CREDITS TARGETED

One credit can be achieved for this issue if a grey-water recycling system is required within a Green Lease Agreement. The grey-water system should be sized to meet at least 10% of the urinal and WC flushing demand and should collect from at least 80% of hand basins and showers.

4.6 MATERIALS

MAT 1 – MATERIALS SPECIFICATION (MAJOR BUILDING ELEMENTS)

4 OF 4 CREDITS TARGETED

The BRE MAT1 calculator is used to calculate the credits for this issue depending on the Green Guide 2009 rating of the external walls, roof, floors and windows.

It is assumed that a Green Guide rating as follows is achieved for the three key building elements;

Roof	A+
External Walls	A
Windows	A

For further information of which constructions achieve the required ratings see the BRE Green Guide website http://www.bre.co.uk/greenguide.

Drawings and/or specification documents detailing the proposed constructions and areas for the key building elements are required for the design stage evidence.

MAT 2 – HARD LANDSCAPING AND BOUNDARY PROTECTION

1 OF 1 CREDIT TARGETED

It is anticipated that external hard landscaping and boundary protection materials will be specified to have a low environmental impact; hence this credit can be awarded.

To meet the criteria at least 80% of all external hard landscaping and boundary protection materials must achieve an A or A+ rating in the *Green Guide to Specification*.

Any existing exterior hard landscaping, boundary protection or natural features can be awarded with an A+ rating.

Drawings and/or specification documents detailing the proposed constructions and areas for the applicable hard landscaping and boundary elements are required for the design stage evidence.

MAT 3 – RE-USE OF BUILDING FAÇADE

0 OF 1 CREDIT TARGETED

It is not anticipated that any of the façade of the proposed building will be re-used from an existing building; hence no credits can be awarded.

MAT 4 – RE-USE OF BUILDING STRUCTURE

0 OF 1 CREDIT TARGETED

It is not anticipated that any of the structure of the proposed building will be re-used from an existing building; hence no credits can be awarded.

MAT 5 – RESPONSIBLE SOURCING OF MATERIALS

3 OF 3 CREDITS TARGETED

It is assumed that 80% of the materials required for the construction of each of the building elements (Structural frame, ground floor, roof, external and internal walls, foundation/substructure) would be responsibly sourced.

In order to get credits for this issue, all materials should be sourced from suppliers/manufacturers capable of providing certification for BES6001, EMS (EMAS/ISO 14001) or any other equivalent.
All timber should be sourced from suppliers capable for providing FSC Certificate with CoC number.

This requirement should be specified and the evidence in the form of certificates or purchase orders with certificate numbers and quantity of materials should be provided.

MAT 6 – INSULATION

1 OF 2 CREDITS TARGETED

It is assumed that evidence will be provided demonstrating that any thermal insulation products specified for the proposed retail units in the following building elements; external walls; ground floor; roof; building services, have a low embodied impact relative to their thermal properties, determined by the *Green Guide to Specification* ratings. This will be demonstrated with an *Insulation Index* for the building insulation assumed to be at least 2.

In addition, at least 80% of the thermal insulation used in the building elements identified must be responsibly sourced.

The above requirements should be included in the Green Building Guide where they do not form part of the shell and core build. Where insulation materials are specified as part of the shell and core build then meeting this requirement should be ensured through the specification and drawings.

As part of the evidence is from the Green Building Guide; hence only half of the credits can be awarded.

MAT 7 – DESIGNING FOR ROBUSTNESS

1 OF 1 CREDIT TARGETED

It is assumed that protection will be given, in the form of bollards and base plinth detailing etc, to vulnerable internal and external areas exposed to high pedestrian traffic, vehicular and trolley movements; hence this credit can be awarded.

In order to satisfy the design stage evidence requirements drawings need to be provided highlighting vulnerable areas of the building and specifying appropriate durability measures.

4.7 WASTE

WST 1 – CONSTRUCTION SITE WASTE MANAGEMENT

3 OF 4 CREDITS TARGETED

It is assumed that the amount of construction waste generated per 100m^2 (gross internal floor area) will be in the range 9.2 - 12.9m^3 (actual volume) and of weight 4.7 - 6.5 tonnes.

These targets do not include demolition or excavation waste.

In addition, it is required that a Site Waste Management Plan will be produced to contain the following information:

a. The target benchmark for resource efficiency, i.e. m^3 of waste per 100m^2 or tonnes of waste per 100m^2 (as specified above)
b. Procedures and commitments for minimising non-hazardous waste in line with the benchmark
c. Procedures for minimising hazardous waste
d. Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste
e. Procedures for sorting, reusing and recycling construction waste into defined waste groups, either on site or through a licensed external contractor
f. The name or job title of the individual responsible for implementing the above.

The third credit of this issue can be achieved if at least 75% by weight or 65% by volume of non-hazardous construction waste generated by the project has been diverted from landfill and either:

a. Reused on site (in-situ or for new applications)
b. Reused on other sites
c. Salvaged/reclaimed for reuse
d. Returned to the supplier via a ‘take-back’ scheme
e. Recovered from site by an approved waste management contractor and recycled

Additionally, waste materials will be sorted into separate key waste groups (according to the waste streams generated by the scope of the works) either onsite or offsite through a licensed contractor for recovery.

Also, an innovation credit is considered to be achieved for this issue, details mentioned in Section 5.

Additional clauses may be required within the Main Contractors Contract in order to ensure that this issue is complied with.

WST 2 – RECYCLED AGGREGATES

1 OF 1 CREDIT TARGETED

The proportion of recycled and secondary grade aggregate specified of the total high-grade aggregate uses of the building is unknown, but it is assumed that it will be in excess of 25% (by weight or volume); hence the credit can be awarded.

It should be noted that use of crushed masonry as a fill material for general landscaping is not considered high grade and would not count as part of the 25% requirement of this issue.

Additional clauses may be required within the Main Contractors Specification to ensure that the requirements of this issue are met.

A summary of the aggregate use proposed along with confirmation of the source of recycled or secondary aggregates is required for design stage evidence.

WST 3 – RECYCLABLE WASTE STORAGE

1 OF 1 CREDIT TARGETED

It is anticipated that a dedicated storage space catering for a minimum of six recyclable material types, generated by each unit during occupation, will be provided. Each unit's facility will be compliant with the following criteria:

a. Clearly labelled for recycling
b. Placed within accessible reach of each unit
c. Sized according to the area of each retail unit and the predicted volume of waste that will arise from that area.
d. In a location with good vehicular access to facilitate collections.

The design stage evidence requires a marked up site plan showing the dedicated recyclable storage area and a description of its labelling.

WST 5 – COMPOSTING

1 OF 1 CREDIT TARGETED

As space is limited on this site, then this credit can be achieved if there is a dedicated segregated space for storing compostable food waste prior to collection and delivery to an alternative composting facility and at least one water outlet is provided for cleaning in and around the facility.

A marked up site plan and/or specification showing the location size and space of the composting vessel and a nearby water outlet for cleaning is required for the design stage evidence.

4.8 LAND USE AND ECOLOGY

LE 1 – RE-USE OF LAND

1 OF 1 CREDIT TARGETED

As the development is to be built upon the site of an existing railway station and its associated car park and surrounding grounds it can be safely assumed that the majority of the development's footprint (at least 75%) is on an area of land which has previously been developed; hence the available credit can be awarded.

Reports, site plans and photographs are required to show the existing footprint of developed land pre-development in order to determine that this credit can be awarded at the design stage.

LE 2 – CONTAMINATED LAND

0 OF 1 CREDIT TARGETED

Chapter 11 of the Environmental Statement investigates the potential impacts of the proposed development on soil and ground conditions. It states that the overall risk rating for the site regarding contamination is currently low to medium; hence this credit it unlikely to be achieved.

LE 3 – ECOLOGICAL VALUE OF SITE AND PROTECTION OF ECOLOGICAL FEATURES

0 OF 1 CREDIT TARGETED

Chapter 13 of the Environmental Statement investigates the potential impacts of the proposed development on the site and its surrounding's ecological features. It finds that there will be a relatively small scale of impact (in terms of habitat affected) during development and this is unlikely to result in an *overall* adverse effect on the integrity of the site or the nearby River Crane. However, the loss of riverside trees (though outside the site boundary) to facilitate a footpath installation has the potential to destroy/disturb a number of species habitats; hence it is believed that this credit cannot be awarded.

LEA 4 – MITIGATING ECOLOGICAL IMPACT

2 OF 2 CREDITS TARGETED

In order to achieve a *Very Good* or higher BREEAM Rating it is a mandatory requirement to demonstrate that the ecological change to the site due to the development is minimal (i.e. where the change in ecological value is less than zero and equal to or greater than minus nine plant species) and this is supported by Chapter 13 of the Environmental Statement.

It is, however, assumed that the ecological value of the site will be improved by the proposed development if the ecologist's recommendations are followed.

The design stage evidence requires detailed documentary evidence of the site prior to development; this should be included within the survey report performed by the ecologist. The ecologist's report should also include a confirmation of the landscape and vegetation plot types and areas before and after development.

LE 5 – ENHANCING SITE ECOLOGY

2 OF 3 CREDITS TARGETED

Chapter 13 of the Environmental Statement provides appropriate recommendations for the protection and enhancement of the site's ecology, hence two credits can be achieved.

Drawings and specification or a formal letter is required confirming that the ecologist's recommendations will be implemented.

LE 6 – LONG TERM IMPACT ON BIODIVERSITY

2 OF 2 CREDITS TARGETED

It is anticipated that a Suitably Qualified Ecologist will be appointed prior to the commencement of site activities to produce a 5 year landscape and habitat management plan for the building occupants

and to confirm that all relevant UK and EU legislation relating to protection and enhancement of ecology have been complied with.

In additional to the above requirements, at least four of the following measures must be implemented. However, if the ecologist's findings conclude that some of these measures are not appropriate for the site then two credits can be awarded by meeting all applicable items.

1. Contractor nominates a 'Biodiversity Champion' with authority to influence the site activities in order to minimise environmental impact in line with the Ecologist recommendations.

2. Contractor trains workforce on how to protect site ecology based upon the Ecologists recommendations.

3. The Contractor records actions, and their effectiveness, taken to protect biodiversity at key stages of construction.

4. A new ecologically valuable habitat is created appropriate to the local area.

5. Where flora and/or fauna habitats exist on site the Contractor programmes site works to minimise disturbance to wildlife.

As there are several items required to meet this credit where responsibilities are put onto the Contractor then there should be relevant clauses in the Main Contract Specification to ensure that these items can be easily implemented.

4.9 POLLUTION

POL 1 – REFRIGERANT GWP – BUILDING SERVICES

0.5 OF 1 CREDIT TARGETED

It is assumed that a Green Building Guide will be drafted and will state that where specified; comfort cooling systems will use refrigerants with a GWP of no greater than 5.

Only half of the credit can be awarded due to the use of a Green Building Guide.

POL 2 – PREVENTING REFRIGERANT LEAKS

1 OF 2 CREDITS TARGETED

It is assumed that a Green Building Guide will be drafted and will state that where specified;

1. Systems using refrigerants are contained in a moderately air tight enclosure (or a mechanically ventilated plant room), and a refrigerant leak detection system is installed covering high-risk parts of the plant.

OR

2. An automatic permanent refrigerant leak detection system is specified, which is NOT based on the principle of detecting or measuring the concentration of refrigerant in air.

In addition to this, the Green Building Guide should specify the detailed requirements of the systems required to achieve this credit. This credit can, however, be awarded by default if CO_2 or ammonia is

used as a refrigerant or if the refrigerant charge is less than 5 kg.

As part of the evidence is from the Green Building Guide; hence only half of the credits can be awarded.

POL 4 – NO_X EMISSIONS FROM HEATING SOURCE

3 OF 3 CREDITS TARGETED

As space heating is to be provided by gas-fired systems (including CHP) it is anticipated that low NOx emissions (≤40mg/kWh) can be achieved. As the development is to be serviced by a central CHP plant, it is recognised that the replacement of grid-imported electricity with locally generated power acts to further reduce NOx emissions associated with the site; including both from heat and power demand.

The specification confirming the heating systems along with manufacturers information confirming the dry NOx emissions rate in mg/kWh is required for design stage evidence.

POL 5 – FLOOD RISK

3 OF 3 CREDITS TARGETED

From the Environment Agency Flood Map, shown above, it can be seen that the site is located in a low-risk zone where the annual probability of fluvial flooding is less than 1 in 1000 in any given year.

It is assumed that a site specific Flood Risk Assessment (FRA) can confirm to the satisfaction of the local authority and statutory body that the development is appropriately flood resilient and resistant from all sources of flooding and that the ground level of the building, and access to it and the site, are designed (or zoned) so they are at least 600mm above the design flood level of the flood zone in which the assessed development is located.

Further to this, it is assumed that attenuation measures are specified to ensure that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the predevelopment site and that such measures make an allowance for climate change.

A Flood Risk Assessment (FRA) report by an appropriately qualified hydrological consultant or engineer will be required clarifying that the site is in a low flood risk area from all sources of flooding in order for the design stage credits to be awarded.

POL 6 – MINIMISING WATERCOURSE POLLUTION

1 OF 1 CREDIT TARGETED

In order to achieve this credit the following measures should be taken to avoid watercourse pollution and it is assumed that this will be implemented.

1. Sustainable Drainage Systems (SUDs) or source control systems such as permeable surfaces should be specified where run-off drains are in areas of relatively low risk of watercourse pollution.
2. Oil/petrol separators' should be specified for the surface water drainage systems covering car parks, areas where goods vehicles are parked or manoeuvred, and roads.
3. All water pollution prevention systems are designed in accordance with the recommendations of *Pollution Prevention Guideline 3* and the *SUDS manual* where appropriate.
4. A comprehensive and up-to-date drainage plan of the site will be made available to the building's occupiers.

Site plans and specification are required to confirm the proposed drainage design. A formal letter is also required as part of the design stage evidence confirming that all of the relevant requirements of the credit will be met.

POL 7 – REDUCTION OF NIGHT TIME LIGHT POLLUTION

1 OF 1 CREDIT TARGETED

It is anticipated that evidence will be provided to demonstrate that the external lighting design will be in compliance with the guidance in the *Institution of Lighting Engineers (ILE) Guidance notes for the reduction of obtrusive light, 2005*; hence this credit can be awarded.

The design stage evidence requires a marked up site plan showing the areas of the site which are externally lit and any neighbouring properties which may be affected by night time light pollution.

Either a specification clause or external lighting design is required to ensure that the external lighting design is in compliance with the credit criteria.

POL 8 – NOISE ATTENUATION

0.5 OF 1 CREDIT TARGETED

An initial desktop survey has found that there are noise sensitive (residential) areas within 800 meters of the proposed development. In order to achieve this credit a noise impact assessment must be carried out by a Suitably Qualified Acoustic Consultant in accordance with BS4142:1997, both at the design stage and the post construction stage.

The study must find that the noise levels due to the development are less than the background noise level. If this is initially not the case, then attenuation measures are required to meet the criteria, though the site's proximity to a busy roads and a railway station suggests that background noise levels are likely to be high already.

This requirement should be included within the Green Building Guide for any occupier supplied building services systems, but will also be assessed in terms of the centralised energy centre supplying the retail units.

An acoustician should be commissioned to undertake the relevant analysis on the energy centre which is required for this credit to be awarded. The acoustician should provide a report sufficient to meet the design stage evidence requirements of this credit.

As part of the evidence is from the Green Building Guide; hence only half of the credits can be awarded.

5.0 INNOVATION

Further credits are available within the Management, Health and Wellbeing, Energy, Water, Materials and Waste categories for exceeding the requirements of certain criteria as stated below.

Innovation credits are also available for innovative solutions to solve issues of sustainability within buildings. Consultation with BRE is required in order to make a submission to request any innovation credits other than those detailed below.

5.1 MANAGEMENT

MAN 2 – CONSIDERATE CONSTRUCTORS

0 OF 1 CREDIT TARGETED

It is assumed that a CCS with a score of a least 36 will not be achieved; hence an innovation credit cannot be awarded.

5.2 HEALTH AND WELLBEING

HEA 1 – DAYLIGHTING

0 OF 1 CREDIT TARGETED

It is assumed that further enhanced levels of daylighting are not achieved throughout the occupied floor areas of each building.

5.3 ENERGY

ENE 1 – REDUCTION OF CO2 EMISSIONS

0 OF 2 CREDITS TARGETED

It is believed to be highly unlikely that each unit will achieve a CO_2 index of less than 0 on the benchmark scale. It is therefore not a true zero carbon development; hence no credits can be awarded.

ENE 5 – LOW ZERO CARBON TECHNOLOGIES

0 OF 1 CREDIT TARGETED

It is anticipated that the scale of low or zero carbon technologies that will be installed will not be sufficient to provide a carbon dioxide emissions reduction of at least 20%; hence an innovation credit cannot be awarded.

5.4 WATER

WAT 2 – WATER METER

0 OF 1 CREDIT TARGETED

There are not anticipated to be any high water usage appliances where sub-metering would be appropriate.

5.5 MATERIALS

MAT 1 – MATERIALS SPECIFICATION (MAJOR BUILDING ELEMENTS)

0 OF 1 CREDIT TARGETED

It is assumed that insufficient points will be achieved for the materials specification; hence an innovation credit cannot be awarded.

MAT 5 – RESPONSIBLE SOURCING OF MATERIALS

0 OF 1 CREDIT TARGETED

It is assumed that less than 95% of the assessed materials will be responsibly sourced; hence this credit cannot be awarded.

5.6 WASTE

WST 1 – CONSTRUCTION SITE WASTE MANAGEMENT

1 OF 1 CREDIT TARGETED

It is anticipated that all key waste groups would be identified for diversion from landfill at pre-construction stage SWMP and at least 90% by weight (80% by volume) of non-hazardous construction waste generated by the build would be diverted from landfill and either:

a. Reused on site (in-situ or for new applications)
b. Reused on other sites
c. Salvaged/reclaimed for reuse
d. Returned to the supplier via a ‘take-back’ scheme
e. Recovered from site by an approved waste management contractor and recycled.

6.0 RESULTS

Assuming that the recommendations within this report are implemented and supported with the required evidence; it is anticipated that a BREEAM *Excellent* rating can be achieved with an overall BREEAM score of 74.55%.

Stage of Assessment	BREEAM Score	BREEAM Rating
Pre Assessment	**74.55%**	**EXCELLENT**

Minimum BREEAM Standards					
Rating Level	Pass	Good	Very Good	Excellent	Outstanding
Minimum Standards Achieved	YES	YES	YES	YES	NO

Although the *Excellent* target has been reached in this pre-assessment, it is important to ensure that sufficient credits are targeted such that a reasonable buffer is afforded. This will allow flexibility in the design and build process should circumstances lead to one or several credits being missed unavoidably.

APPENDIX: Summary of Target Credits

CREDIT	Credit Ref.	Assessment Criteria	Credits Available	Credits Targeted	Notes
Management	MAN1	Commissioning	2	1	Green Building Guide
	MAN2	Considerate Constructors	2	2	
	MAN3	Construction Site Impacts	4	4	
	MAN4	Building User Guide	1	1	
	MAN8	Security	1	1	
Management Total Available / Targeted			**10**	**9**	
Health and Wellbeing	HEA1	Daylighting	1	1	
	HEA4	High Frequency Lighting	1	1	Green Lease Agreement
	HEA5	Internal& External Lighting	1	0.5	Green Building Guide
	HEA8	Indoor Air Quality	1	0	
	HEA9	Volatile Organic Compounds	1	0.5	Green Building Guide
	HEA10	Thermal Comfort	1	0.5	Green Building Guide
	HEA12	Microbial Contamination	1	1	Green Lease Agreement
Health and Wellbeing Total Available / Targeted			**7**	**4.5**	
Energy and Carbon dioxide Emissions	ENE1	Reduction of CO_2 Emissions	15	6	Green Lease Agreement
	ENE2	Sub-metering of substantial energy uses	1	1	Green Lease Agreement
	ENE3	Sub-metering of high energy load areas	1	1	Green Lease Agreement
	ENE4	External Lighting	1	1	
	ENE5	Low zero carbon technologies	3	2	Green Lease Agreement
Energy and Carbon Dioxide Emissions Total Available / Targeted			**21**	**11**	

CREDIT	Credit Ref.	Assessment Criteria	Credits Available	Credits Targeted	Notes
Transport	TRA1	Provision of Public Transport	5	5	
	TRA2	Proximity to amenities	1	1	
	TRA3	Cyclist Facilities	2	1	
	TRA4	Pedestrian and cycle safety	2	2	
	TRA5	Travel Plan	1	1	
Transport Total Available / Targeted			**11**	**10**	
Water	WAT1	Water Consumption	3	1.5	Green Building Guide
	WAT2	Water Meter	1	1	Actual Specification
	WAT3	Major Leak Detection	1	1	
	WAT4	Sanitary supply shut off	1	0.5	Green Building Guide
	WAT5	Water recycling	2	2	Green Lease Agreement
Water Total Available / Targeted			**8**	**6**	
Materials	MAT1	Materials Specification	4	4	
	MAT2	Hard Landscaping & Boundary Protection	1	1	
	MAT3	Re-use of Building Facade	1	0	
	MAT4	Re-use of Building Structure	1	0	
	MAT5	Responsible Sourcing of Materials	3	3	
	MAT6	Insulation	2	1	Green Building Guide
	MAT7	Designing for Robustness	1	1	
Materials Total Available / Targeted			**13**	**10**	

CREDIT	Credit Ref.	Assessment Criteria	Credits Available	Credits Targeted	Notes
Waste	WST1	Construction Site Waste Management	4	3	Additional Innovation credit
	WST2	Recycled aggregates	1	1	
	WST3	Recyclable Waste Storage	1	1	
	WST5	Composting	1	1	
Waste Total Available / Targeted			**7**	**6**	**+1**
Land Use and Ecology	LE1	Re-use of Land	1	1	
	LE2	Contaminated Land	1	0	
	LE3	Ecological Value of Site AND Protection of Ecological Features	1	0	
	LE4	Mitigating Ecological Impact	2	2	
	LE5	Enhancing Site Ecology	3	2	
	LE6	Long Term Impact on Biodiversity	2	2	
Land Use and Ecology Total Available / Targeted			**10**	**7**	
Pollution	POL1	Refrigerant GWP	1	0.5	Green Building Guide
	POL2	Preventing Refrigerant Leaks	2	1	Green Building Guide
	POL4	NOx emissions from heating source	3	3	Actual Specification
	POL5	Flood Risk	3	3	
	POL6	Minimising Watercourse Pollution	1	1	
	POL7	Reduction of Night Time Pollution	1	1	Actual Specification
	POL8	Noise Attenuation	1	0.5	Green Building Guide
Pollution Total Available / Targeted			**12**	**10**	