Energy Assessment Report

Conversion of 05 Bedroom House into 8 Flats

Planning Ref: 2017/2895/P

81 Fordwych Road
London
NW2 3TL

Pre Design Stage

Client: XXXX

Consultant: Wires & Wireless Ltd
28 Wheatcroft way
Swindon
SN1 2RA

Revision	Designed	Date
A	ZA	16.10.2017

Contents

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1 Introduction

This Energy Statement is prepared in support of a **planning Permission Ref: 2017/2895/P,** involving Conversion of **05 Bedroom house to 08 Flats** at the side of **81 Fordwych Road, London, NW2 3TL .**

An energy efficient scheme has been proposed that has reduced the CO2 emissions through passive design measures, increasing insulation in the existing building fabric to reduce heat loss, improved heating and efficient lighting and on-site renewable technology.

The development has been evaluated, following the **London Plan policy 5.2** and **the London Borough of Camden Local plan policy CGP 3** requirements to ensure the development is energy efficient and achieves the target of at least a **35%** reduction in CO2 emissions below the target emission rate (TER) set in Part L of the 2013 Building Regulations.

2 Planning Policy

A review has been undertaken of current local, regional and national planning policies.:

NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework as a presumption in favor of sustainable development.

LONDON PLAN

The London Plan (March 2016) provides regional guidance.

Policy 5.2 requires that:

"Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

1. Be lean: use less energy;
2. Be clean: supply energy efficiently;
3. Be green: use renewable energy".

The London Plan requires that major developments achieve the following improvements over the Building Regulations (2010) Target Emission Rate (TER): -

Residential Buildings

2010-2013: 25% CO_2 reduction

2013-2016: 40% CO_2 reduction

2016-2031: Zero Carbon

Non-domestic Buildings

2010-2013: 25% CO_2 reduction

2013-2016: 40% CO_2 reduction

2016-2031: As per building regulations requirements

2019-2031: Zero Carbon

These targets refer only to the Regulated emissions associated with space heating, hot water and fixed electrical equipment.

Carbon dioxide emissions from new development should be reduced by sustainable use of energy in accordance with the Mayor's energy hierarchy. The first step in the hierarchy, to reduce energy demand, should be met through adopting sustainable design principles outlined in Policy 5.3. The second step, to supply energy efficiently, should be met by prioritising decentralised energy, as outlined in Policies 5.5 and 5.6. The third step, to use renewable energy, is outlined in Policy 5.7.

The relevant policies of the London Plan March 2016 are listed below:

Policy 5.1 – Climate Change Mitigation

Policy 5.2 – Minimising Carbon Dioxide Emissions

Policy 5.3 – Sustainable design and construction

Policy 5.4 – Retrofitting

Policy 5.5 – Decentralised energy networks

Policy 5.6 – Decentralised energy in development proposals

Policy 5.7 – Renewable Energy

The energy hierarchy

KEY MESSAGES

All developments are to be design to reduce carbon dioxide emissions

Energy strategies are to be designed following the steps set out by the energy hierarchy

2.1 Buildings in Camden account for 88% of Camden's overall carbon dioxide emissions. These emissions result from the energy used within buildings. Therefore the Council encourages all buildings to be as energy efficient as possible. Our approach is to implement the energy hierarchy as set out in policy CS13 of the Core Strategy. The energy hierarchy is a sequence of steps that, if taken in order, will minimize the energy consumption in a building.

2.2 This section provides an overall introduction to the energy hierarchy and energy statements. This section sets out:

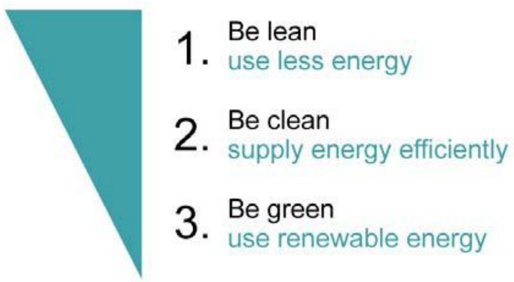
The energy hierarchy

How to apply the energy hierarchy

When an energy statement is required

What to include in an energy statement

2.3 The next four sections provide more detailed guidance on each of the 3 steps in the hierarchy.



The 3 steps of the energy hierarchy are:

2.4 All developments are expected to reduce their carbon dioxide emissions by following the steps in the energy hierarchy to reduce energy consumption.

2.5 Developments involving 5 or more dwellings and/or 500sq m (gross internal) floorspace or more are required to submit an energy statement which demonstrates how carbon dioxide emissions will be reduced in line with the energy hierarchy (see below for more details on what to include in an energy statement).

Furthermore Planning document provide details for Existing or Change of use building.

4 Energy efficiency: existing buildings

KEY MESSAGES

As a guide, at least 10% of the project cost should be spent on environmental improvements

Potential measures are bespoke to each property

Sensitive improvements can be made to historic buildings to reduce carbon dioxide emissions

4.1 Many of the sections in this guidance focus on reducing the environmental impact of new buildings, however Camden's existing buildings account for almost 80% of the borough's carbon emissions. Therefore it is essential that these buildings make a contribution towards the borough's reduction in carbon dioxide emissions.

4.2 This section provides more information on how existing buildings can be more energy efficient. It builds on the previous section, which covered Stage 1 of the energy hierarchy and improving energy efficiency in new buildings.

4.3 Camden Core Strategy Policy CS13, paragraph 13.9 expects development or alterations to existing buildings to include proportionate measures to be taken to improve their environmental sustainability,

where possible.

WHAT DOES THE COUNCIL EXPECT?

All buildings, whether being updated or refurbished, are expected to reduce their carbon emissions by making improvements to the existing building. Work involving a change of use or an extension to an existing property is included. As a guide, at least 10% of the project cost should be spent on the improvements.

Where retro-fitting measures are not identified at application stage we will most likely secure the implementation of environmental improvements by way of condition. Appendix 1 sets out a checklist of retro fit improvements for applicants.

Development involving a change of use or a conversion of 5 or more dwellings or 500sq m of any floor space, will be expected to achieve 60% of the un-weighted credits in the Energy category in their EcoHomes or BREEAM assessment, whichever is applicable. (See the section on Sustainability assessment tools for more details).

Special consideration will be given to buildings that are protected e.g. listed buildings to ensure that their historic and architectural features

3 Baseline Assessment:

05 Bedroom House at 81 Fordwych road, London, NW2 3TL is to form 08 apartments. The work involves upgrading existing fabric and new elements of fabric in line with Approved Document Part L1B 2010 (with 2013 amendments) and relevant building regulations.

The existing fabric improvements are better than the suggested values in tables in ADL1B 2010. New elements equal or exceed the minimum requirements in ADL1B 2010.

Controlled services also follow the guidance in ADL1B 2010 and the domestic building services compliance guide.

Emissions calculation:

Please note on conversions/extensions there is **no target** for **DER v TER in SAP 2012**, only a predicted emissions figure is given.

All figures have been taken from SAP2012 calculations for each dwelling for the regulated emission only and follow the guidance in ADL1B 2010 (With 2013 Amendments).

To determine the emissions for the apartments two SAP 2012 calculations have been provided for each apartment.

The first calculation is the as proposed taking into account the upgraded building fabric element and proposed installed control services.

The second calculation is a baseline calculation following the guidance in ADl1B 2010 for minimum standards for conversion and extension to dwellings and controlled services apart from the building fabric which is taken as existing building fabric for baseline calculation.

The difference between the two calculated emissions figures is then expressed as an overall percentage improvement for the development.

The first step of the energy hierarchy is to improve the design of the building fabric and services to maximize the energy efficiency and minimise the energy requirements. To reduce the CO2 emissions from the building, the following improvements will be made to the building design.

The heat loss from the building will be reduced by increasing the levels of insulation in the building fabric to achieve U-values significantly better than Part L 2013 performance standards. This shall reduce the energy requirement for heating and therefore the energy consumption and CO2 emissions associated with the heating. Please see table 3.1 Below.

The air tightness shall be improved as much as possible , but there is no requirement to conduct air pressure test for change of use properties, Hence for the purpose of calculation 15 m3/m2.hr is used for Baseline and actual option .Pease see table 3.1 below.

Table 3.1 - Fabric and Air Permeability Improvements

Fabric Improvement			
Element	**Existing Fabric Values W/m2.K**	**Part L 2013 Regulations U Values W/m2.K (Target Values)**	**% Improvement over Existing Fabric**
Wall	2.1	0.30	85.71%
Floor	0.58	0.25	56.89%
Roof	2.30	0.18	92.17%
Windows	5.0	1.60	68.00%
Air Permeability Improvement			
	Target Air Permeability m3/h.m2	Part L 2013 Air Permeability m3/h.m3	% Improvement over 2013 Regulations
Air Permeability	15	-	-

To reduce the energy consumption associated with heating further, the heating could be zoned throughout the building with independent user controls. Therefore heating shall only remain on in areas where it is required with the heating installation including time, and temperature compensation controls. Space heating is to be provided via energy efficient combination Natural Gas Boiler of minimum **88.7% Efficiency**. DHW to be provided via main heating system.

Natural ventilation shall be maintained for the building with openable windows and energy efficient extract fan provided to the kitchen, toilets and bathrooms only. This shall have very low specific fan powers and shall only operate when the kitchen or Toilets/bathroom is occupied, to minimise energy consumption.

100% energy efficient lighting will be installed throughout. The external lighting shall be controlled via PIR sensors to enable the lighting to only be switched on in areas where it is required. This shall enable the energy consumption associated with lighting to remain as low as practicable.

All of the new appliances will be **'A' grade**, thereby using energy efficiently and reducing the energy consumption.

The domestic energy hierarchy, energy consumption and carbon emissions and savings of the proposed development will be as below. The SAP compliance documents are attached at Appendix-1.

Figure 3.1 – Domestic Energy Hierarchy

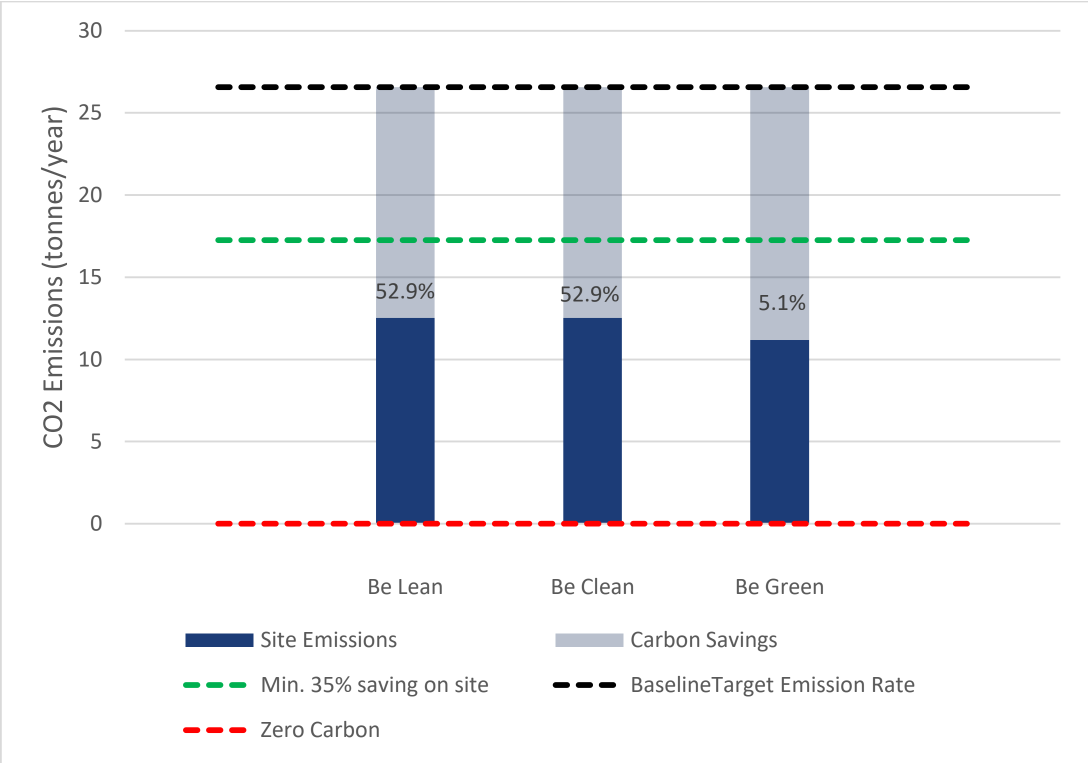


Table 3.2 - Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide emissions (Tonnes CO2 per annum)	
	Regulated	**Unregulated**
Baseline: Target Emission	26.56	8.8
After energy demand reduction (Be Lean)	12.52	8.8
After heat network/CHP (Be Clean)	12.52	8.8
After renewable energy (Be Green)	11.17	8.8

Table 3.3 - Regulated carbon dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated Carbon Dioxide emissions	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction (Be Lean)	14.04	52.86%
Savings from CHP (Be Clean)	0.0	0.0%
Savings from renewable energy (Be Green)	1.34	5.06%
Cumulative on site savings	15.38	57.9%
Total Target Savings	9.296	35%
Annual Surplus	6.084	22.9%
Cumulative shortfall	0.00	

Table 3.4 - Site wide regulated carbon dioxide emissions and savings

Be Lean	Reduction in Regulated Carbon Dioxide emissions (Tonnes CO_2 per annum)	
	(Tonnes CO_2 per annum)	(%)
	14.02	52.86%
TOTAL	14.02	52.86%
Total Target Savings	9.269	35%
Shortfall	-4.7	-17.9%
Be Lean + Be Clean	14.02	52.86%
TOTAL	14.02	52.86%
Total Target Savings	9.269	35%
Shortfall	-4.70	-17.9%
Be Lean + Be Clean + Be Green	15.4	57.9%
TOTAL	15.4	57.9%
Total Target Savings	9.269	35%
Shortfall	-6.1	-22.9%

The scheme will therefore meet the minimum **35% reduction in** CO_2 emissions below the Baseline emission rate (TER).

The construction will be on the basis of a 'fabric first' approach, which concentrates on getting a building's fabric right, first and foremost. It means achieving well-built, thermally efficient, air tight building elements, all of which give their designed level of performance for the life of the building. The improvements set out in the table 3.1 above will achieve at least a **35%** reduction in CO_2 emissions below the target emission rate (TER) set in set in Part L of the 2013 Building Regulations. Refer to the appended 'as designed' Part L calculations/SAP compliance documents for baseline and proposed option.

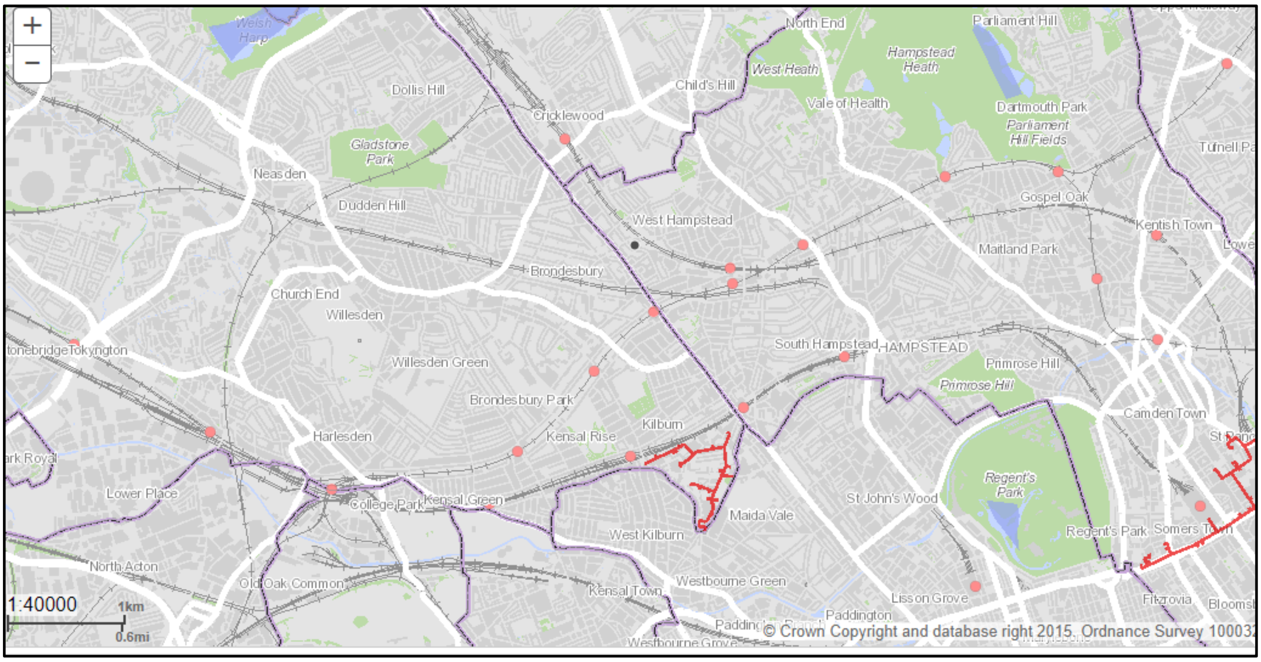
4 Combined Heat and Power (CHP)

Combined heat and power (CHP), also known as cogeneration, is the simultaneous generation of thermal and electrical energy from a single stream of fuel.

Installations can typically convert between 80% and 90% of the energy in the fuel into electrical power and useful heat. By generating the electricity in an on-site CHP unit, and utilizing the heat, electricity from conventional power stations is displaced and the substantial conversion, transmission and distribution losses are avoided. The resulting efficiency gives typical small-scale CHP installations a simple payback period of between 3 and 5 years, beyond which the units continue to save energy right up until the end of the life of the plant.

Systems must be 'heat lead' for high efficiency, which best suits applications to situations there is a significant demand for heat for long periods of time, such as hospitals, hotels and leisure centres. Due to the nature and limited size of this dwelling, CHP would not be applicable, as there is not a constant heat requirement. It is likely there will be a small number of peak demands as per the schedule of the proposed activities, rather than a steady load throughout the day.

There are no existing district heating networks that the proposed scheme could connect to. Therefore CHP either on-site or via an existing network is not a viable solution for this scheme. Please see below Image taken from London Heat Hat Map



5 Renewable Energy

The following low and zero carbon technologies have been considered for the scheme:

5.1 Ground Sourced Heat Pump (GSHP)

Ground sourced heat pump (GSHP) is a device for extracting heat from the ground to provide space heating and domestic hot water for buildings. Water or another fluid is circulated through pipes buried in the ground and passes through a heat exchanger in the heat pump that extracts heat from the fluid. The heat pump then raises the temperature of the fluid via the compression cycle to supply hot water to the building as from a normal boiler.

Providing the space heating requirement only using ground source heat pumps would provide limited CO2 reduction and would require an excessive amount of boreholes across the site. This is an expensive technology with low CO2 reductions that will not meet the Local Plan requirements without additional LZC technologies. Therefore this is not considered to be viable for this project.

5.2 Air Source Heat Pumps

Air Source Heat Pumps extracts heat from the outside air through using an external condenser unit and transfers it, through refrigeration pipework to the indoor unit which then conveys that heat to the heating emitters and hot water cylinder. This system is capable of providing 100% of heating within a building.

This system would require a external condenser units to be located external to the building, which would have space and noise implications, potentially requiring acoustic screening. The external condensers would also need to be approved through the planning application process. Due to these constraints combined with the low CO2 reduction, this technology is not considered viable.

5.3 Biomass

Waste timber, in the form of wood chips and pellets, is used as fuel in boilers providing heating to buildings. Biomass generates about the same amount of carbon dioxide as fossil fuels, however, with new plant/tree growth this carbon dioxide is actually removed from the atmosphere making the Biomass system carbon neutral. Wood chips and pellets present no risk if accidentally released into the environment and there are no harmful by-products. The flue gas is smoke-free and the ash content of between 0.5% and 3% by volume (depending on material), is minimal.

The biomass boilers would meet a significant proportion of the heating load and gas condensing boilers would assist with providing load trimming to reduce the amount of on/off cycling of the biomass boilers. The provision of biomass boilers to meet all of the domestic hot water and heating demands would require a constant baseload. Due to the nature of the proposed use of the building, the hot water and heating demands would be very low and not constant. Consequently, biomass boilers are not considered viable in this case.

The space and access requirements for the energy centre and biomass store are unlikely to be viable on this site. Furthermore the biomass boiler(s) would require a large flue and careful consideration of its sizing, location and the potential impact of local air quality would be required in this residential area.

5.4 Solar Thermal

Solar water heating systems use the energy from the sun to heat water, most commonly in the UK for hot water needs. The systems use a heat collector, generally mounted on the roof in which a fluid is heated by the sun. This fluid is passed through a heat exchanger and used to heat up water which is stored in either a separate hot water cylinder or a twin coil hot water cylinder inside the building. There are two types of collectors used for solar water heating applications - flat plate collectors and evacuated tube collectors. Evacuated tube collectors are generally more expensive due to a more complex manufacturing process (to achieve the vacuum) but manufacturers generally claim better winter performance.

An adequately sized solar thermal collector array could potentially provide up to 50% of the annual hot water demand on site, which would provide a limited reduction in CO2 emissions. This is a small reduction for the relatively high capital cost, and in order to meet the required targets, an additional technology would be required. The solar thermal collectors would also need to be located on the roof of the building, reducing the area available for PV, which has a greater impact on CO2 emissions per square metre.

5.5 Photovoltaic

Photovoltaic technology converts daylight directly into electricity. It works during daylight hours but more electricity is produced when the sunshine is more intense (a sunny day) and is striking the PV modules directly.

Unlike solar systems for heating water, PV technology does not produce heat. Instead, PV produces electricity as a result of interaction of sunlight with semi-conductor materials in the PV cells.

For Part L calculations, the energy produced per year depends on the installed peak power (kWp) of the PV module (the peak power corresponds to the rate of electricity generation in bright sunlight, formally defined as the output of the module under radiation of 1 kW/m^2 at 25°C). PV modules are available in a range of types and some produce more electricity per square metre than others, and the peak power depends on the type of module, as well as its effective area. In the UK climate, an installation with 1 kWp typically produces about 720 to 940 kWh of electricity per year (at favourable orientation and not overshaded, depending on latitude).

At times of high solar radiation the PV array may generate more electricity than the instantaneous electricity demand within the dwelling. Arrangements must be made for the surplus electricity to be exported to the grid via a dual or two-way electricity meter.

6 LZC Energy Strategy

The assessment of the viable low and zero carbon technologies indicate the most appropriate technology for the scheme would a photovoltaic array **3 KWp (18m2)** as set out below:

A measurement of the roof area suggests there is around 25m2 (South - Pitch Roof) available for PV panels. However around 15% of this area would be lost to the spacing of the panels so they can be maintained and not shade each other. This would reduce the area to 21.25m2.

Appendix A

SAP Regulation - Baseline

Block Compliance WorkSheet: Baseline

User Details

Assessor Name:	Zahid Ashraf	**Stroma Number:**	STRO023144
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.0.4.10

Calculation Details

Dwelling	**DER**	**TER**	**DFEE**	**TFEE**	**TFA**
Flat 1 BaseLine	66.29	19.72	239.3	57.1	78.67
Flat 2 BaseLine	55.71	17.9	193.3	46.3	67.718
Flat 3 Baseline	64.24	19.24	230.1	54	78.1412
Flat 4 Baseline	52.41	19.19	169.8	38.9	40.648
Flat 5 Baseline	53.05	21.01	171.1	46	39.93
Flat 6 Baseline	61.86	19.22	206.1	35.1	38.29
Flat 7 Baseline	50.13	19.28	158.7	36.9	39.93
Flat 8 Baseline	72.31	19.81	256.5	47.7	54.37

Calculation Summary

Total Floor Area	437.70
Average TER	19.35
Average DER	60.68
Average DFEE	209.74
Average TFEE	47.24
Compliance % Improvement DER|TER % Improvement DFEE|TFEE	Fail N/A N/A

SAP Regulation - Proposed Lean+Clean+Green

Block Compliance WorkSheet: Proposed

User Details

Assessor Name:	Zahid Ashraf	**Stroma Number:**	STRO023144
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.0.4.10

Calculation Details

Dwelling	**DER**	**TER**	**DFEE**	**TFEE**	**TFA**
Flat 1 Proposed	30.94	19.72	92.8	57.1	78.67
Flat 2 Proposed	27.47	17.9	76.8	46.3	67.718
Flat 3 Proposed	29.1	19.24	84.4	54	78.1412
Flat 4 Proposed	26.77	19.19	64.4	38.9	40.648
Flat 5 Proposed	29.24	21.01	72.6	46	39.93
Flat 6 Proposed	27.26	19.22	62.9	35.1	38.29
Flat 7 Proposed	26.69	19.28	61.6	36.9	39.93
Flat 8 proposed	4.4	19.81	77.4	47.7	54.37

Calculation Summary

Total Floor Area	437.70
Average TER	19.35
Average DER	25.53
Average DFEE	76.97
Average TFEE	47.24
Compliance	Fail
% Improvement DER|TER	N/A
% Improvement DFEE|TFEE	N/A