23-24 Montague Street

London, WC1B 5BH

ENERGY STATEMENT

Revision A – 23 Feb 2017

For Planning

Abba Energy Ltd

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1 EXECUTIVE SUMMARY

1.1 The proposed development is the conversion of a hotel into 6 flats. As such it constitutes a change of use.

1.2 The target standards for this scheme are to

1.2.1 achieve compliance under the Building Regulations Part L 2013.

1.2.2 20% reduction on CO2 from on-site renewables

1.2.3 achieve a BREEAM Domestic Refurbishment Excellent Rating, and minimum credit ratings under Energy (60%); Materials (40%); Water (60%)

1.3 This report has been prepared in support of the planning application in response to the requirements of the London Plan and London of Borough of Camden requirements.

1.4 This report does not address the issues relating to materials and water use within BREEAM Domestic Refurbishment, that is dealt with in another document.

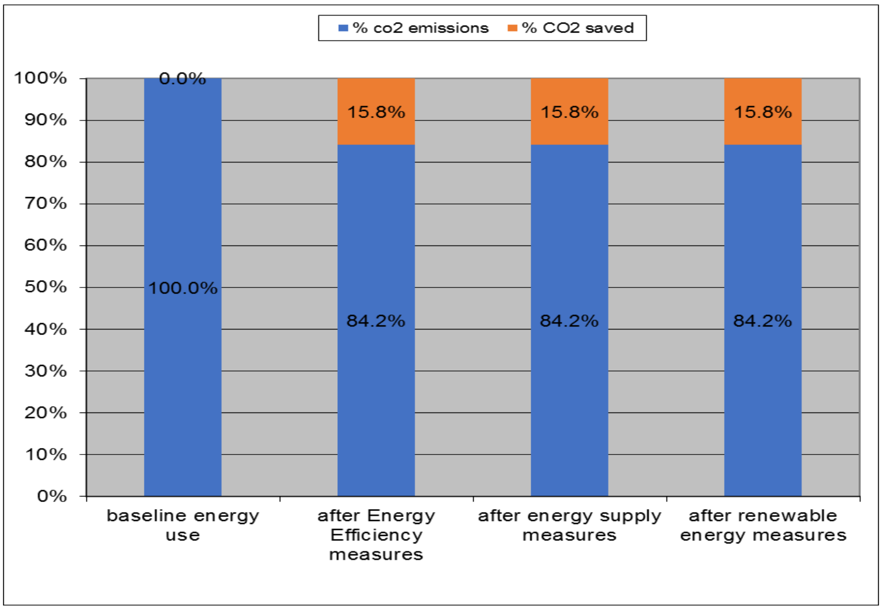
1.5 The proposals comply with the requirements of Part L1B 2013 of the Building Regulations. This is detailed in a separate report. The Part L compliance report reviews the upgrading of existing elements. The roofs are upgraded within the requirements of Part L1B. The walls have not been upgraded as in some rooms the area loss exceeds 5%, and in others it is not economically feasible to carry out the insulation works. Windows to the front of the building are being replaced, but those on the rear are required to remain due to Planning requirements. Nevertheless, overall the proposals are demonstrated to comply with Part L1B.

1.6 The proposed development has been reviewed under the London Plan three stage energy hierarchy. The energy use and carbon emissions have been calculated using the London Renewables Toolkit calculation method. The London Plan seeks to reduce energy use and carbon emissions using a three-stage energy hierarchy.

1.6.1 BE LEAN - The review shows that the proposed fabric and heating systems will achieve a 15.8% reduction in carbon emissions of all regulated uses over the baseline case of the 'Notional' works, being that which just complies with Part L1B.

1.6.2 BE CLEAN - It is not viable to connect to a district system, or provide a CHP system.

1.6.3 BE GREEN – it is estimated that the most feasible on-site renewable system would be a PV array. However due to site constraints, including planning issues it is not possible to provide PV on this building.



1.7 Overall the proposed scheme provides for a high level of sustainability in its design.

1.8 It complies with the requirements for Part L2013; and the intent of the London Plan but due to the inability to install PV, it does not achieve the 20%. Reduction of CO2 from on-site renewables.

1.9 The proposals allow for very high levels of energy efficiency improvements to the existing fabric and services which represent the optimum provision taking into account planning economic feasibility and the physical constraints of the site. The proposals do represent a 15.8% improvement over Part L 2013, due to the fabric and services specification.

2 LIMITATIONS

2.1 Some assumptions have been made on the figures for capital costs of the renewable installations, and savings provided are approximate but wholly applicable for the planning application report.

2.2 This review has used appropriate bench mark data and is valid and reliable.

3 ENERGY USE

3.1 The energy use and carbon emissions have been calculated using the London Renewables Toolkit calculation method. The London Plan seeks to reduce energy use and carbon emissions using a three-stage energy hierarchy:

3.1.1 Be Lean – Use Energy Efficient measures to reduce energy use This includes passive measures such as orientation, levels of insulation, ventilation strategies, and heating systems efficiencies and controls.

3.1.2 Be Clean – Source energy from the greenest sources. This could be to use CHP, or to link in to an existing district heating system

3.1.3 Be Green – Use on-site renewable energy to reduce energy and carbon emissions.

3.2 To estimate the energy use of the flats and heated common area, in the proposed development we have used SAP2012 for the Flats and iSBEM 5.2.g for the common area. This enables us to get accurate energy and carbon emission figures for both the As Proposed situation, and the 'Baseline' situation. The Baseline represents a notional building just complying with Part L 1B 2013.

3.3 We have then looked at the specification As Proposed and the energy use and carbon emissions achieved. See Appendix A & B for the outline specifications of the dwellings and commercial. The proposed fabric standards exceed the requirements of Building Regulations. The table below illustrates the standards proposed.

ELEMENT	PROPOSED	U Values used in Part L1A 2013 Notional
floor	0.42	0.42
wall	1.10	1.10
roof	0.12	0.16
window	1.30	1.60
door	n/a	n/a
thermal bridging	default	default
air permeability	8	default
lowE lights	100%	75%

3.4 Active and passive design measures incorporated.

3.4.1 There are high levels of insulation and air permeability as demonstrated in the table in 3.3 above.
3.4.2 A high level of services specification is proposed. Includes high efficiency gas boilers to the flats; very good space and water heating controls (the actual specification of controls is better than SAP allows for). Commercial space to have high efficiency gas boiler, and good controls.
3.4.3 Water demand will be managed through the use of low water use fittings – low flush WCs; flow controlled taps and showers – which will reduce the hot water demand and reduce energy use.
3.4.4 LowE lighting proposed through
3.4.5 Orientation is compromised by the site location in an urban environment.
3.4.6 As this is and urban site the development can take advantage of significant shelter benefits from surrounding buildings

3.5 The tables below show the energy use in kWh/ year and kg/CO2/year for the Baseline condition (Notional) and the As Proposed standard for the whole development, which incorporates the Energy Efficiency measures.

BASELINE **TABLE 1**

baseline just complying with BRegs part L	energy demand kWh/yr	CO2 emissions kgCO2/yr	CO2 emissions tonnes/yr
heating	76,176	16,454	16.5
hot water	16,855	3,641	3.6
auxiliary	2,924	361	0.4
lighting	6,446	3,309	3.3
cooling	0	0	0
PV generation	0	0	0
equipment	21,783	11,255	11.3
total heat / hot water	93,031	20,095	20.1
total electricity	9,370	3,670	3.7
total REGULATED	102,402	23,765	23.8
total REG + UNREG	124,184	35,019	35.0

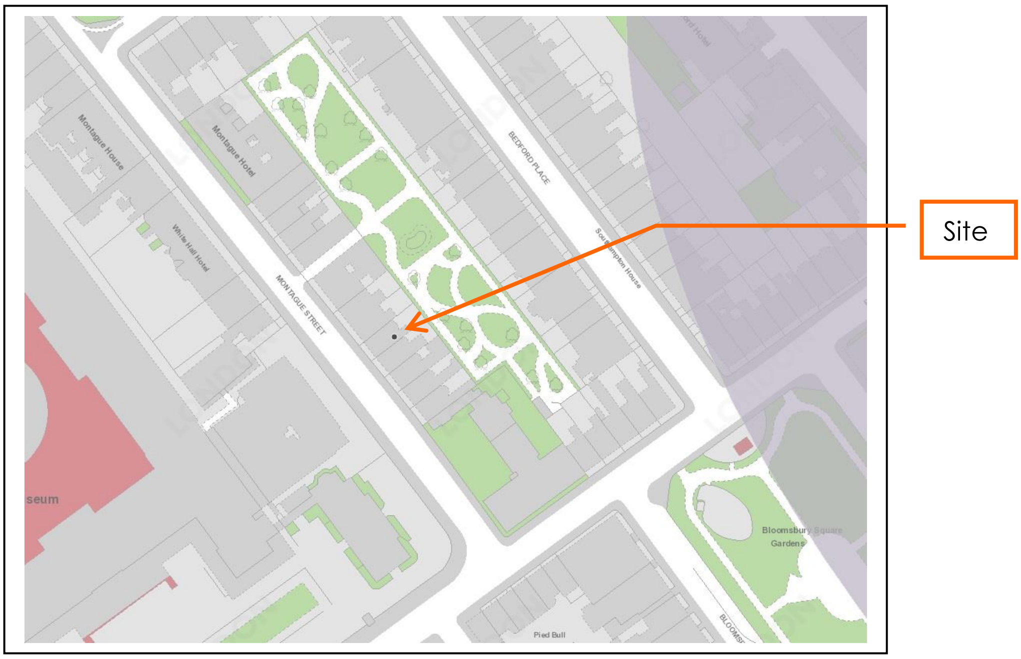
AS PROPOSED SCHEME **TABLE 2**

No renewables, after implementation of energy efficiency measures	energy demand kWh/yr	CO2 emissions kgCO2/yr	CO2 emissions tonnes/yr
heating	62,476	14,330	14.3
hot water	14,611	3,358	3.4
auxiliary	674	362	0.4
lighting	3,613	1,954	2.0
cooling	0	0	0
PV generation	0	0	0
appliances and cooking	21,783	11,255	11.3
total heat / hot water	77,087	17,688	17.7
total electricity	4,287	2,316	2.3
total REGULATED	81,374	20,004	20.0
total REG + UNREG	103,157	31,259	31.3
% improvement over baseline REGULATED	-20.53%	-15.82%	-15.8%
% improvement over baseline REG + UNREG	-16.93%	-10.74%	-10.7%

4 CHP / DISTRICT HEATING

4.1 The London Plan policy looks for efficient sourcing of energy. Typically, through the use of CHP or linking into existing district heating systems.

4.2 Below is an extract from the London Heat map.



Area of Decentralised Energy Potential

4.3 The site is located outside of any area of Decentralised Energy Potential, based on there being a number of planning applications in this zone. There are no existing or potential networks in this area.

4.3.1 As there are no existing District heating schemes or networks that this scheme could be connected to, and we are not aware of any proposals for such schemes in the near future. This technology is therefore considered unsuitable for the proposed development.

4.4 A CHP system is one where there is simultaneous generation of heat and power. The CHP unit acts as a boiler in producing a heated primary circuit, and generates electrical power. The use of CHP although generating electricity is not considered an onsite renewable source unless fuelled by biomass.

4.5 This scheme is too small to benefit from a CHP system. Therefore, this technology is not suitable.

5 RENEWABLE OPTIONS

5.1 Within the London Renewables Toolkit there are the following technologies considered appropriate for inclusion.

- Wind generators
- Photovoltaics
- Solar water heating
- Biomass heating

- Heat Pumps

5.2 Wind Generators

5.2.1 The economics of wind are driven by two factors: wind flow and rotor diameter, with economies of scale acting strongly in favour of turbines with a capacity of greater than 1MW. Micro-wind is defined as units of less than 4m diameter, having an output of up to 3.5kW.

5.2.2 Another performance factor, particularly relevant to micro wind power is quality of wind flow. Poor wind flow can have a detrimental effect on output levels, efficiency and unit longevity. Poor wind quality is often experienced in urban locations, where neighboring buildings disrupt turbine operation. The height of the turbine installation relative to neighboring buildings will help to determine efficiency – ideally, they should be 9m above other obstructions within 100m. It is important to have a detailed survey of the proposed site before proceeding with a wind turbine. Even then small changes in location can have a large effect on the output of the turbine.

5.2.3 A further disadvantage with wind turbines is noise generation.

5.2.4 Further issues surrounding turbines consider the visual impact of the units in areas such as this. A turbine would require planning permission, and would probably be not well received by neighbours.

5.2.5 This is an urban site. The average wind speed on this site using the Carbon Trust Wind Energy calculation tool is approx. 2.9 m/s at 9m above the ridge height. This is low and makes the viable use of a turbine less possible.

5.2.6 These issues plus the potential planning problems mean that we do not consider this a viable technology.

5.3 Photovoltaics

5.3.1 Photovoltaic systems convert energy from the sun into electricity through semiconductor cells mounted in collector panels. The panels are connected to an inverter to turn the DC output into AC for use in the building to which they are attached and to be fed back into the grid when not required.

5.3.2 Any power generated by the PV panels has a proportionally high saving in terms of CO_2, as the fuel saved is electricity, which is a carbon dense fuel.

5.3.3 Generally, PV panels will produce more electricity during the day than is used in the home. Therefore, typically a majority percentage of the generated electricity will be exported. In order to achieve running cost savings one must find an energy supplier who will purchase this generated electricity. Currently the amount paid for this electricity is quite low sometimes 3p/kwh.

5.3.4 Outputs are usually measured in Kilowatt Peak (kWp). This is the max kW that the panel could produce under perfect conditions.

5.3.5 There is a new feed-in-tariff that began in April 2016 which imposes minimum tariffs. Currently this is 14.0 p/kwh for installations of 0 - 4 kWp. An agreement with a service provider is required.

5.3.6 The cost of PV panels varies according to the amount purchased. The more purchased the less the cost / m2. Costs have been coming down due to the feed-in tariff. For arrays of between 10-15 kWp an average cost would be £1,400 - £2,000 per kWp depending on the amount installed, access, scaffolding etc. The more panels installed the cheaper the £ / kWP cost.

5.3.7 The outputs for the PV are affected by orientation – see table 5 below.

5.3.8 Table 5 – PV outputs

orientation of PV panels	kwh/kWP	kgCO2/kWP
South 30 deg	863.6	448.2
South horizontal	760.5	394.7

5.3.9 This development has two pitched roof areas affording an orientation around the compass. However due to site constraints, including planning issues it is not possible to provide PV on this building.

5.3.10 This technology is not suitable for this scheme.

5.4 Solar Water Heating

5.4.1 Solar water heating systems use the energy from the sun to heat water stored in a hot water cylinder inside the building. The amount of savings from solar thermal is determined by the level of hot water use.

5.4.2 The roof area available for solar panels is the same as for PV. However, the area of panel required is determined by the hot water use. Depending on the type of panel – flat plate glazed, or evacuated tube, there is an optimum area needed for the hot water use. Flat plate glazed panels tend to be less efficient but cheaper than the evacuated tubes. Most installations use the flat plate glazed panels. For flats of this size an area of about 3m2 is applicable.

5.4.3 Such a system would require a cylinder internally which would use up space. The reductions in carbon emissions over the efficient hot water system proposed will not be great. Similarly, the savings over the proposed system will not be great. In addition, there is no comparable feed-in tariff for solar thermal systems as there is for PV. Therefore, the simple payback will be in excess of 80 years, and well beyond the systems expected life of 25 years.

5.4.4 This technology is suitable for this scheme. However, as the panels do not provide a good economic return we would not recommend the use of this technology.

5.5 Ground Source Heat Pump

5.5.1 Ground source heat pumps are used to extract heat from the ground to provide space and water heating. Heat pumps take in heat at a certain temperature and release it at a higher temperature, using the same process as a refrigerator. Fluid is circulated through pipes buried in the ground and pass through a heat exchanger in the heat pump that extracts heat from the fluid. The heat pump raises the temperature of the fluid via the compression cycle to supply hot water to the building as with a normal boiler. The ground pipe system can be horizontal or vertical. The system works most efficiently with underfloor heating.

5.5.2 Key to the effectiveness of GSHP is the pipe system. This can either be a “slinky” style pipe buried in trenches a couple of meters deep, or in much deeper boreholes. Generally, the “slinky” type needs a greater site area which is available on this site.

5.5.3 GSHP are much more efficient than gas boilers, therefore use a lot less energy. However, electricity is more carbon dense than gas, and so some of that benefit is reduced. Nevertheless, overall the use of a GSHP should reduce the amount of CO_2 emitted on the site. Similarly, with running costs. Although GSHP can be 350+% efficient, that is 3 ½ more efficient than a gas boiler, the cost of electricity is also about 3 ½ the cost of gas, therefore there tends not to be any significant running cost saving.

5.5.4 GSHPs are much more expensive to install than a traditional gas system. In this case we estimate that replacing the existing system with a GSHP system would add a cost of about £90,000. Therefore, there will not be an economic reason for the installation of a GSHP.

5.5.5 This technology is not suitable for this scheme.

5.6 Air Source Heat Pumps

5.6.1 An ASHP works in an identical way to a GSHP. The difference comes in achieving the temperature difference in the system fluids. The GSHP uses the difference in temperature found as you go deeper into the earth. An ASHP uses the difference in air temperatures. Typically an ASHP is much less efficient than a GSHP. A default efficiency for a GSHP is 350%, whereas for an ASHP it is 300%.

5.6.2 An ASHP is much cheaper to install than a GSHP as there are no ground works, although usually an external condenser unit must be sited on the building.

5.6.3 For the flats, we estimate that an ASHP system would cost about £18,000 in addition to the proposed communal gas boiler system. However, it will produce a higher running cost than a gas system, and therefore is an uneconomic alternative. Overall, we estimate that use of an ASHP will result in a reduction in the carbon emissions over a gas system of about 3.5%.

5.6.4 This technology is not suitable for the flats.

5.7 Biomass Boilers

5.7.1 Bio mass is a form of stored solar energy. Plants use the suns energy to grow and during this process absorb CO2. When burnt the stored energy and stored CO2 is released. Biomass fuels are considered virtually carbon neutral because unlike fuels such as gas, oil and coal, if not burnt the CO2 would be released anyway as the plant material rotted. Therefore, there is no addition to CO2 in the environment.

5.7.2 Typical biomass fuels include Wood; straw; energy crops; sewage; waste materials. It is a proven technology and has been in use for many years, particularly in northern European countries. Biomass plants can vary from small manual fed systems, to large fully automatic systems. The most common is wood chips or pellets.

5.7.3 Biomass boilers are much more common in large communal systems, and are often designed to operate alongside back up gas boilers. Typically, the biomass boiler operating on the constant loads, such as hot water, with the back-up gas boilers which have faster reaction times to cope with the variable loads.

5.7.4 Another key factor of these boilers is that a large fuel store is required. A store is usually sized according to the lorry that is to deliver the fuel, and to minimise the number of deliveries over the year. Therefore, access for large vehicles is required. There is also the need for higher levels of maintenance than there are with gas boilers.

5.7.5 Another important point is the clean air act. Under this Act Local Authorities control the burning of fuels likely to cause smoke. Most urban areas are Smokeless Zones where only authorised smokeless fuels can be burnt. Almost no biomass fuels are authorised as 'smokeless'. However, some biomass fuels can be used provided that an Exempt Appliance is used. Many biomass boilers qualify. However, there will be the need for a chimney, and to work closely with the local authority to ensure any proposed system complies.

5.7.6 Due principally to the poor economics and limited space for storage, and the consequent need for a chimney and related issues on air quality we do not consider this to be a viable technology for this scheme.

5.8 Summary Recommendations on Renewables

5.9 Of the reviewed technologies, we believe that none of the renewable technologies are suitable for this site.

6 CONCLUSION

6.1 With the use of the outline specification in Appendix A the development achieves a 15.8% improvement over the Part L1B standard.

6.2 It does this using high levels of fabric and services specification.

6.3 It does not achieve a 20% reduction from on-site renewables.

6.4 The proposals do allow for very high levels of energy efficiency improvements to the existing fabric and services which represent the optimum provision taking into account planning economic feasibility and the physical constraints of the site. The proposals do represent a 15.8% improvement over the Part L2013, due to the fabric and services specification.

APPENDIX A - OUTLINE SPECIFICATION

Element			U value	Part L EXISTING UPGRADE target	Part L NEW ELEMENT target	Construction
Floor	1	Basement floor	**1.23=0.42** **1.24=0.40**	0.25		As existing Solid floor, no insulation Proposed – no change
	2	Floor over un heated space		0.25		
Walls	1	External wall 550mm	**1.10**	0.30		Existing – 550mm solid brick wall no insulation Proposed – no change
	2	External wall 330mm	**1.61**	0.30		Existing – 550mm solid brick wall no insulation Proposed – no change
	3	Existing wall between flats and heated circulation	**0.00**	n/a		Masonry Party wall solid
	4	new wall between flats and heated circulation	**0.00**		n/a	Masonry or timber/metal studs Party wall either solid, or fully filled cavity
	5	Existing party wall	**0.00**			Solid wall
Roof	1	Existing flat roof	**0.12**	0.18		Existing – unknown assume 100mm mineral wool UV=0.40 Proposed – i350mm mineral wool k=0.040
	2	Roof to heated space	**n/a**			Timber floor with sound insulation

Windows	1	Existing Windows	**4.80**	1.60		Front elevation - replaced Rear elevation Retained Single glazed timber Draught stripping part of works
	2	New windows Front elevation	**1.30**		1.60	Timber sash windows
	3	Secondary glazing Basement & 3rd floor bedroom	**1.60** **2.40**			Where new timber sash front elevation Where retained single glazed timber - rear elevation
Doors		Door solid	**1.20**	1.80		Timber doors off of sheltered circulation
Thermal bridging						Default value
Thermal mass		MEDIUM				Default

Primary Heating	System	Gas boiler-SEDBUK Band A Worcester Bosch 30 CDi System / standard
	Emitter	Radiators and underfloor
	Controls	Programmer room stat & TRVs – to flats Time & temperature zone control - to maisonettes
	Compensator	Weather compensator
	Delayed start	Delayed start stat

Secondary heating	Gas	None
	Solid fuel	None
	Electric	None
Hot water	System	From main system
	Hot Water Cylinder	Megaflow Eco 210i Heat loss=1.42
	HWC Controls	Separately timed Cylinder stat Primary pipes fully insulated
	Water use	Less than 125 litres / person / day

Ventilation	Air permeability	Design Air permeability rate – 8 m3/hm2
	Extract ventilation	Extract fans in wet rooms
	Other ventilation	None
	MVHR	None
Lights	Internal	100% lowE
Cooling		None
Renewables	Solar thermal	None
	PV	None

Summer Over heating	Cross ventilation	On all units
	Window ventilation	Taken to be fully open half the time.

HEATED COMMON AREA

FABRIC CONSTRUCTIONS AS FOR DWELLINGS ABOVE

SERVICES

GEOMETRY	
Air permeability	Air permeability - no test to be carried out default standard 25 m3/m2.hr
Thermal bridges	Accredited Construction Details (ACD) not applicable Default values
Electric power factor	default performance <0.90

	SYSTEM 1	
MAIN HVAC	**existing**	**proposed**
Main heating system	Gas boiler and radiators	Gas boiler and radiators
Description	Gas boilers	Gas boilers
Areas heated	All	All common circulation
Fuel proposed	Mains gas	Mains gas
Manufacturer / model / model number of heating appliance	Assume non-condensing, more than 15 years old	New heat only boiler
Seasonal efficiency for system for heating	Assume 78% efficiency	89%
Pump	Constant speed	Constant speed
Is HVAC separately metered?	No	Yes
M&T with alarms for 'out of range' values	No	No
COOLING	None	None
Controls	Central time control – yes Optimum Start/stop control – no Local time control (room by room) – no Local temperature control (room by room	Central time control – yes Optimum Start/stop control – no Local time control (room by room) – no Local temperature control (room by room) – YES Weather compensation control - no

HOT WATER SYSTEM	existing	proposed
System	Unknown Assume electric instantaneous to retail and office	None
Storage	None	None
Secondary circulation	No secondary system	None

VENTILATION	existing	proposed
Feature		
Natural ventilation	Natural	Natural
Extract	n/a	n/a
Mechanical ventilation	n/a	n/a
Fresh air ventilation	n/a	n/a
Fresh air and extract And Comfort cooling	None	None

RENEWABLES	existing	proposed
SYSTEM	None	None
PV	None	None
SOLAR THERMAL	None	None

LIGHTING		
Metering	Not Separately metered	Separately metered
	NOT with M&T with alarm for 'out of range' values	NOT with M&T with alarm for 'out of range' values

LIGHTS - AS PROPOSED

Room	SBEM zone	Lighting design Watts and Lux	Lights chosen (no design) Lumens / circuit watt & LOR	Lamp type e.g. Fluorescent-triphosphor coated Fluorescent-halophosphor coated CFL; LED etc	Local manual	Daylight sensing photoelectric	Occupancy sensing / Auto on-off / Man on-off etc
All areas			85 / LOR 100%	LED	NO	NO	Auto on-off parasitic power of 0.1 W/m2

RESULTS

COMMON CIRCULATION

	Heating	Cooling	Aux Energy	Lighting	Hot Water	Total	kgCO2/m2		% imp
Actual	30.17	0.00	3.07	11.90	0.00	45.14	14.29	BER	-45.3%
Notional	22.63	0.00	3.07	37.87	0.00	63.56	26.13	TER	

FLATS

		FLOOR AREA	SAP	CO2 kg/yr	DER kgCO2/m2/yr	TER kgCO2/m2/yr
flat 1-23-basement	As Proposed	144.28	76	4,164	28.86	22.90
flat 1-24-basement	As Proposed	134.9	76	3,828	28.38	22.97
flat 2-23-1st	As Proposed	67.3	74	2,322	34.51	27.15
flat 2-24-1st	As Proposed	63.4	75	2,145	33.83	27.40
flat 3-23-2nd-3rd	As Proposed	144.43	80	3,230	22.36	18.69
flat 3-24-2nd-3rd	As Proposed	144.43	80	3,274	22.67	18.65
				18,963		
flat 1-23-basement	Notional	144.28	72	4,907	34.01	15.56
flat 1-24-basement	Notional	134.9	73	4,444	32.95	15.64
flat 2-23-1st	Notional	67.3	73	2,525	37.53	18.55
flat 2-24-1st	Notional	63.4	73	2,339	36.90	18.73
flat 3-23-2nd-3rd	Notional	144.43	77	3,826	26.49	12.82
flat 3-24-2nd-3rd	Notional	144.43	77	3,813	26.40	12.80
				21,855		

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