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22 THE CAUSEWAY, TEDDINGTON TW11 0HF
PLANNING APPLICATION FOR REDEVELOPMENT AS GROUND FLOOR BUSINESS USE AND RESIDENTIAL ABOVE

ENERGY STATEMENT, July 2009

1.0 INTRODUCTION

This Energy Statement has been prepared by HTP Architecture llp to accompany the Planning Application and Code for Sustainable Homes Assessment for Redevelopment of 22 The Causeway, Teddington, to be submitted by Home County Property Centres Limited, 23rd July 2009.

The Energy Statement provides a prediction of the potential improvement through the use of Renewable Energy technologies over the benchmark energy requirement for a design that is compliant with current Building Regulations.

2.0 POLICY AND GUIDANCE

A) London Borough of Richmond upon Thames Unitary Development Plan.

B) London Borough of Richmond upon Thames Supplementary Planning Guidance – Sustainability Construction Checklist.

All major developments of 5 or more residential units are expected to comply with the checklist as follows:

- Achievement of Code for Sustainable Homes 'Level 3' rating.
- Use of Renewable Energy Technologies to reduce predicted site carbon dioxide emissions by at least 20% unless it can be demonstrated that such provision is not feasible.

3.0 DEVELOPMENT PROPOSALS

3.1 The proposed development is for a three, part four, storey building comprising ground floor business use with residential accommodation on three upper floors. The development would replace an existing three storey building that was constructed in the early 1960's.

The new accommodation will comprise:

Ground Floor	Mixed A2 and B1 Commercial Use, gross internal area		89.1m²
Upper Floors	Residential Accommodation		
First Floor	1 bedroom flat	47.0m²	
	1 studio	31.5m²	
Second Floor	1 bedroom flat	47.0m²	
	1 studio	31.5m²	
Third Floor	1 bedroom flat	47.0m²	204.5m²
Staircase	(unheated internal space)		35.0m²
TOTAL constructed space (excluding external and internal compartment walls)			**329.0m²**

4.0 RENEWABLE ENERGY TECHNOLOGIES

4.1 Wind Turbines

Wind turbines can be a cost effective means of producing electricity without carbon emissions when located in open rural or maritime areas, but are generally less suited to dense urban locations where output can be adversely affected by lower and more disrupted wind speeds.

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From the BWEA Windspeed Database, wind speeds between 4.6 – 5.4 metres per second are recorded for this site at 10 – 25 metres above ground level. The speeds are relatively small and adjacent buildings, in particular no. 20 The Causeway will contribute to uneven and turbulent wind conditions.

This technology is not therefore considered to be appropriate or beneficial in this small urban site.

4.2 Solar Photovoltaics

This technology uses modular photovoltaic panels that can be installed independently or as part of roof or wall cladding, and capable of generating electricity during daylight or (better) sunlight. PV panels should ideally be orientated between south east and south west at an elevation of 30-40°.

Roof mounted PV technology may be a effective renewable energy source for this development, however the installation cost at present can be disproportionate to the gains.

4.3 Solar Thermal

Use of modular flat plate or evacuated tube collectors containing fluid, used to provide water heating. Ideally collectors should be south facing marked at an elevation as between 10° and 60° to the horizontal.

Savings from solar water heaters are difficult to predict, depending on how much water occupants of a building use and at what times.

This technology may be suitable for this development.

4.4 Biomass Heating

Use of waste wood based fuel, considered to be carbon neutral.

Not suitable in this development due principally to delivery and storage constraints, and where a communal heating system is inappropriate.

4.5 Ground Source Heat Pumps

Ground Source Heat Pumps use a combination of a renewable source (heat extracted from ground) and electricity.

Ground source heating can be considered for use in individual houses, and flats with communal heating, where an optimum Coefficient of Performance can be achieved.

This technology is not considered suitable for this site with its very limited external area, the presence of underground mains services, and as communal heating is inappropriate.

4.6 Air Source Heat Pumps

Heating technology that extracts heat from the outside air to warm water. Less efficient than ground source systems due in part to fluctuating air temperatures that are more variable than ground temperature.

A suitable location for the heat pumps would be the roof of the building, and this technology may be suitable for this development with separate units serving the heating and hot water demands of individual flats.

5.0 ANNUAL PREDICTED ENERGY DEMAND

5.1 **Energy Input Benchmarks**

a) **London Renewables Toolkit, Table 6, Section 4.3.3**

Financial and Professional Services Buildings

Banks and Building Societies (Gas and Electrics)

Gas **63 kwh/m²/year**

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Electricity	**71 kwh/m²/year**
or	
Banks and Building Societies (all Electric)	**122 kwh/m²/year**

b) **HTP Architecture llp Project: 63 High Street, Hampton Wick**

SAP Calculation, 15th October 2008 (Energist)

One bedroom flat in urban infill redevelopment (size 34.50 m²)

Space Heating	**59.6 kwh/m²/year**
Water Heating	**35.2 kwh/m²/year**
Lighting	**5.4 kwh/m²/year**

c) **Non-regulated Power Consumption (appliances, work equipment, entertainment equipment)**

ACT ON CO2 Carbon Footprint Calculator

Flats: Calculated figures given for single bedroom dwellings having single occupancy (Studios) or double occupancy (1 Bedroom Flats).

Office: Emissions using national average for single occupancy dwellings pro-rata to the number of workstations in the offices.

5.2 **Predicted Energy Calculations**

Business Space Option 1 (Gas and Electric Energy Sources)

89.1 m² x 63	5,613 kWh/year
89.1 m² x 71	6,326 kWh/year
Predicted energy requirements	**11,939 kWh/year**

Business Space Option 2 (Electric Energy Source)

89.1 m² x 122	**10,870 kWh/year**

Upper Floor Flats

Refer to Table 1 (Gas and Electricity) and Table 2 (All Electricity)

6.0 BASELINE CARBON EMISSIONS

6.1 **CO2 Emission factors from Building Regulations 2005, Part L2A, Table 2**

Fuel Source	**Conversation Factor**
Electricity (mains)	**0.422**
Electricity (offset)	**0.568**
Gas	**0.194**

6.2 **Calculations**

Refer to Table 1 (Gas and Electricity) and Table 2 (All Electricity)

6.3 **Target Reductions**

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From Tables 1 and 2, the total carbon emissions for the new development, assuming mains gas and electricity fuel sources are as follows

Gas and Electricity combined (Table 1)	
Total Predicted (Baseline) Carbon Emissions	**17,817 kgCO2/year**
Target Reduction in Emissions (LBRUT 20%)	**3,563 kgCO2/year**
All Electricity (Table 2)	
Total Predicted (Baseline) Carbon Emissions	**21,943 kgCO2/year**
Target Reduction in Emissions (LBRUT 20%)	**4,389 kgCO2/year**

7.0 RENEWABLE TECHNOLOGIES

7.1 Solar Photovoltaic Panels (Electricity Generation)

Available Flat Roof Area: 35 square metres (after allowing for maintenance access)

Assume pv area of 11-12 square metres per kWp (Kilowatt Peak)

Maximum Solar Power generation	3kWp
Gas and Electricity	3,563 kgCO2/year
Saving required (3,563/0.568/810)	7.74kWp
Potential Saving (3/7.74*20%)	**8% over Baseline**
All Electricity	
Potential Saving (3/ (4,389/0.568/810)*20%)	**6% over Baseline**

7.2 Solar Thermal (Heat Generation)

Available Flat Roof Area: 35 m^2 (after allowing for maintenance access)

Assume panel area of 50% of roof	18 m^2

Refer to Appendix 1 for Solar Thermal Calculation

Solar Collectors would be designed to provide maximum 60% of hot water requirement for an individual flat. Collector Area per flat: 2.6 square metres x 5no. flats	13 m^2
Max annual energy savings	1,476 kWh/year
Maximum annual reduction in CO2 (1,476 x 5 x 0.194)	**1,431 kgCO2/year**
Potential Saving	**8% over Baseline**

7.3 Air Source (Heat Generation)

Available Flat Roof Area: 35 square metres (after allowing for maintenance access) will accommodate 5no. 5kW heat pumps, size 950mm W x 330mm D x 740mm H, spaced 750mm apart. Manufacturers advise that 1no. 5kW unit will be adequate to provide for heating and hot water demand for an individual flat.

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ENERGY STATEMENT, July 2009

Gas and Electricity

TOTAL from Table 1	**17,817kgCO2/year**
Reduction in Emission (LBRUT 20%)	**3,563 kgCO2/year**

Calculation

Air Source Heat Pump	**Energy Requirement**		**Electrical Input/year**
Space heating (3no. 1 Bed Flats)	9,036 kWh/year	**COP** 3.4	2,658 kWh/year
Space heating (2no. Studios)	4,038 kWh/year	**COP** 3.4	1,188 kWh/year
Water Heating (3no. 1 Bed Flats	5,337 kWh/year	**COP** 2.7	1,977 kWh/year
Water Heating (2no. Studios)	2,384 kWh/year	**COP** 2.7	883 kWh/year
TOTAL			6,706 kWh/year
Potential Saving 5no. flats	**6,706 kWh/year**	**0.422**	**2,830 kgCO2/year**

Potential Saving (Gas and Electricity)	**16% over Baseline**
Potential Saving (All Electricity)	**13% over Baseline**

8.0 CONCLUSION

Preliminary calculations suggest that:

Solar Photovoltaic Panels

PV panels could achieve a reduction in the order **6-8%** of the annual predicted carbon emissions.

Solar Thermal Panels

Could achieve a reduction in the order of **8%** of the annual predicted carbon emissions, but are limited to meeting 60% of hot water demands. There may be scope to combine this technology with air-source heat pumps to increase the achievable reductions

Air-Source Heat Pumps

Located on the upper roof have the potential to contribute **13-16%** towards the target reduction of 20%

Attachments:

Table 1	Gas and Electricity Energy Calculation
Table 2	All Electricity Energy Calculation
Appendix 1	Solar Panel Calculation

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TABLES 1 AND 2

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BASELINE ENERGY CALCULATIONS, 21st July 2009
Table 1 Gas and Electricity

22 THE CAUSEWAY, TEDDINGTON
ENERGY STATEMENT

	Area	Predicted Annual Energy Requirements		Baseline Carbon Emissions arising from		Total Carbon Emissions
		Electricity	Gas	Electricity	Gas	
	m2	kWh/year	kWh/year	kgC/year	kgC/year	kgC/year
Carbon Emissions Factor				0.422	0.194	
Ground Floor						
Offices	89.1					
Space heating	)					
Water heating	)	11,939		5,038		5,038
Lighting	)					
Appliances		9,715		4,100		4,100
First Floor						
1 Bedroom Flat	47.0					
Space heating			3,012		584	584
Water heating			1,779		345	345
Lighting		254		107		107
Appliances*		1,943		820		820
Studio	31.5					
Space heating			2,019		392	392
Water heating			1,192		231	231
Lighting		170		72		72
Appliances*		1,943		820		820
Second Floor						
1 Bedroom Flat	47.0					
Space heating			3,012		584	584
Water heating			1,779		345	345
Lighting		254		107		107
Appliances*		1,943		820		820
Studio	31.5					
Space heating			2,019		392	392
Water heating			1,192		231	231
Lighting		170		72		72
Appliances*		1,943		820		820
Third Floor						
1 Bedroom Flat	47.0					
Space heating			3,012		584	584
Water heating			1,779		345	345
Lighting		254		107		107
Appliances*		1,943		820		820
Other Area						
Staircase	35.0					
Space heating		0		0		0
Lighting		189		80		80
SITE TOTAL		**32,660**	**20,795**	**13,783**	**4,034**	**17,817**

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BASELINE ENERGY CALCULATIONS, 21st July 2009
Table 2 Electricity

22 THE CAUSEWAY, TEDDINGTON
ENERGY STATEMENT

	Area	Predicted Annual Energy Requirements		Baseline Carbon Emissions arising from		Total Carbon Emissions
		Electricity	Gas	Electricity	Gas	
	m2	kWh/year	kWh/year	kgC/year	kgC/year	kgC/year
Carbon Emissions Factor				0.422	0.194	
Ground Floor						
Offices	89.1					
Space heating	)					
Water heating	)	11,939		5,038		5,038
Lighting	)					
Appliances		9,715		4,100		4,100
First Floor						
1 Bedroom Flat	47.0					
Space heating		2,801		1,182		1,182
Water heating		1,654		698		698
Lighting		254		107		107
Appliances*		1,943		820		820
Studio	31.5					
Space heating		1,877		792		792
Water heating		1,109		468		468
Lighting		170		72		72
Appliances*		1,943		820		820
Second Floor						
1 Bedroom Flat	47.0					
Space heating		2,801		1,182		1,182
Water heating		1,654		698		698
Lighting		254		107		107
Appliances*		1,943		820		820
Studio	31.5					
Space heating		1,877		792		792
Water heating		1,109		468		468
Lighting		170		72		72
Appliances*		1,943		820		820
Third Floor						
1 Bedroom Flat	47.0					
Space heating		2,801		1,182		1,182
Water heating		1,654		698		698
Lighting		254		107		107
Appliances*		1,943		820		820
Other Area						
Staircase	35.0					
Space heating		0		0		0
Lighting		189		80		80
SITE TOTAL		**51,997**	**0**	**21,943**	**0**	**21,943**

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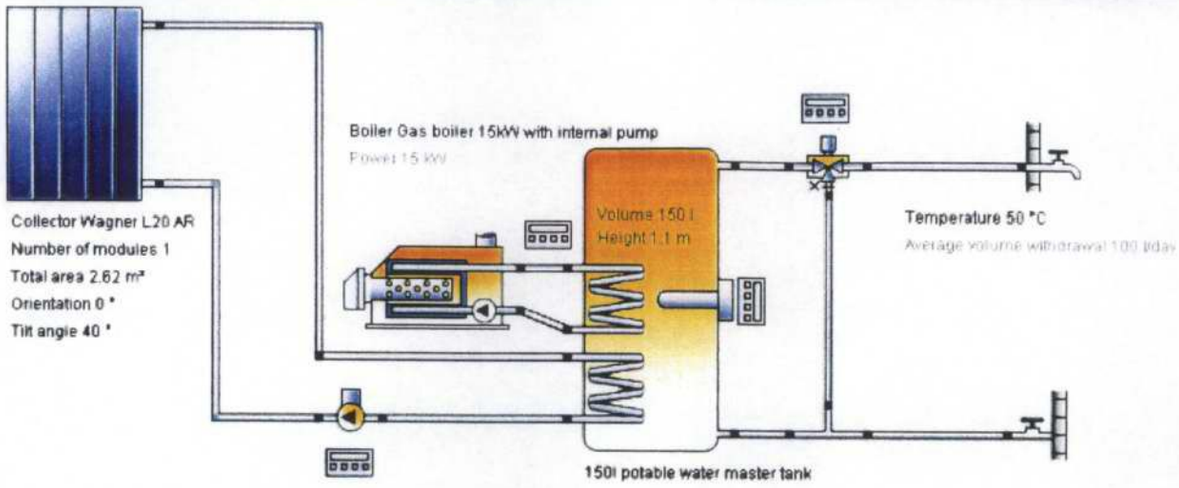
APPENDIX 1 SOLAR PANEL CALCULATION

Professional report

Paul Beech - Richmond **8a: Hot water (solar thermal, high-flow)**



Name of the company	Location
	United Kingdom
Sean Bingham	Kingston upon Thames
Unit 2 Dell Buildings	Longitude: -0.28°
Milford Road SO41 0JD	Latitude: 51.42°
	Elevation: 36 m

Overview

Max annual fuel savings	140.6 m³: [Natural gas H] Gas boiler 15kW with internal pump / -
Max annual energy savings	1476.7 kWh: Gas boiler 15kW with internal pump / 0 kWh: Electric resistance heater element 2
Annual reduction in CO2 emissions	342 kg: [Natural gas H] Gas boiler 15kW with internal pump / 0 kg : [Electricity] Electric resistance heater element 2
End energy to the system (fuel and electricity)	1578.9 kWh
Energy consumption (Quse)	1495.8 kWh
Syst. efficiency (Energy consumption / End energy)	0.95
Comfort demand	Energy demand covered

Overview thermal energy

Collector area	2.62 m²
Solar fraction total	60.2 %
Total collector field yield	1329 kWh
Collector field yield relating to aperture area	561 kWh/m²/Year
Collector field yield relating to gross area	507 kWh/m²/Year