A & G Partnership

Building Services Consulting Engineers.

ENERGY REPORT

Coram Foundation

New East Wing Building

DATE: August 2013

REF: RSG/4371

ISSUE REGISTER

Revision	Reason for Issue	Date of Issue	Issued by
1.0	For Submission	28th August 2013	RG

2. CONTENTS

3. EXECUTIVE SUMMARY

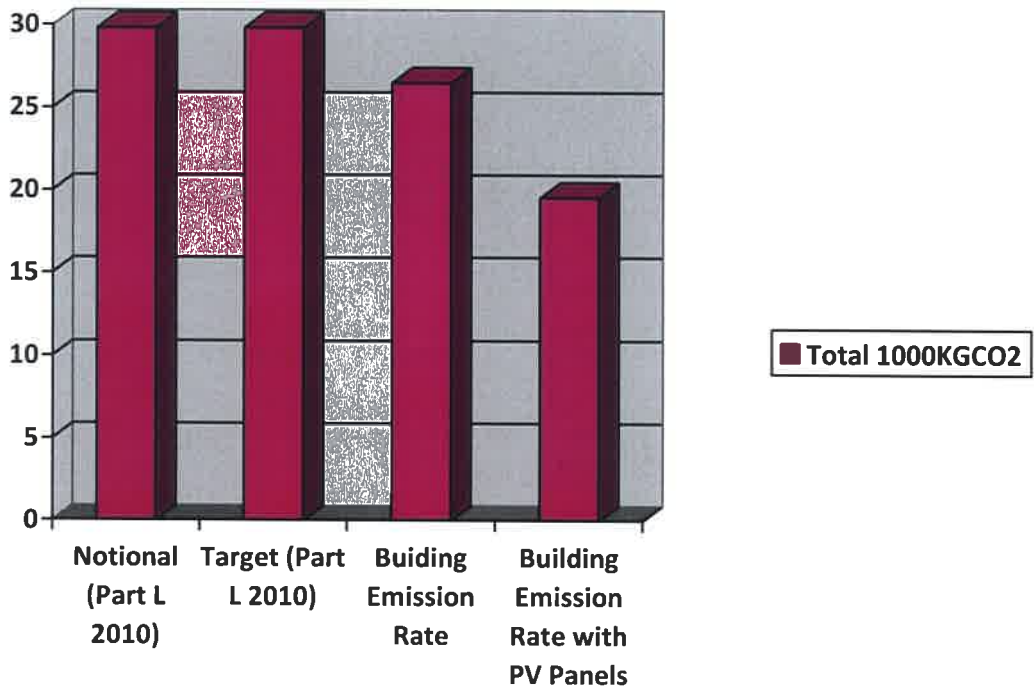
This document responds to planning policy in respect of energy consumption and carbon dioxide emissions.

The methodology used herein is consistent with;

- The London Renewables Toolkit (LRT)
- Part L of the Building Regulations.
- The London Plan 2011
- The London Borough of Camden Unitary Development Plan 2006

The Proposed Development includes energy saving measures to reduce the Proposed Development's energy requirements. Details of these measures are provided within this report.

A feasibility study of the currently available low and zero carbon technologies has been undertaken and from this it is proposed that PV panels can be used to provide the appropriate level of renewable resources. The calculations show that the introduction of these technologies would further reduce the annual carbon dioxide emissions of the Proposed Development by 6,975kgCO_2. The overall effect is that the Building Emission Rate becomes 10.62kgCO_2/m^2 this is a reduction of 35% below the notional emissions and Target Emission rate, thereby, meeting the London Plan and the Camden UDP.



4 INTRODUCTION

4.1 Planning Policy Context

4.1.1 National

The following description is taken from the LRT.

"Increased development of renewable energy resources is vital to facilitating the delivery of the Government's commitments on both climate change and renewable energy. The Government's Energy Policy, including its policy on renewable energy, is set out in Energy White Paper. This aims to put the UK on a path to cut its carbon dioxide emissions by some 60% by 2050, with real progress by 2020 and to maintain reliable and competitive energy supplies. As part of the strategy for achieving these reductions the White Paper sets out:-

- The Government's target to generate 10% of UK electricity from renewable energy sources by 2010.
- The Government's aspiration to double the figure to 20% by 2020 and suggests that still more renewable energy will be needed beyond that date."

"The Energy White Paper indicated that the Government would be looking to work with regional and local bodies to deliver its objectives, including establishing regional targets for renewable energy generation. Regional Planning Guidance should include the target for renewable energy generation for its respective region, derived from assessments of the region's renewable energy resource potential."

Planning Policy Statement 22 (PPS 22) sets out the Government's national policy for renewable energy, in terms of both dedicated renewable generation projects (e.g. wind farms) and 'embedded' generation. It states that "Local planning authorities" may include policies in local development documents that require a percentage of the energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments. Such policies:

I) Should ensure that requirement to generate on-site renewable energy is only applied to developments where the installation of renewable energy generation equipment is viable given the type of development proposed, its location and design;

II) Should not be framed in such a way as to place an undue burden on developers, for example, by specifying that all energy to be used in a development should come from on-site renewable generation.

4.1.2 Regional

The London Plan (Consolidated with Alterations since 2004) was adopted in February 2008 and Policy 4A.7 Renewable Energy states that:

"The Mayor will and boroughs should, in their DPDs adopt a presumption that developments will achieve a reduction in carbon dioxide emissions of 20% from on site renewable energy generation (which can include sources of decentralized renewable energy) unless it can be demonstrated that such provision is not feasible. This will support the Mayor's Climate Change Mitigation and Energy Strategy and its objectives of increasing the proportion of energy used generated from renewable sources by:

- Requiring the inclusion of renewable energy technology and design, including: biomass fuelled heating, cooling and electricity generating plant, biomass heating, renewable energy from waste (Policy 4A.21) photovoltaic, solar water heating, wind, hydrogen fuel cells and ground coupled heating and cooling in new developments wherever feasible.
- Facilitating and encouraging the use of all forms of renewable energy where appropriate and giving consideration to the impact of new development on existing renewable energy schemes."

Paragraph 4.24 of the London Plan states that: 'The required renewable energy contribution should be established in line with Policies 4A.4 [production of Energy Assessment for Major Developments only] and 4A.7 [the 20% renewables target mentioned above].'

A consultation draft replacement plan was published in October 2009, entitled The London Plan – Spatial Development Strategy for Greater London. Proposed Policy 5.2 – Minimising carbon dioxide emissions proposes targets for major development proposals, with a detailed energy assessment to be met within the framework of the energy hierarchy. The minimum targets are given below:

Year	Improvement on 2006 Building Regulations	
	Residential buildings	Non-domestic buildings
2010-2013	44 per cent	44 per cent
2013-2016	55 per cent	55 per cent
2016-2019	Zero carbon	As per building regulations requirements
2019-2031		Zero carbon

Table 1 – Proposed carbon dioxide reduction targets under the consultation draft replacement plan.

4.1.3 Local

The Core Strategy sets out how energy usage will change up to 2026 as set out in the sustainable community strategy.

Strategic Policy 13 (High environmental standards) states that:

Development will help us live and work in a way that respects the limits of the plant's natural resources, reduces pollution and damage to the environment and helps are adapt to climate change.

We will do this by:-

1. Requiring development to meet the highest possible environmental standards, including targets based on the Code of Sustainable Homes and BREEAM.

2. Requiring all new development to be designed and built to minimize greenhouse gas emissions across its lifetime. This will be achieved by applying the energy hierarchy (as illustrated in Figure 4):

    - Designing all developments so that they require as little energy as possible to build and use.
    - Expecting all major developments to set up and/or connect to local energy generation networks where possible.
    - Requiring developments to use low and zero carbon sources of energy.

3. Enabling existing buildings to become more energy efficient and make use of low and zero carbon sources of energy.

4. Increasing recycling and composting, minimizing waste, reducing landfill and making more use of waste as a resource. By 2015 we will be recycling and composting at least 45% of municipal waste, 50% by 2020 and aspiring to achieve 60% by 2031. By 2020, we will be recycling at least 70% of commercial and industrial waste. We are aiming to meet the Mayor's target of recycling or reusing 95% of construction, excavation and demolition waste by 2020.

5. Requiring applicants to demonstrate how they will avoid waste and minimise landfill from construction and use of a development.

6. We will meet the London Plan waste apportionment target set for managing at least 243,000 tonnes of waste by 2016, at least 275,000 tonnes by 2021 and at least 343,000 tonnes by 2031. We will implement this though a development plan document and our Waste Management Strategy. We have set aside enough facilities and land to make sure we can fully meet our targets.

7. Requiring developments to minimise water use and use local sources of water where possible.

8. Setting high standards and supporting measures for reducing air, land, water, noise and light pollution and avoiding amenity and environmental problems that affect how we enjoy the environment in which we live and work. This includes making sure developments are designed to cope with climate conditions as they change during the development's lifetime.

9. Allowing development to occur in the protected Thames flood zone as long as it is designed to be safe and resilient to flooding and meets the Exceptions Test.'

The following relevant targets are also set within the Core Strategy:

- Major development should achieve a 44% saving in carbon dioxide emissions above the building regulations from energy efficiency, efficient energy and supply and renewable energy generation;
- Major development must achieve a reduction in carbon dioxide of 20% from using on-site or local low and zero carbon sources of energy.'

4.2 Proposed Development

The Proposed Development consists of a single 3 storey office building with low energy lighting and natural ventilation.

5 METHODOLOGY

This report draws on the information and approach set out in the LRT. The currency used for emissions is carbon dioxide, rather than the carbon equivalent, for consistency with Part L of the Building Regulations.

A Part L analysis is conducted to calculate carbon dioxide emissions for the following end uses: heating; hot water; fans, pumps and controls; and lighting. Various energy-saving measures are considered in terms of technical and economic feasibility and their effect on carbon dioxide emissions. A package of energy-saving measures is proposed that meets the Part L standard.

Calculations are presented in summary form in subsequent sections, with detailed calculations in Appendix A.

Figure 2 below provides a summary of methodology in the form of a flow diagram.

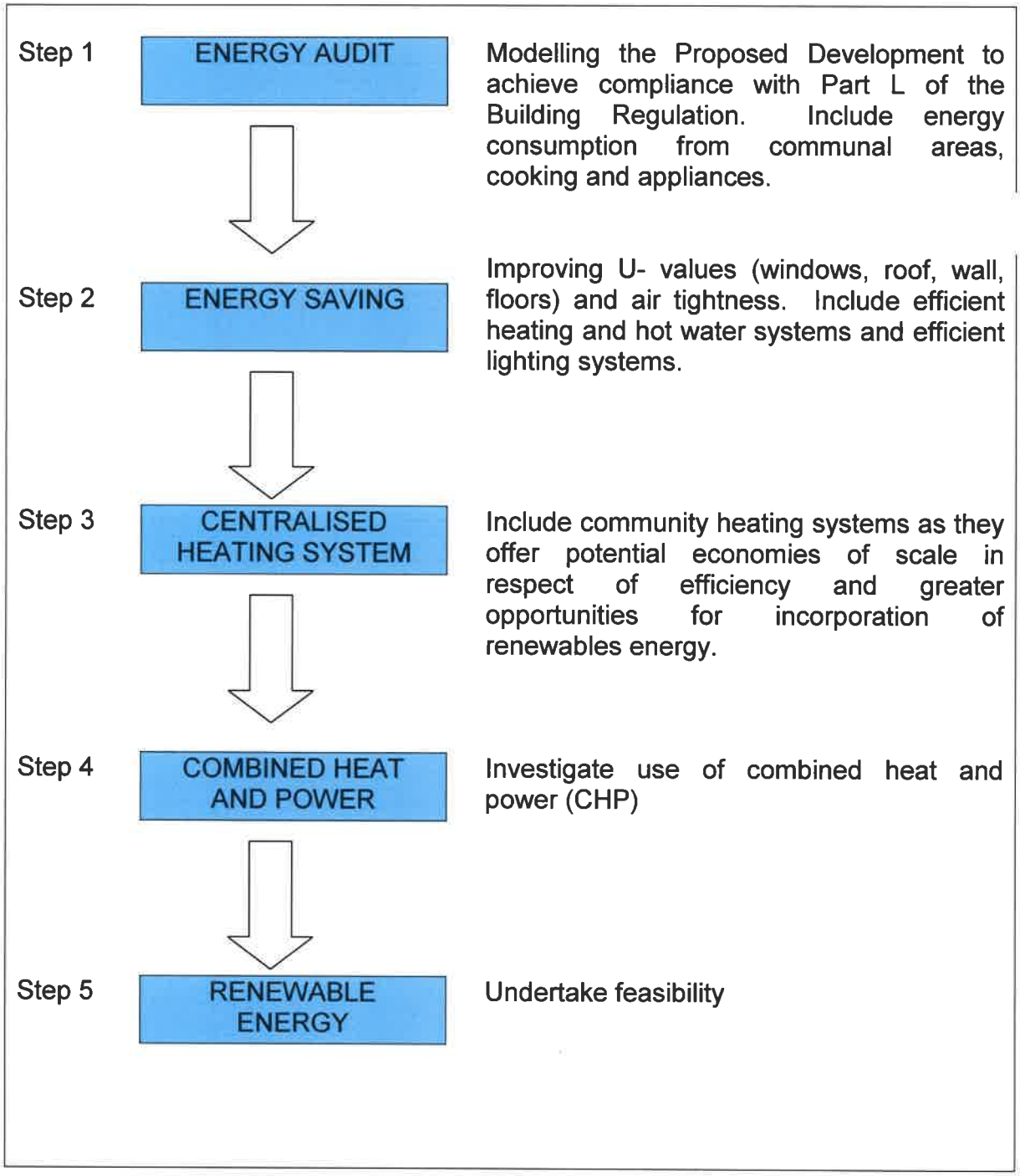


Figure 2 – Flow diagram of methodology

6 ENERGY DEMAND

The Proposed Development would feature energy saving measures to significantly reduce the energy requirements of the development, prior to the integration of the renewable technologies. As required under Part LA of the Approved Document of the Building Regulations.

6.1 Offices

Part L2A calculations have been undertaken for the Proposed Development. The minimum requirements for compliance with Part L2A were established and feasible improvements were included to further reduce the carbon dioxide emissions. The measures outlined below have been used in the calculations and exceed the requirements:

Element	Proposed Development	Part L Compliant
External Walls ($W/m^2.K$)	0.35	0.35
Windows ($W/m^2.K$)	1.51	2.2
Floors ($W/m^2.K$)	0.2	0.25
Roof ($W/m^2.K$)	0.15	0.25
Air Permeability ($m^3/hr/m^2$)	Tested target of 5	10
Low energy lighting (%)	100	75

Table 2 – Comparison of proposed measures against Part L (2010) compliance.

6.2 Total Energy Demand

The energy saving measures would be used to reduce the Proposed Development's energy requirements. Table 4 below provides details of the total energy demand within the Proposed Development and provides a comparison against Part L compliance.

Model	Gas Demand (MWh)			ELECITIY DEMAND (MWh)					Total Energy Demand (MWh)	Carbon Dioxide Emissions (t)		
	Space Heating	Hot water	Sub-Total (Part L)	Space Heating	Hot Water	Fans, Pumps and controls	Lighting	Sub Total		Elec.On-Site Generation	Total Part L	Total
Notional/Target (Part L 2010)	24	5.5	31.7			1.75	44	45.75	76	0	29.8	29.8
Building Emissions	43	7.7	50.7			3.7	28	31.7	82	6.9	19.5	19.5

Table 4 – Total energy demand within Proposed Development.

7 RENEWABLES – FEASBILITY STUDY

The LRT provides benchmark sizing and cost data for "Renewable energy technologies suitable for London". It is therefore provides the information to assess the various technologies at an early design stage, with initial measurements of the impact of using each technology on the building's carbon dioxide emissions. Table 5 (below) outlines these technologies and the variations proposed in the LRT used in this assessment.

Table 5

Technology	End Use Demand Met
Wind	Electricity
CHP	Annual Hot Water + Electricity
PV Cells – rooftop	Electricity
PV Cells – cladding	Electricity
Solar Water Heating	Annual DHW (50%)
Biomass heating (a)	Annual space Heating + Domestic Hot Water (33%)
Biomass heating (b)	Annual Space Heating + Domestic Hot Water (50%)
Biomass heating (c)	Annual Space Heating + Domestic Hot Water (100%)
Biomass CHP(a)	Annual Space Heating + Domestic Hot Water (33%)
Biomass CHP(b)	Annual Space Heating + Domestic Hot Water (50%)
Heat pumps (a)	Annual Space Heating + Domestic Hot Water (50%)
Heat pumps (b)	Annual Space Heating + Domestic Hot Water (100%)
Ground cooling (a)	Annual Cooling (50%)
Ground cooling (b)	Annual Cooling (100%)

The following other "Acceptable renewable energy technologies" are considered to be not typically appropriate:

- Fuel cells using hydrogen from renewable sources;
- Gas from anaerobic digestion;
- Geothermal;
- Ground cooling air systems;
- Micro hydro; and
- Solar air collectors

On the basis of this preliminary analysis and a review of the general advantages and disadvantages of the different technologies relative to the Proposed Development, the following technologies were not considered to be appropriate to the Proposed Development:

- Wind turbines: on the basis of visual appearance, noise issues and concerns over outputs in urban areas. Wind turbines are not considered appropriate for the urban context. There are still concerns over noise with the horizontal axis turbines and therefore they are not considered appropriate for the development.

- Combined heat and power (CHP) has been assessed in terms of feasibility. The CHP requires a base load to ensure economical running of the plant. There is no economic or sustainable justification for over-sizing the CHP plant and therefore the CHP plant and the CHP unit size needs to be carefully matched to the demands of the development. The Proposed Development hot water demand is too small to successfully incorporate a central CHP unit, as there is an insufficient base load to make the smallest commercially available unit technically viable.
- Biomass: on the basis of concerns over air quality issues from flue discharge; concerns over transport issues relating to regular deliveries of biomass; security and cost of fuel supply; concerns over disposal of ash; and relatively high maintenance. Biomass is not considered to be a suitable fuel for use within an urban development and therefore this technology is not considered appropriate for the development;
- Biomass: on basis of embodied impacts; high maintenance; concerns over air quality issues from flue discharge; concerns over transport issues relating to regular deliveries of biomass; lack of micro-scale units on the market to suit this scale of development; and it being an immature technology. Biomass is not considered to be a suitable fuel for use within an urban development and therefore this technology is not considered appropriate for the development;
- Solar collectors: it has been calculated that the provision of the optimum area of solar thermal panels would not provide a significantly lower carbon reduction considering the hot water demand, and this technology has been discounted for the project.
- PV panels roof mounted will provide the required renewable energy source and can be accommodated on the roof. Also the feed in tariff provides the building owner an income when the building is not using the full power available which will make the repayment period shorter.
- Ground source heat pumps: on the basis that the PV's proposed would provide the required reduction in carbon dioxide emissions. There would also be significant ground works involved with a ground source system of this scale and it is not considered to be economically viable.

8 DETAILED PROPOSAL

On the basis of this preliminary analysis and a review of the general disadvantages of the different technologies relative to the Proposed Development, the following technologies were considered to be appropriate to the Proposed Development:

- Photvoltaic Panels roof mounted providing 16,530KwHr/annum will provide the 20% renewable energy requirement.

9 CONCLUSION

This document responds to planning policy in respect of energy consumption and carbon dioxide emissions. The methodology used herein is consistent with the London Renewables Toolkit (LRT) and Part L of the Building Regulations.

The Proposed Development includes energy saving measures to reduce the Proposed Development's energy requirements. Details of these measures have been provided within this report.

A feasibility study of the currently available low and zero carbon technologies has been undertaken and from this it is proposed that PV Panels roof mounted will meet the criteria of the LRT and Camden UDP.

The proposed measures would reduce the carbon emissions of the development by 25% thereby meeting the energy requirements.

10 APPENDIX A – DETAILED CALCULATIONS

See attached calculations.

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

Coram East Wing

As designed

Date: Wed Aug 28 08:23:57 2013

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v4.1.d.0

Interface to calculation engine: Design Database

Interface to calculation engine version: v25.05

BRUKL compliance check version: v4.1.d.0

Owner Details

Name: Information not provided by the user

Telephone number: Information not provided by the user

Address: Information not provided by the user, Information not provided by the user, Information not provided by the user

Certifier details

Name: Information not provided by the user

Telephone number: 0207 828 8200

Address: 95 Buckingham Palace Road, London, SW1W 0RP

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	16.2
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	16.2
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	14.4
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.35	0.35	1-01 Wall 1
Floor	0.25	0.2	0.2	G-01 Exposed Floor 1
Roof	0.25	0.15	0.15	2-01 Exposed Roof 1
Windows***, roof windows, and rooflights	2.2	1.51	2.19	G-06 Door 1
Personnel doors	2.2	-	-	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No heat loss vehicle access doors"
High usage entrance doors	3.5	-	-	"No heat loss high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

2.b Building services

The building services parameters listed below are expected to be checked by the BCO against guidance. No automatic checking is performed by the tool.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- HVAC 1

Heating seasonal efficiency	**Cooling nominal efficiency**	**SFP [W/(l/s)]**	**HR seasonal efficiency**
0.89	-	-	-
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system			NO

1- Default DHW

Heating seasonal efficiency	**Hot water storage loss factor [kWh/litre per day]**
Hot water provided by HVAC system	0.015

"No zones in project where local mechanical ventilation or exhaust is applicable"

General lighting and display lighting

Zone	**General lighting [W]**	**Display lamps efficacy [lm/W]**
1-01	2810	-
1-02	90	-
1-03	110	-
1-04	20	-
1-05	70	-
1-06	10	-
2-01	2680	-
2-02	90	-
2-03	110	-
2-04	20	-
2-05	70	-
2-06	10	-
G-01	2310	-
G-02	90	-
G-03	290	15
G-04	110	-
G-05	20	-
G-06	260	-
G-07	50	-
G-08	10	-

Criterion 3: The spaces in the building should have propriate passive control measures to limit solar gains

Zone	**Solar gain limit exceeded? (%)**	**Internal blinds used?**
1-01	YES (+0%)	NO
2-01	YES (+0%)	NO
G-01	YES (+0%)	NO
G-03	YES (+0%)	NO

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

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1841.9	1841.9
External area [m²]	2254.9	2254.9
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	5
Average conductance [W/K]	1236.17	513.63
Average U-value [W/m²K]	0.55	0.23
Alpha value* [%]	14.81	6.49

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Telephone exchanges
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	23.23	13.38
Cooling	0	0
Auxiliary	2.05	0.95
Lighting	15.4	24.07
Hot water	4.19	2.99
Equipment*	44.26	43.15
TOTAL	**44.87**	**41.4**

* Energy used by equipment does not count towards the total for calculating emissions.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Indicative Target
Heating + cooling demand [MJ/m²]	309.6	139.51
Total consumption [kWh/m²]	44.87	41.4
Total emissions [kg/m²]	14.4	16.2

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: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	66.4	243.2	23.2	0	2.1	0.79	0	0.89	0
	Notional	38.2	101.4	13.4	0	1	0.79 / 0.81	0	---	---

Key to terms

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 (for notional building, value depends on activity glazing class)
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

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.35	1-01 Wall 1
Floor	0.2	0.2	G-01 Exposed Floor 1
Roof	0.15	0.15	2-01 Exposed Roof 1
Windows, roof windows, and rooflights	1.5	1.5	1-01 Window 1 (1)
Personnel doors	1.5	-	"No heat loss personnel doors"
Vehicle access & similar large doors	1.5	-	"No heat loss vehicle access doors"
High usage entrance doors	1.5	-	"No heat loss high usage entrance doors"

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

Thermal bridges

There is at least one junction in the project whose linear thermal transmittance has been defined as having been calculated following a quality-assured accredited construction details approach in accordance with a scheme approved by the Secretary of State.

SBEM Main Calculation Output Document

Wed Aug 28 08:07:07 2013 v4.1.d.0

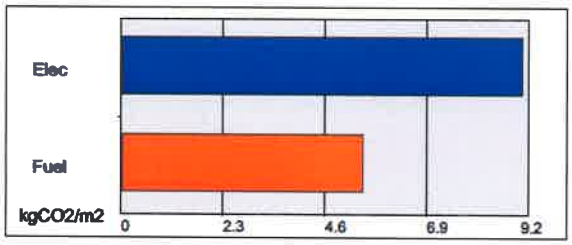
Building name

Coram East Wing

Building type: B1 Offices and Workshop businesses

SBEM is an energy calculation tool for the purpose of assessing and demonstrating compliance with Building Regulations (Part L for England and Wales, Section 6 for Scotland, Part F for Northern Ireland, Part L for Republic of Ireland and Building Bye-laws Jersey Part 11) and to produce Energy Performance Certificates and Building Energy Ratings. Although the data produced by the tool may be of use in the design process, **SBEM is not intended as a building design tool.**

Building Energy Performance and CO2 emissions

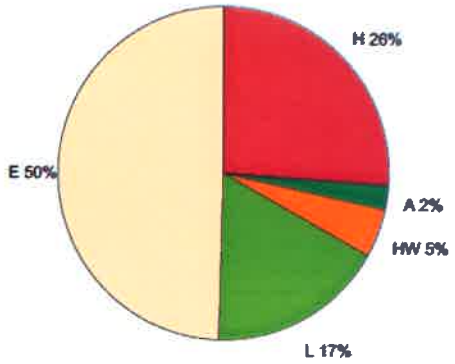


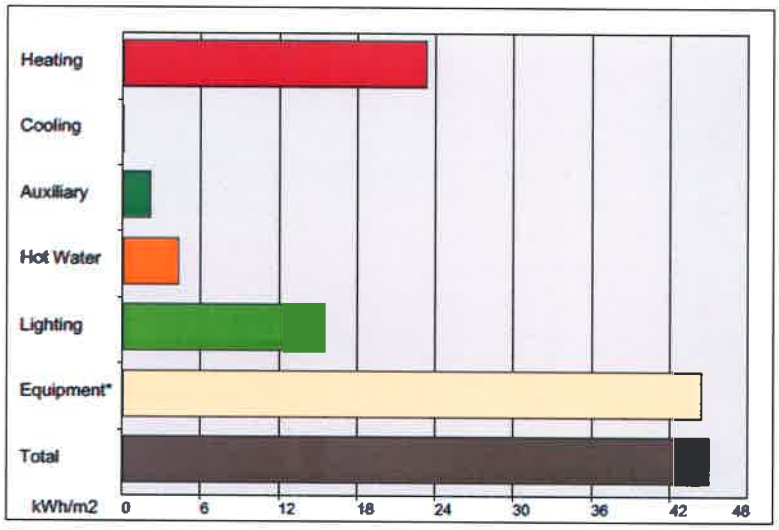
0 kgCO2/m2 displaced by the use of renewable sources.

Building area is 1841.91 m2

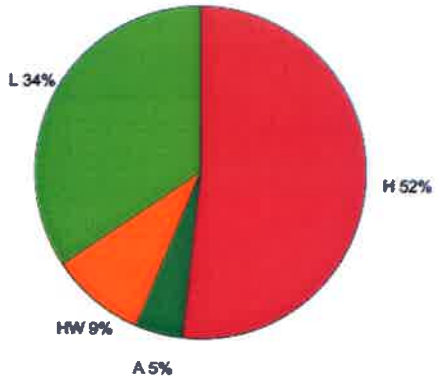
Annual Energy Consumption

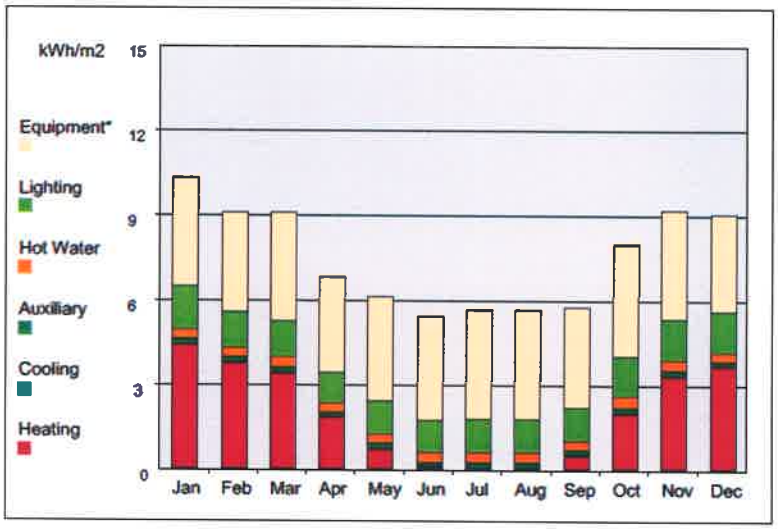
(Pie chart including Equipment end-use)





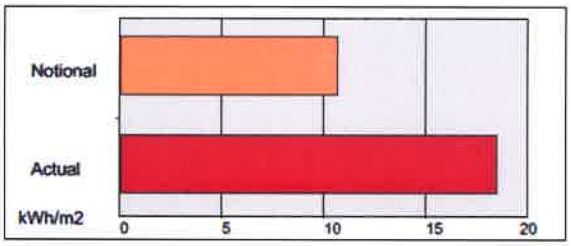
(Pie chart excluding Equipment end-use)

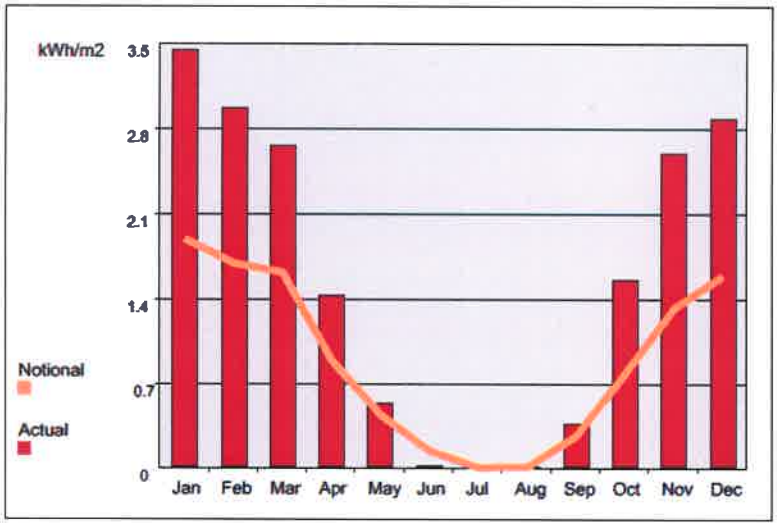




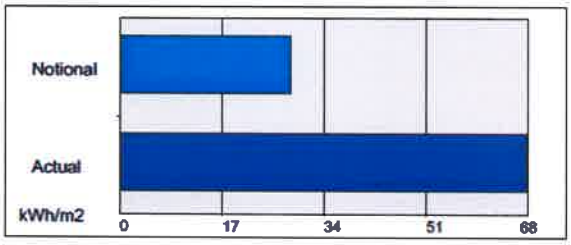
(*) Although energy consumption by equipment is shown in the graphs, the CO2 emissions associated with this end-use have not been taken into account when producing the rating.

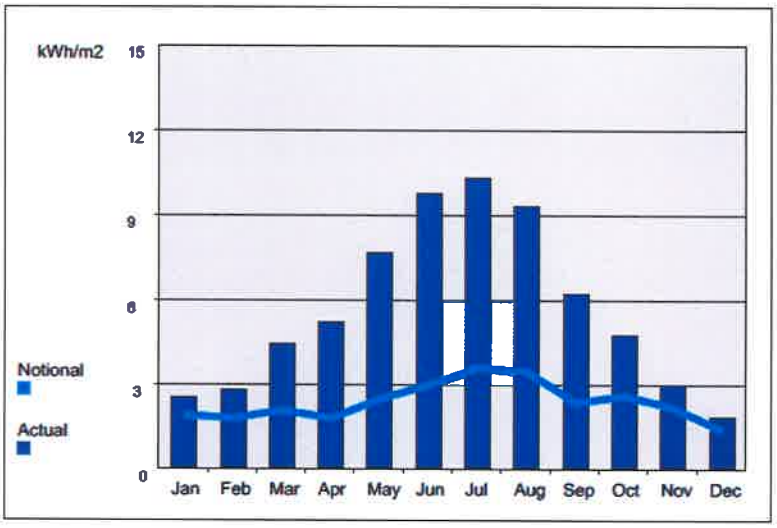
Annual Heating Demand





Annual Cooling Demand





Building Rating

	Heating	Cooling	Auxiliary	Lighting	Hot water	Total	
Actual	23.23	0.0	2.05	15.4	4.19	44.87	**kWh/m²**
Notional	13.38	0.0	0.95	24.07	2.99	41.4	**kWh/m²**

CO2 emissions mandatory requirement

BER	14.4	**kgCO2/m²**
Notional	16.2	**kgCO2/m²**
TER	16.2	**kgCO2/m²**
Pass CO2	**Yes**	