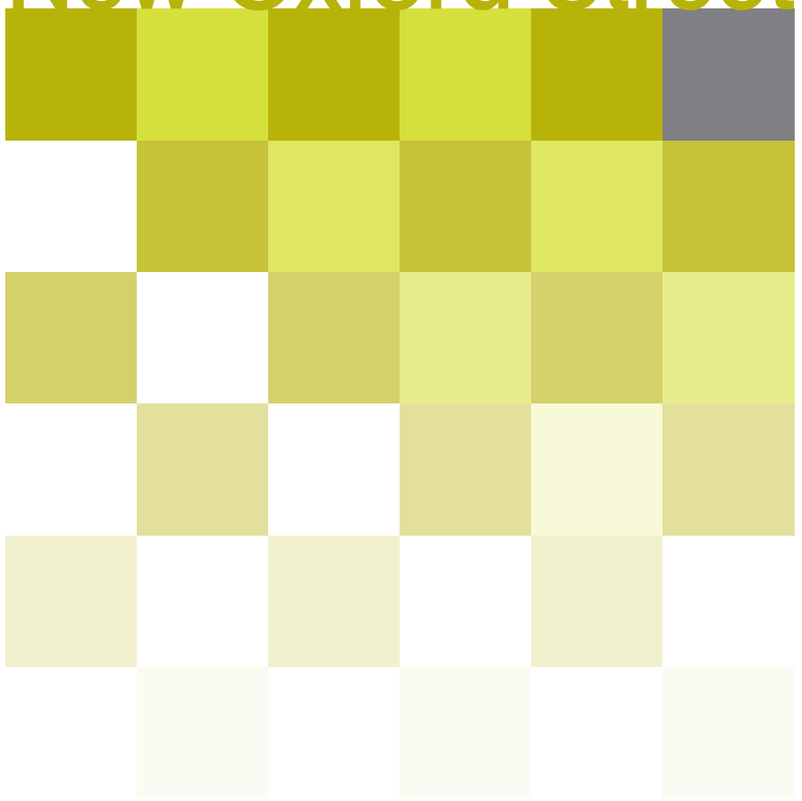
112 – 116

New Oxford Street

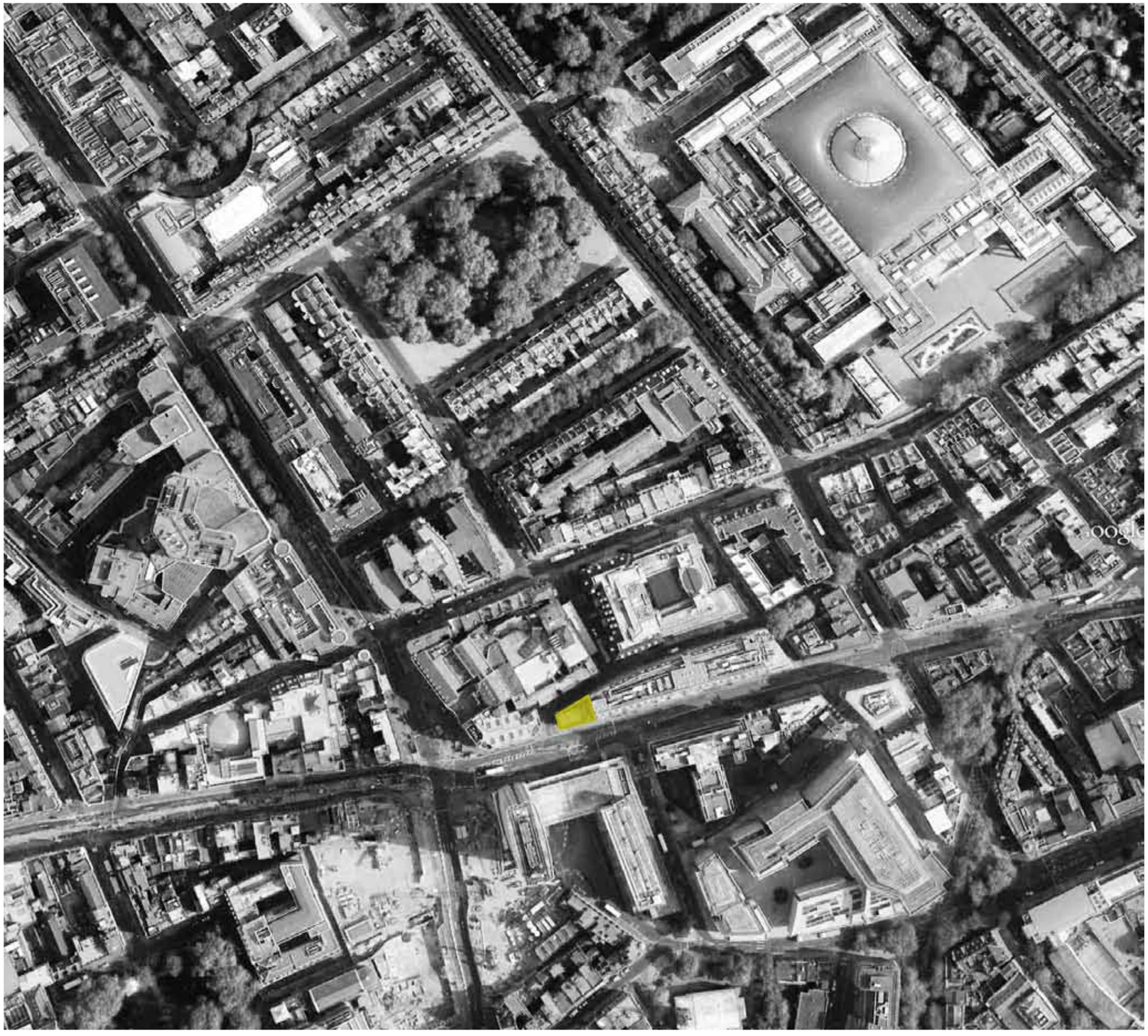


Planning Application Design Document

September 2013

Benoy ZaniaUniversal

1.0 : Contents:



Aerial Photograph Showing Application Site within Local Urban Street pattern.

2.0 : Site Location

Site Description and its Surroundings

2.1 The site is located on New Oxford Street, in Central London and lies within the London Borough of Camden.

2.2 The property is located on the corner junction of Bainbridge Street, and New Oxford Street, with the main frontage being towards the A40 New Oxford Street. The location of the site in relation to the junction is shown on the aerial photograph.

2.3 The site is accessed via both New Oxford Street and Bainbridge Street.

2.4 The property is the first of a terrace. The terrace fronts New Oxford Street, and runs continuously to Fairgate House at Dyott Street. The properties are all constructed of a similar light stone, with grand arched windows. The terrace, excluding the subject site, has additional floors at roof level, which have been constructed from more modern building materials.

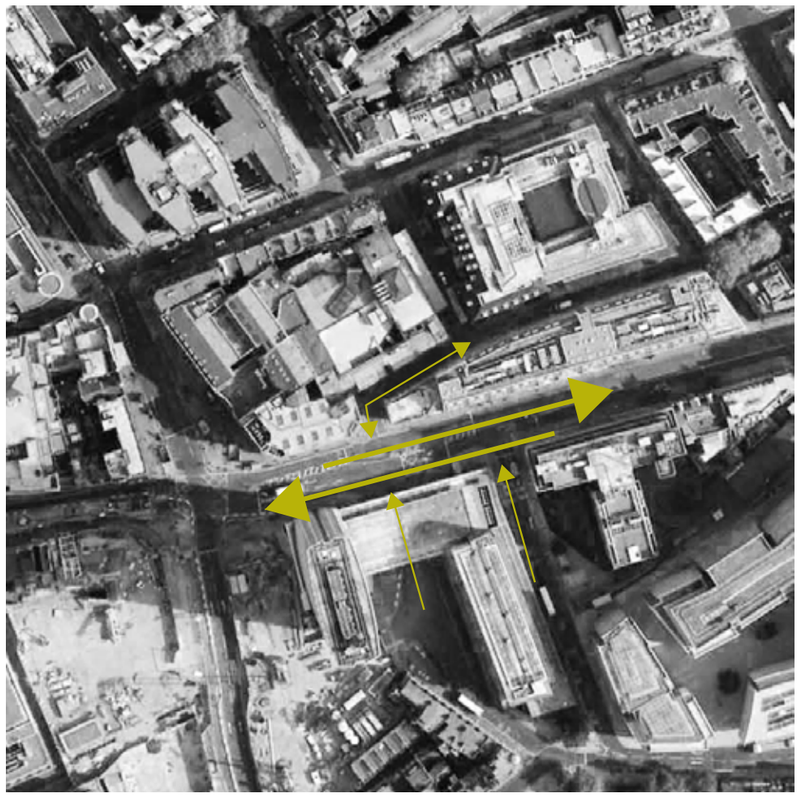
2.5 New Oxford Street has a wide range of uses, ground floor uses are predominantly retail creating a vibrant active frontage at this location with predominantly secondary office accommodation to upper levels. The adjoining terrace and immediate environment predominantly comprises retail and office uses. To the east of the site is Holborn and to the west lies the bustling Tottenham Court Road with the Dominion Theatre to the East side.

2.6 The surrounding uses are provided in a mix of traditional and contemporary properties, ranging from 4 storeys to the taller buildings located on the opposite side of Great Russell Street to 35 storeys at Centre Point, diagonally opposite the site.

2.7 The site is located in Zone 1 and provides easy access to Tottenham Court Road tube station, which is located approximately 110 metres west of the site, providing access to the Central Line and Northern Line Services connecting to West End destinations including Oxford Circus and Bond Street as well as the City of London. Works are currently being undertaken at Tottenham Court Road for the introduction of the new Crossrail service. Holborn to the east of the site provides good access to the Piccadilly Line.

2.8 Other public transport consists of a range of bus services which run frequently along New Oxford Street; the nearest bus stop is located approximately 20 metres from the site.

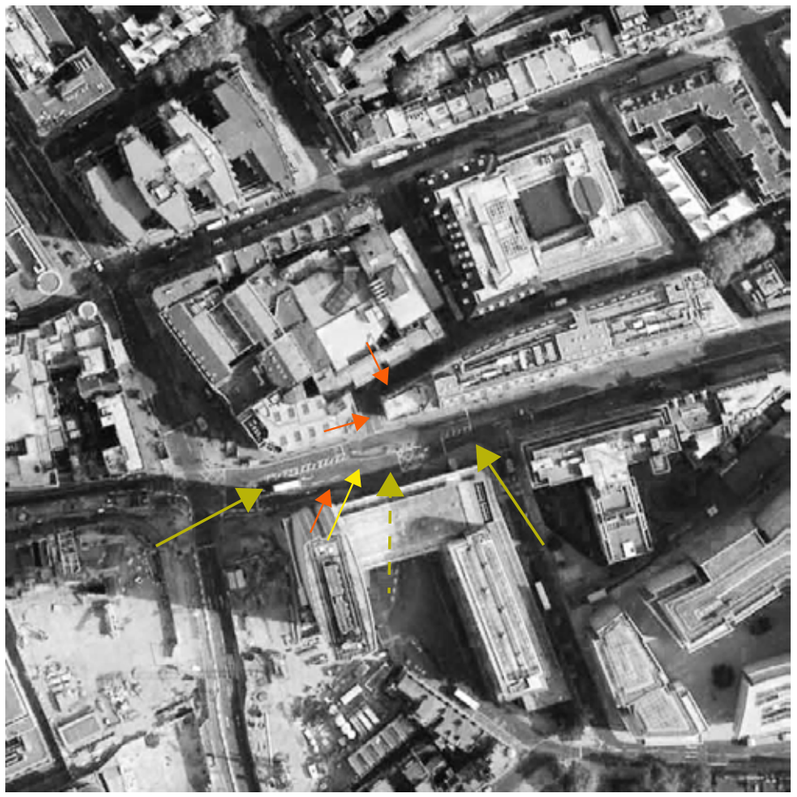
2.1 : Site Analysis:



Major Road

Minor Road

Traffic Flow.



Mid View

High View

Ground View

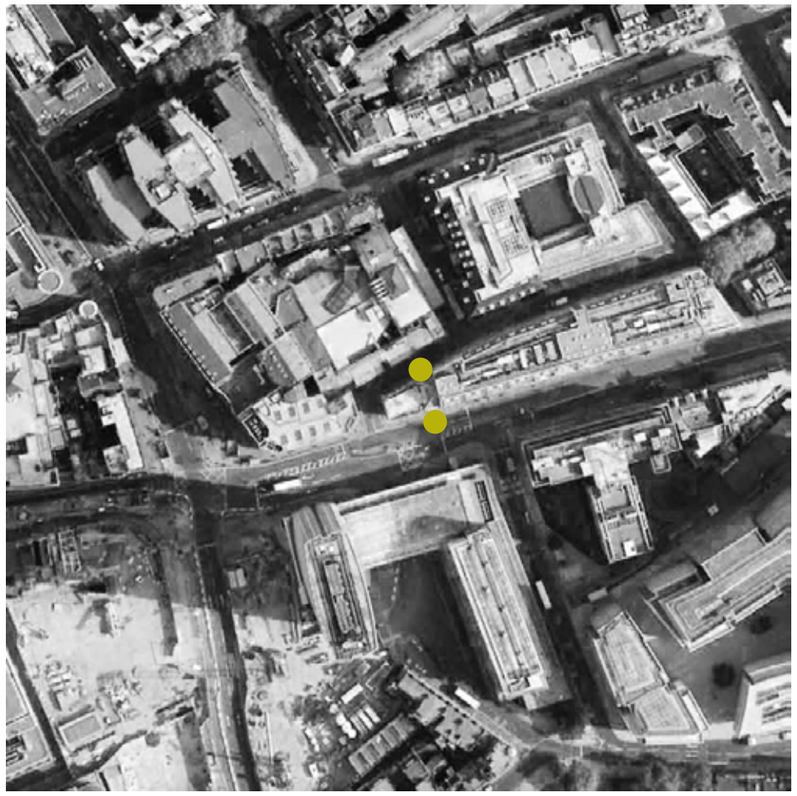
Views Onto Site From Local Enviroment.

Mid View

High View

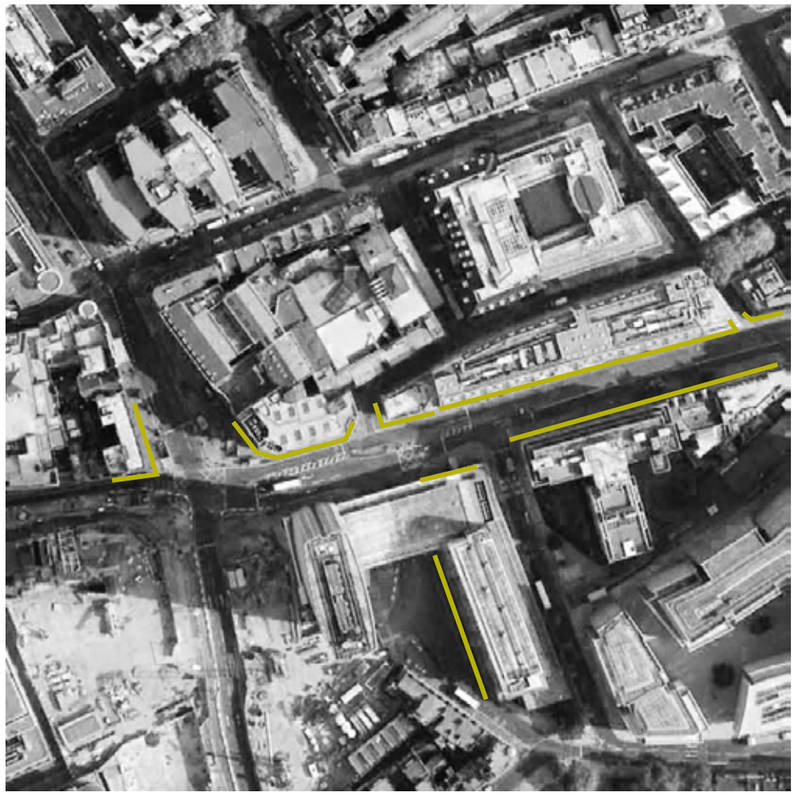
Views Out of Building and Off The Site.

2.1 : Site Analysis:

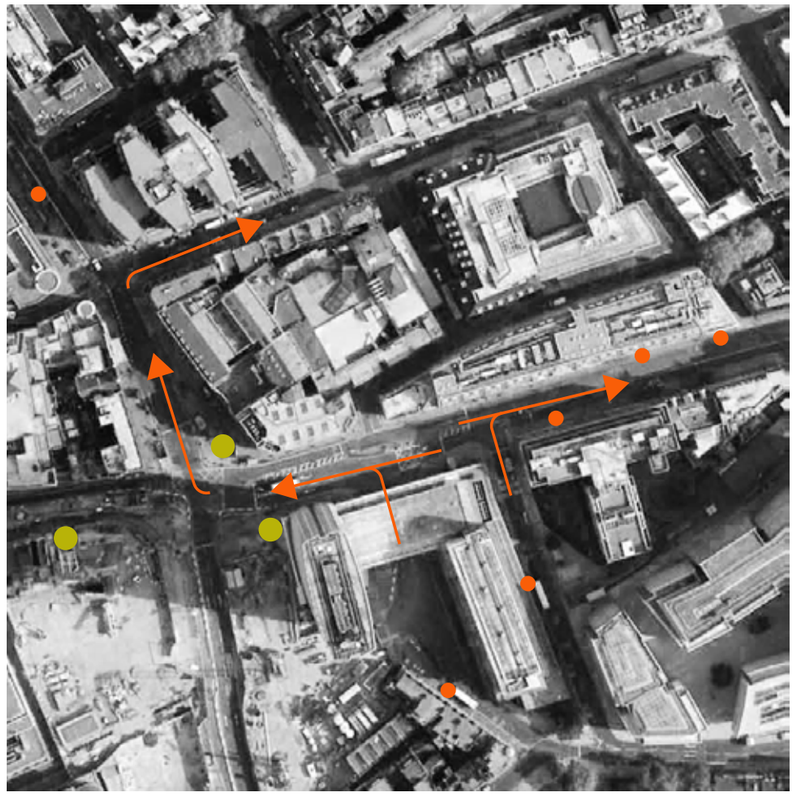


Building Entry Points

Entry Points Into Building, From New Oxford Street and Bainbridge Street.



Existing Retail Frontages.



Bus Route

Bus Stop

Underground Entry

Local Public Transport Routes, with Underground Station Entry Points and Bus Stops.

3.0: Site Photographs:
Location of Site Photographs

Photograph Locations

3.1: Site Photographs:
Aerial View of Site Within Context

1 View Looking Down from Centre Point, Showing Local Context and Urban Scale of Existing and New Developments.

3.2: Site Photographs:
New Oxford Street Facade and Building Within Context

2 Corner of Building Where it Turns into Bainbridge Street.

3 View of existing building from Tottenham Court Road and New Oxford Street junction, party wall and stepped height with neighbouring building visable

4 View from New Oxford Street looking up, with narrow entry into Bainbridge Street.

3.3: Site Photographs:
Bainbridge Street Facade and Building Within Context

5 Bainbridge Street Rear Facade.

6 View of Rear of Theatre and Bainbridge Street

7 Looking up to Bainbridge Street Facade.

3.4: Site Photographs:
New Oxford Street and Tottenham Court Road Vista

8 New Oxford Street and Tottenham Court Road Junction Vista.

3.5: Site Photographs:
New Oxford Street Frontage

9 New Oxford Street Building Frontage.

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4.0: As Existing Drawings:
Ground Floor

0m 1m 2m 5 m

4.1: As Existing Drawings:
First Floor

0m 1m 2m 5 m

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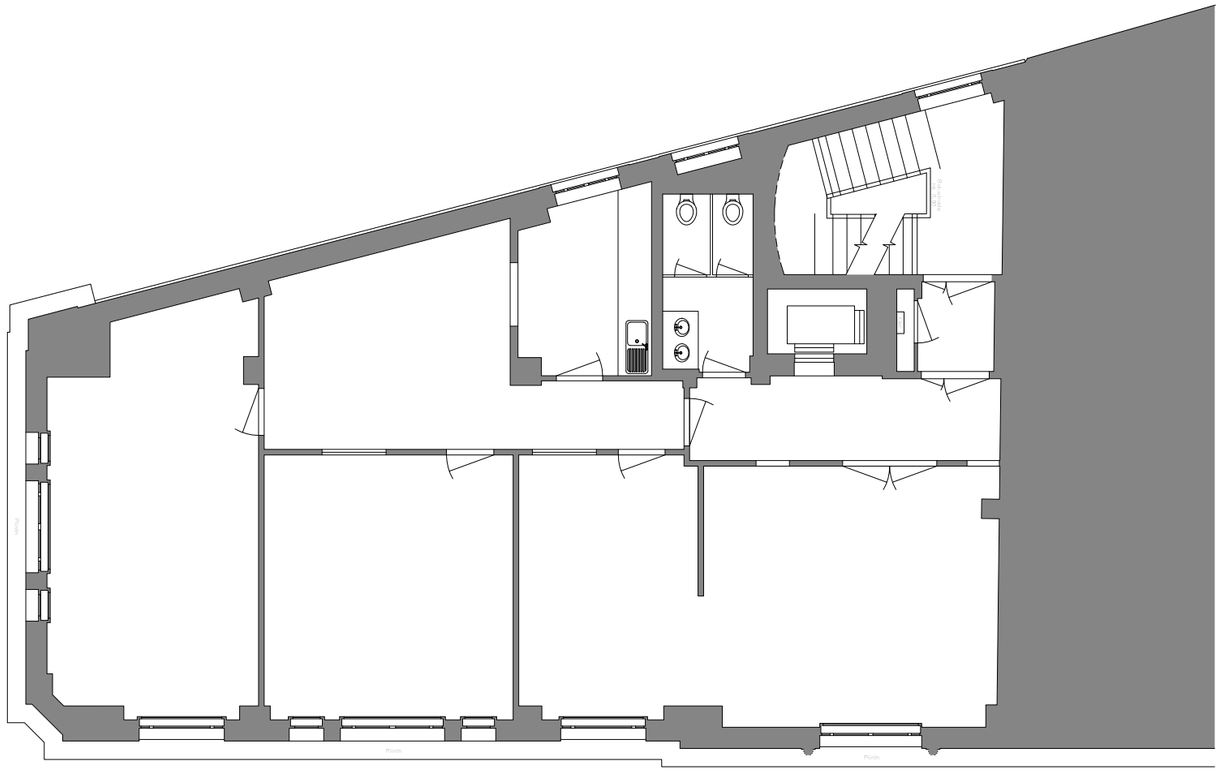
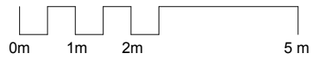
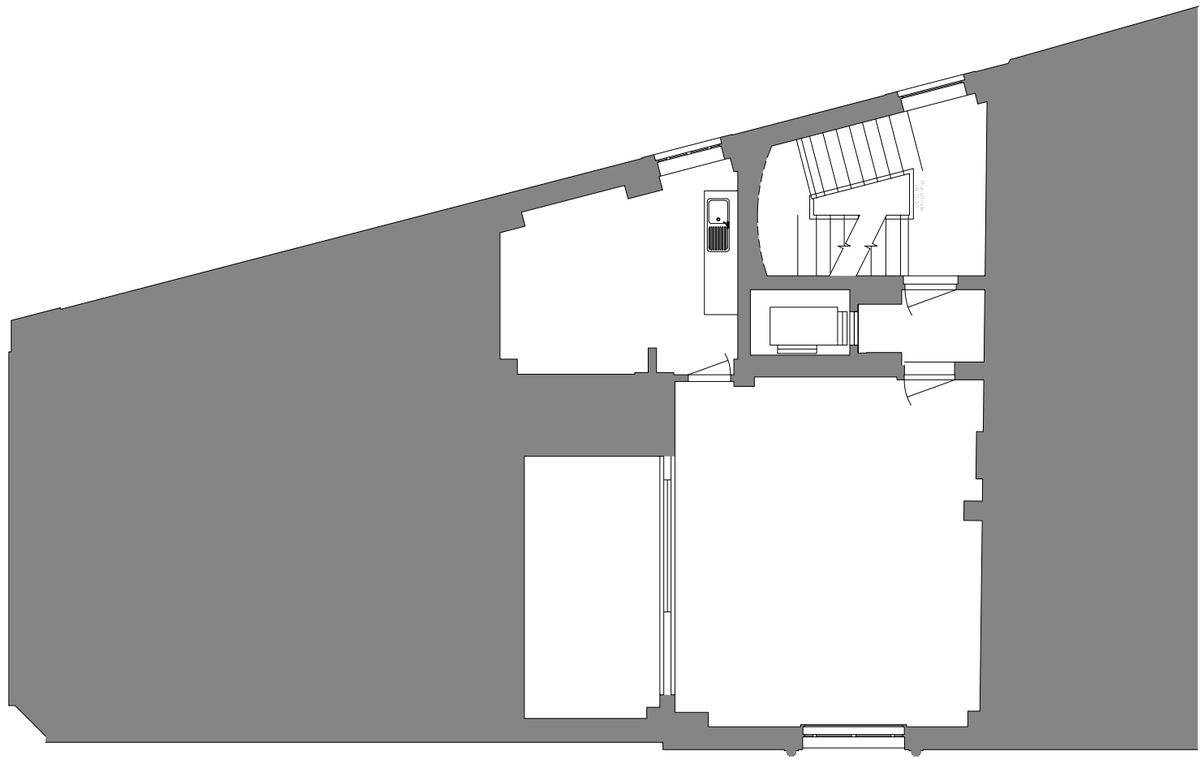
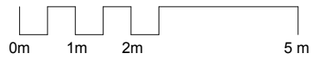
4.2: As Existing Drawings:
Second Floor





4.3: As Existing Drawings:
Third Floor





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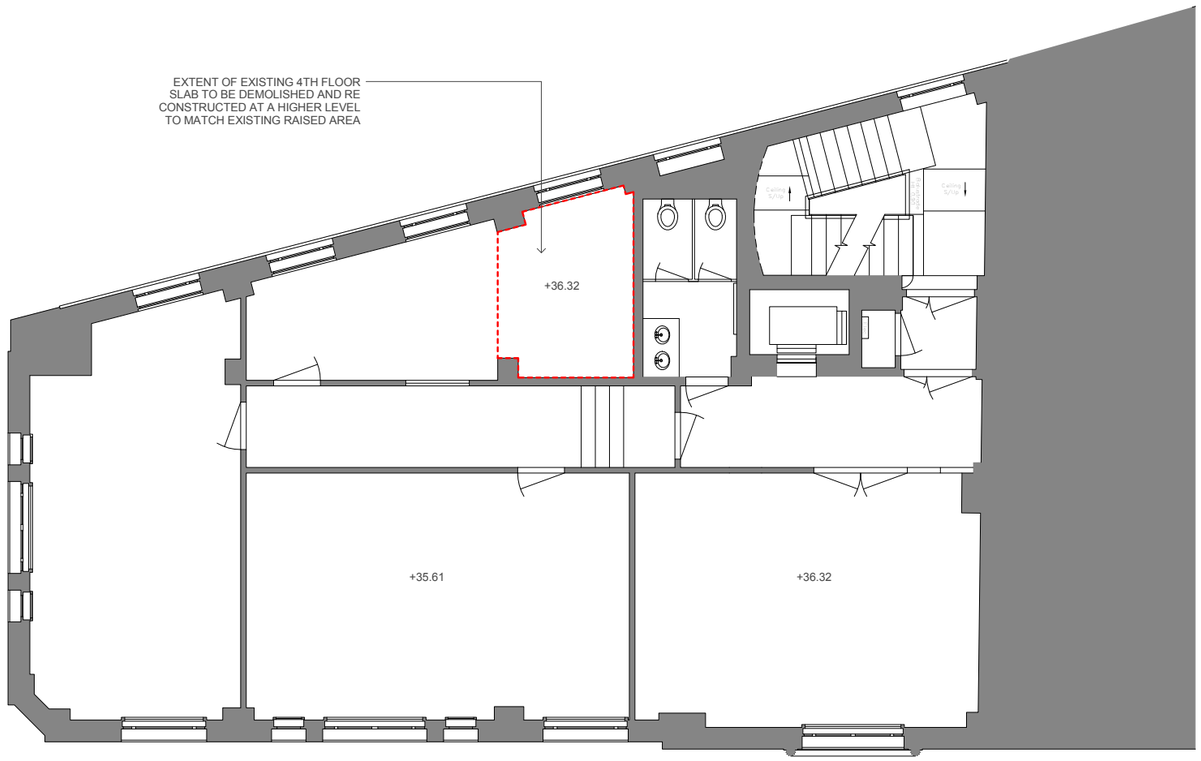
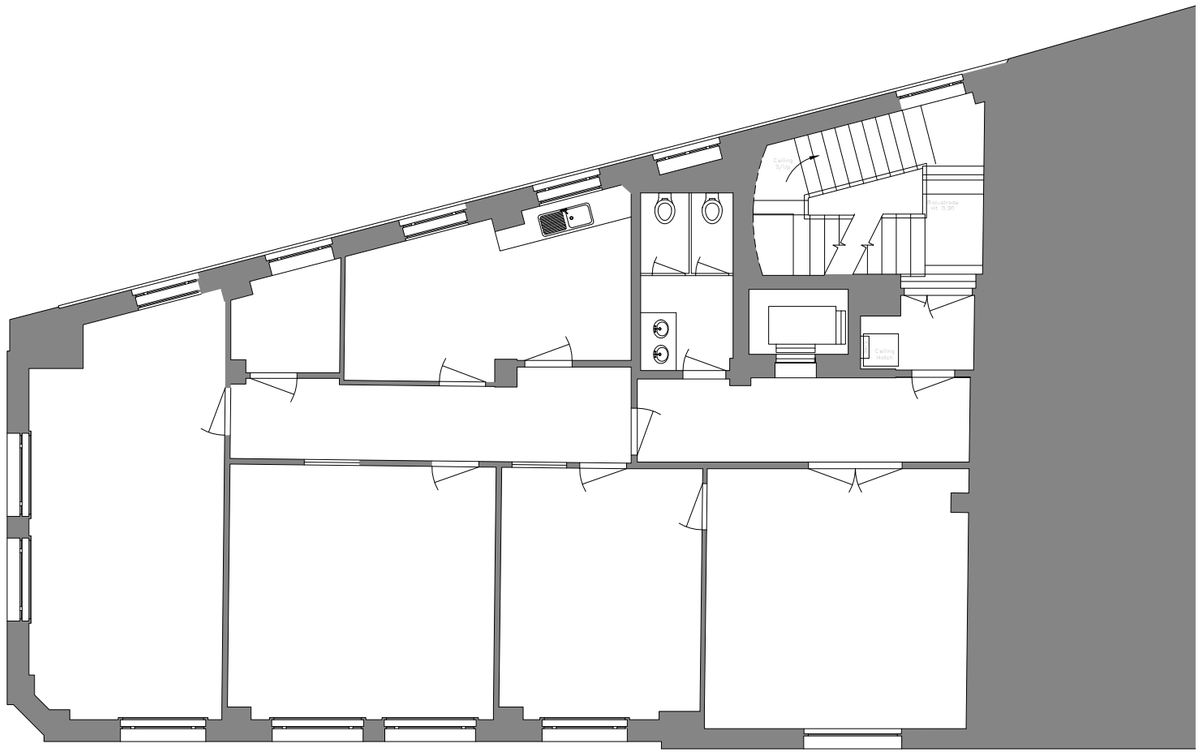
4.4: As Existing Drawings:
Fourth Floor



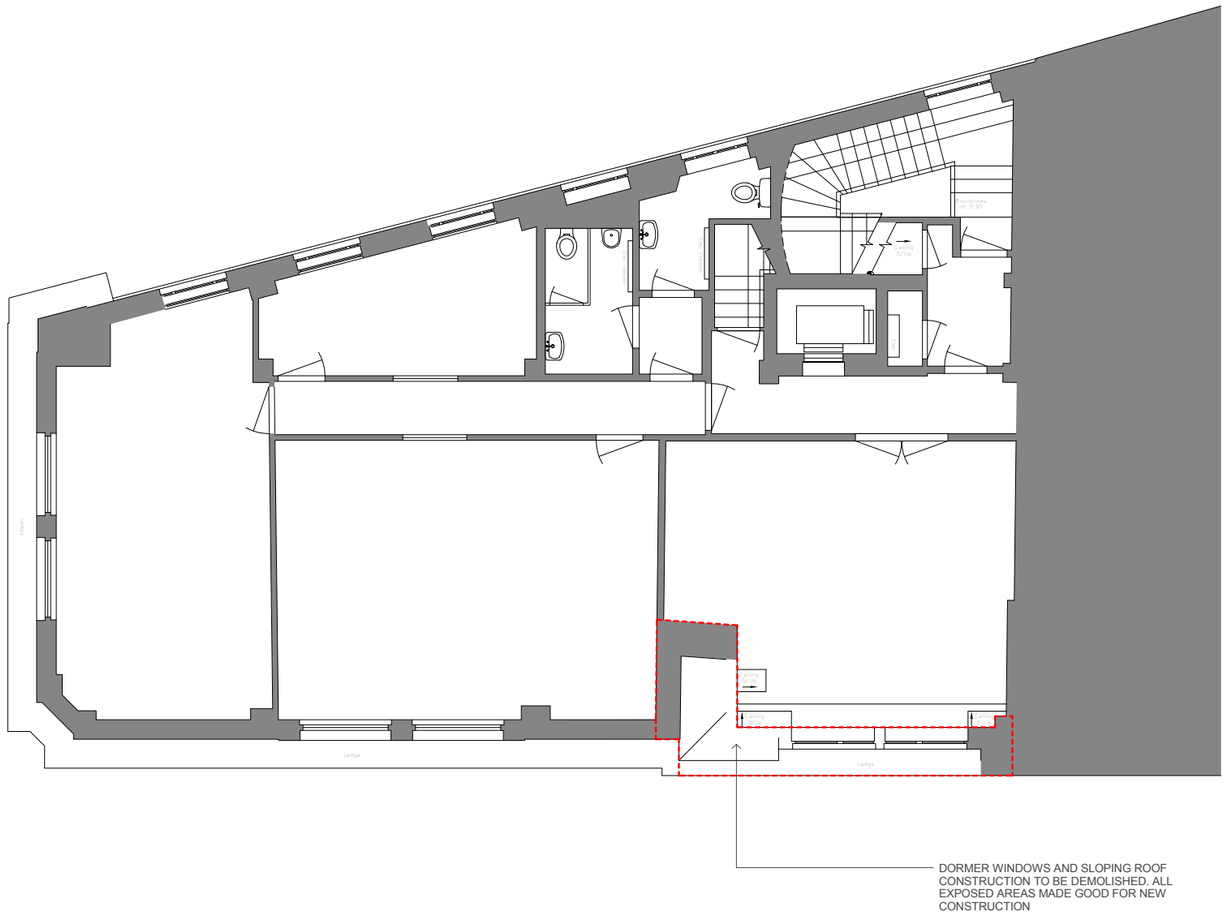
0m 1m 2m 5 m

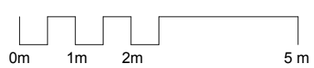
4.5: As Existing Drawings:
Fifth Floor



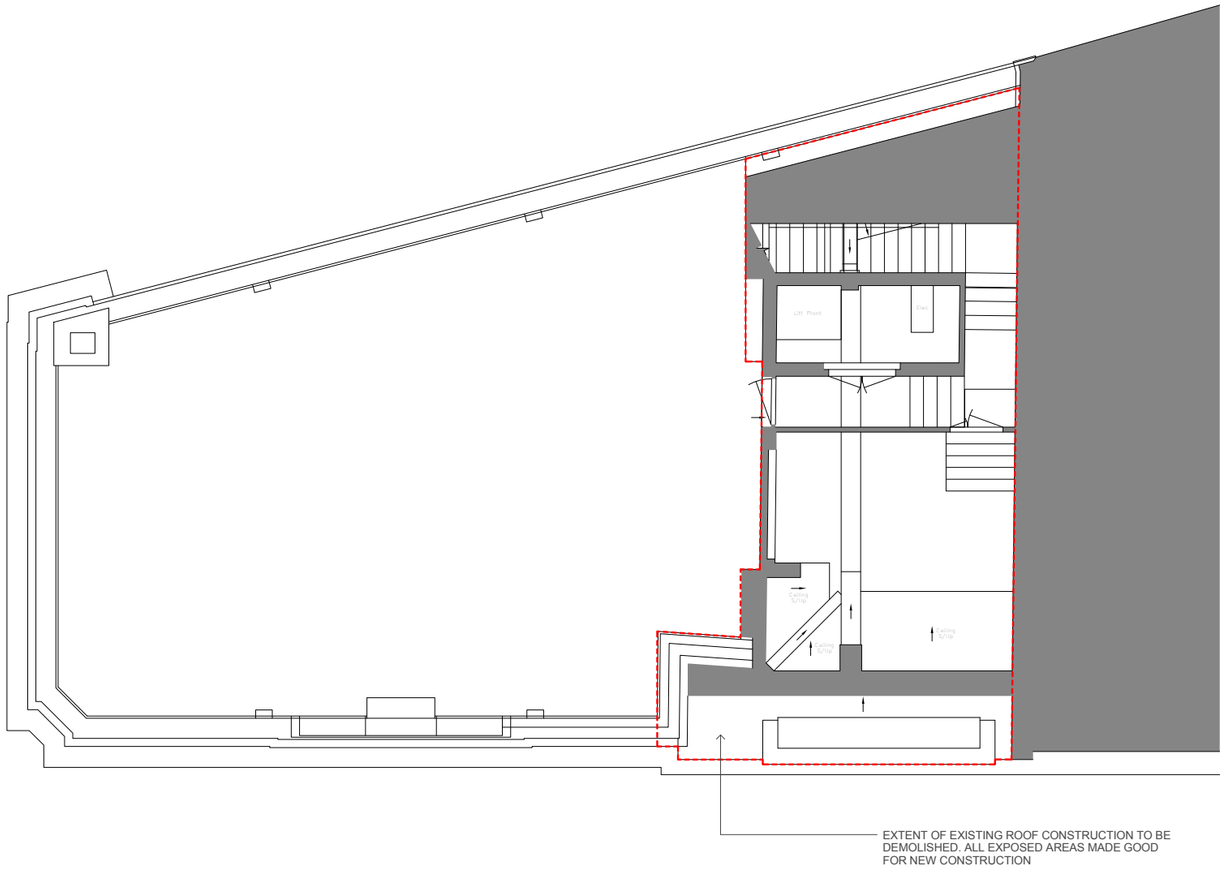
0m 1m 2m 5 m

4.6: As Existing Drawings:
Sixth Floor





4.7: As Existing Drawings:
Seventh Floor



0m 1m 2m 5 m

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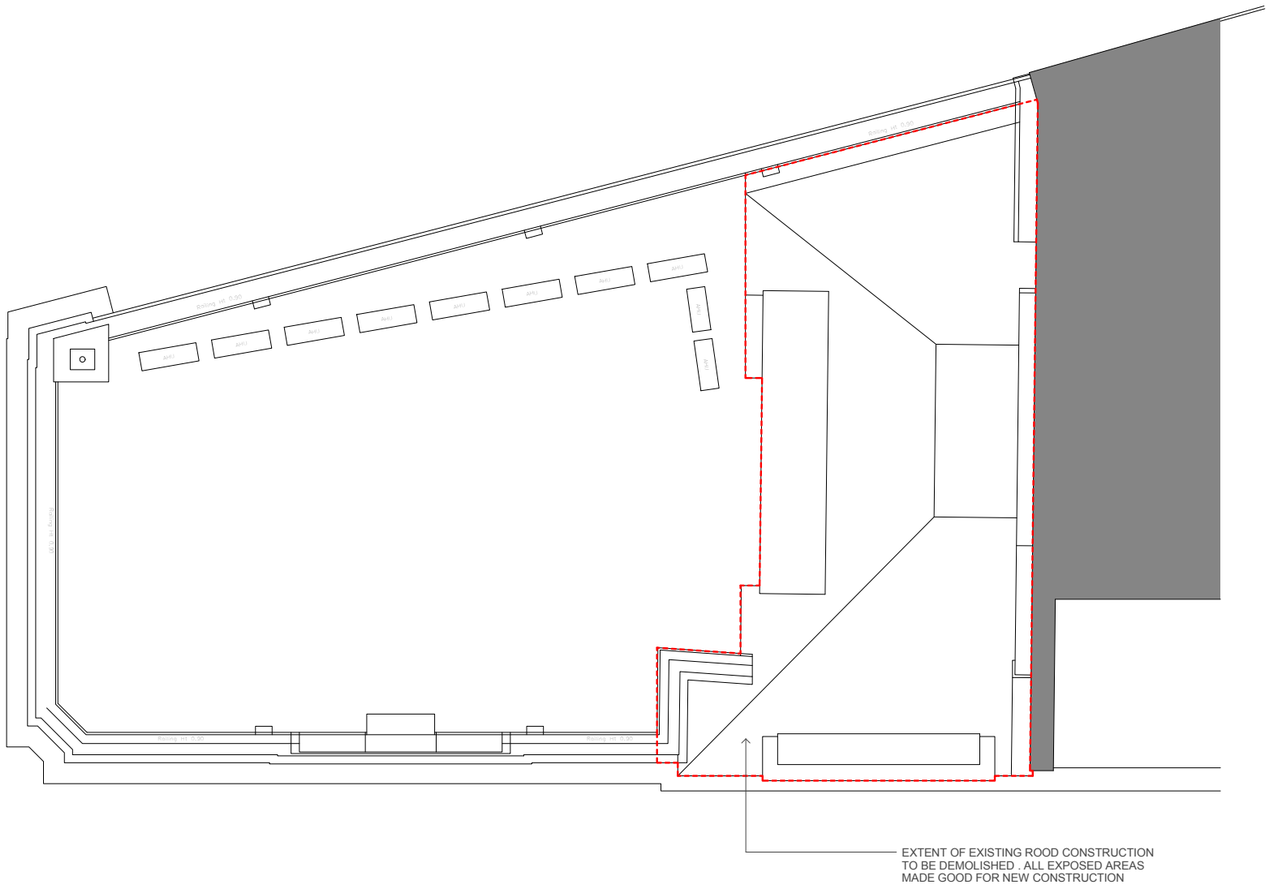
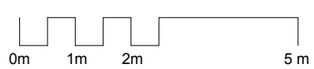
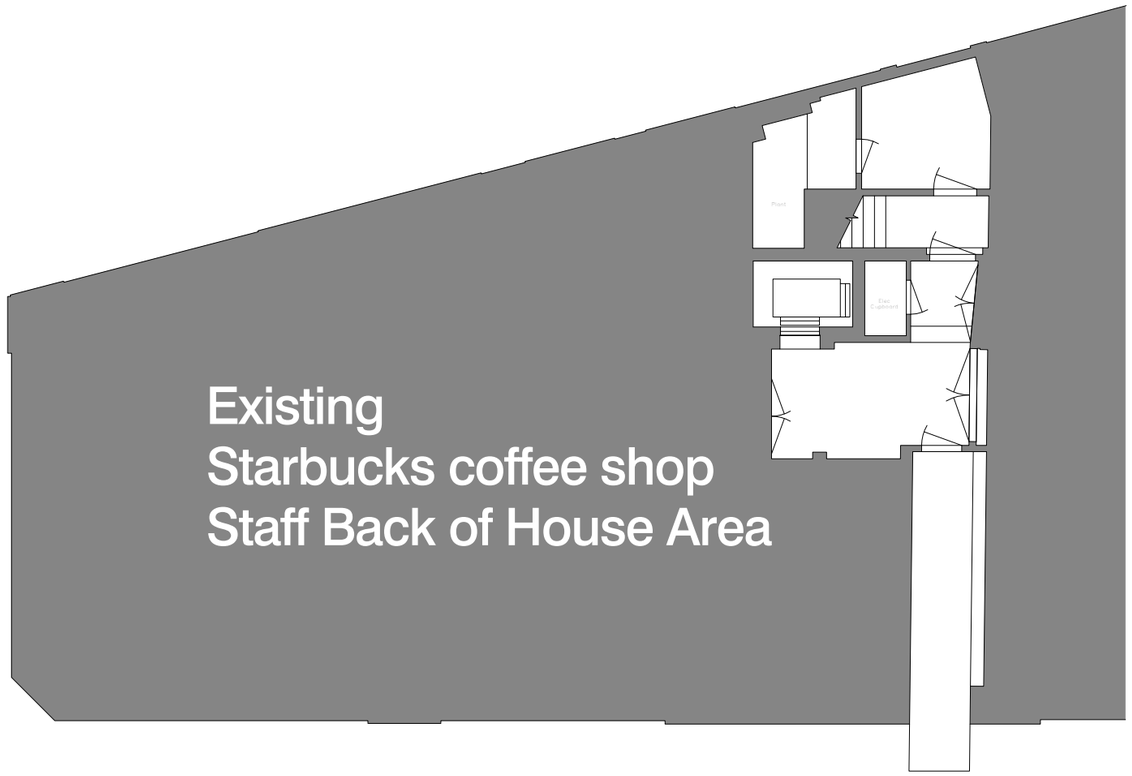
4.8: As Existing Drawings:
Roof Plan





4.9: As Existing Drawings:
Basement Plan



0m 1m 2m 5 m

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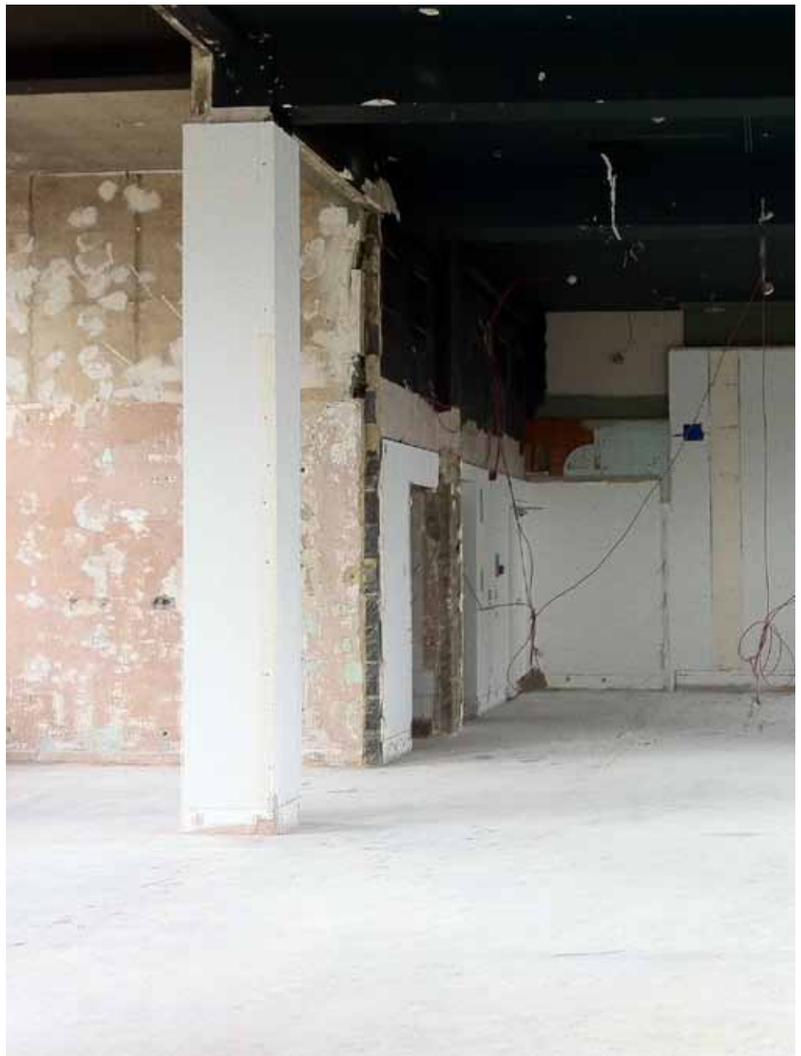
4.10: Site Photographs:
Existing Internal Photographs

View Looking Up The Existing Staircase

View of 2nd Floor showing 3rd Floor Mezzanine Floor

View of 4th Floor

4.10: Site Photographs:
Existing Internal Photographs

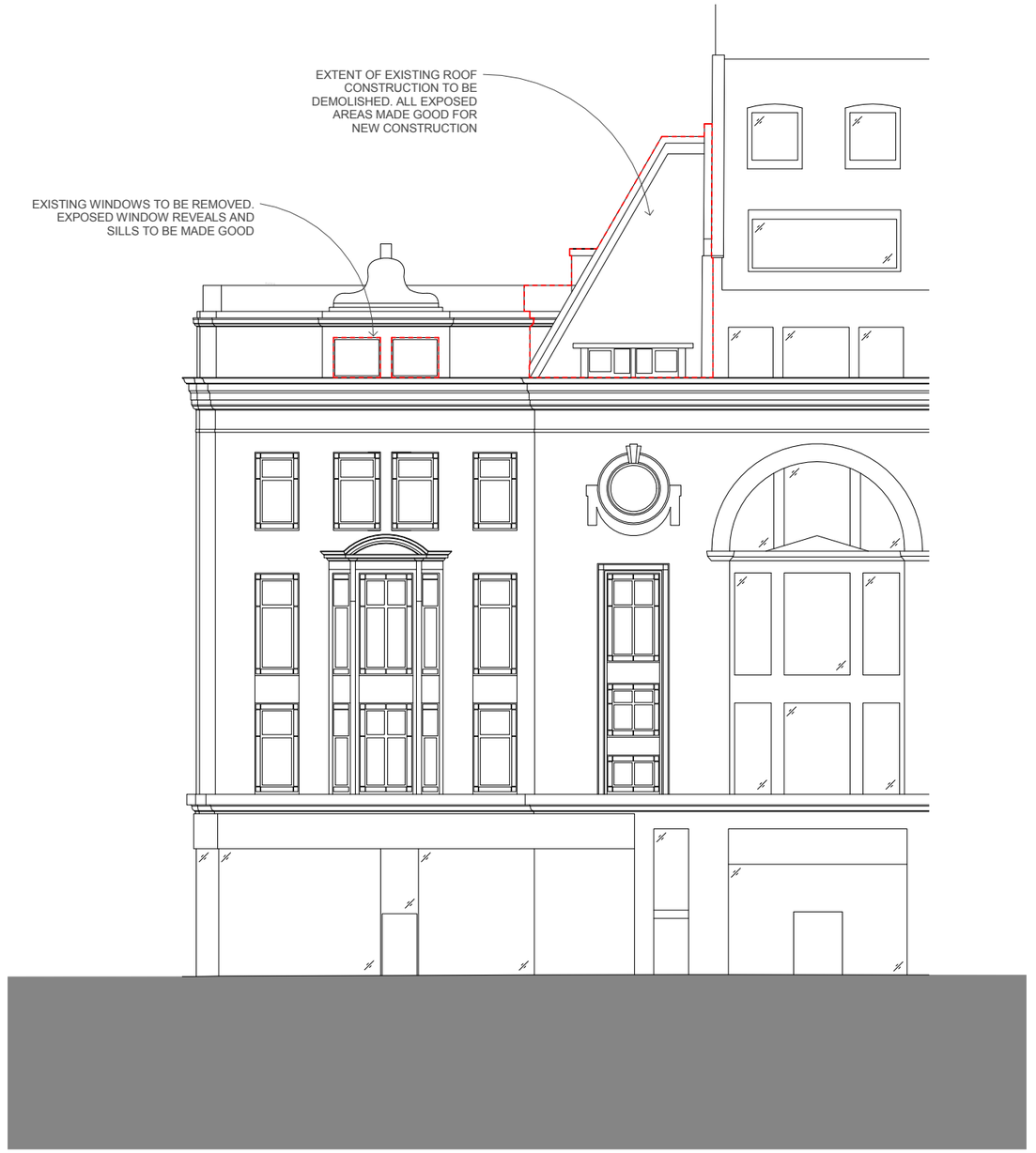


View of 5th Floor

View of 5th Floor

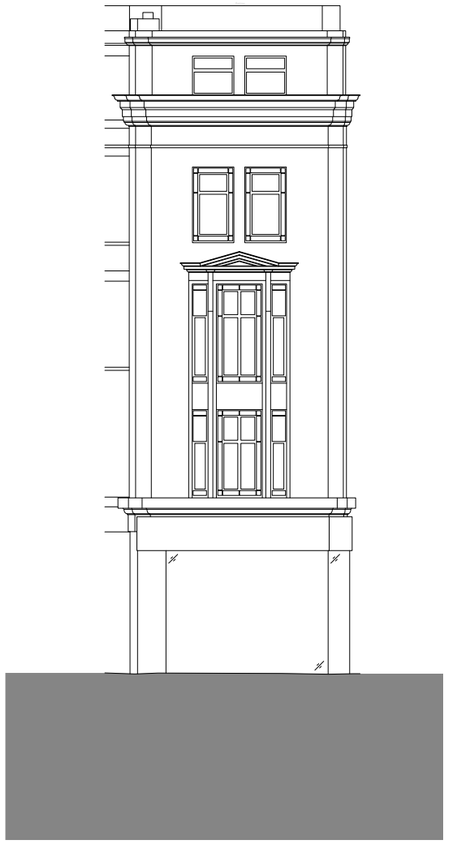
View of 6th Floor

4.11: As Existing Drawings:
New Oxford Street Elevation



1 EXISTING South Elevation
1 : 100

4.12: As Existing Drawings:
Bainbridge Street Elevations



1 EXISTING West Elevation
1 : 100

2 EXISTING North Elevation
1 : 100

0 5m 10 m

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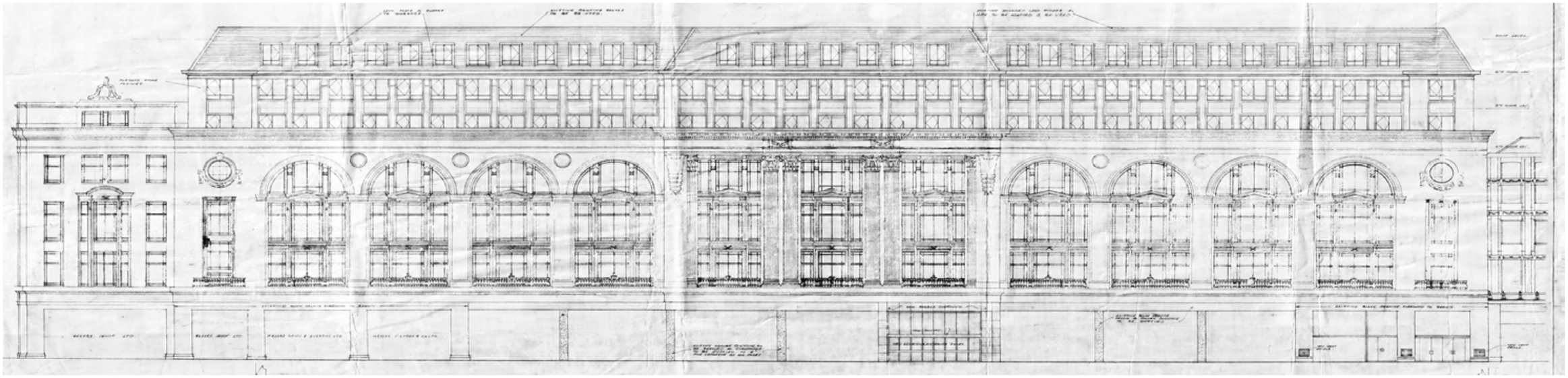
4.13: As Existing Drawings:
Cross Sections

1 EXISTING Section AA
1 : 100

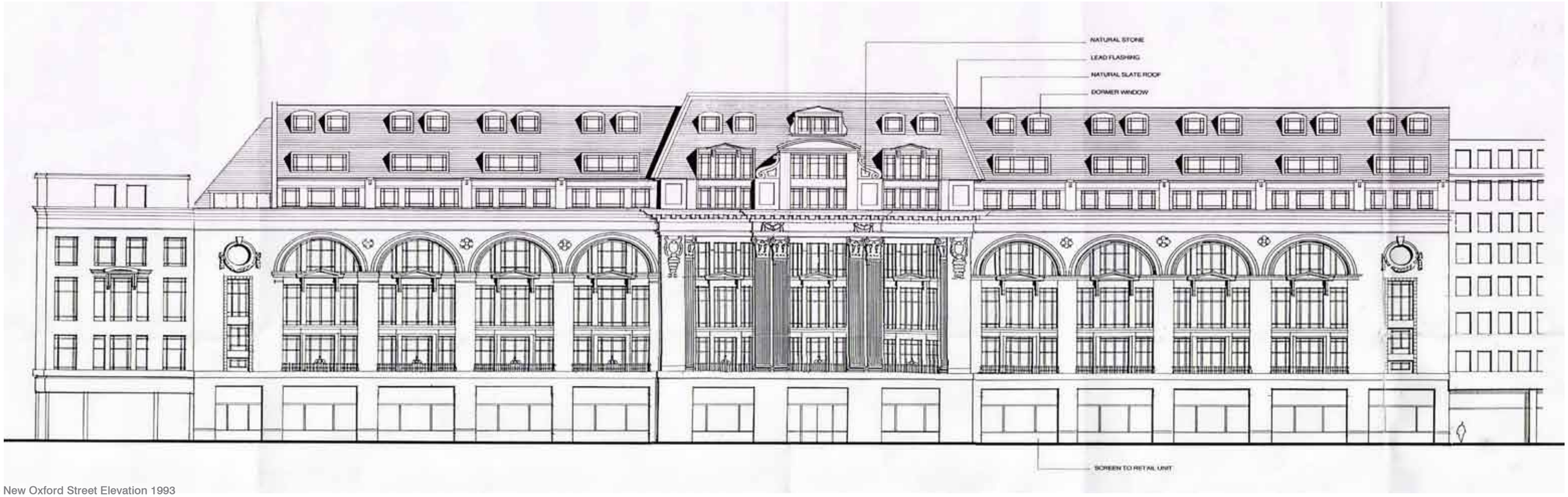
2 EXISTING Section BB
1 : 100

0 5m 10 m

4.14: As Existing Drawings:
New Oxford Street Elevation 1962 and 1993

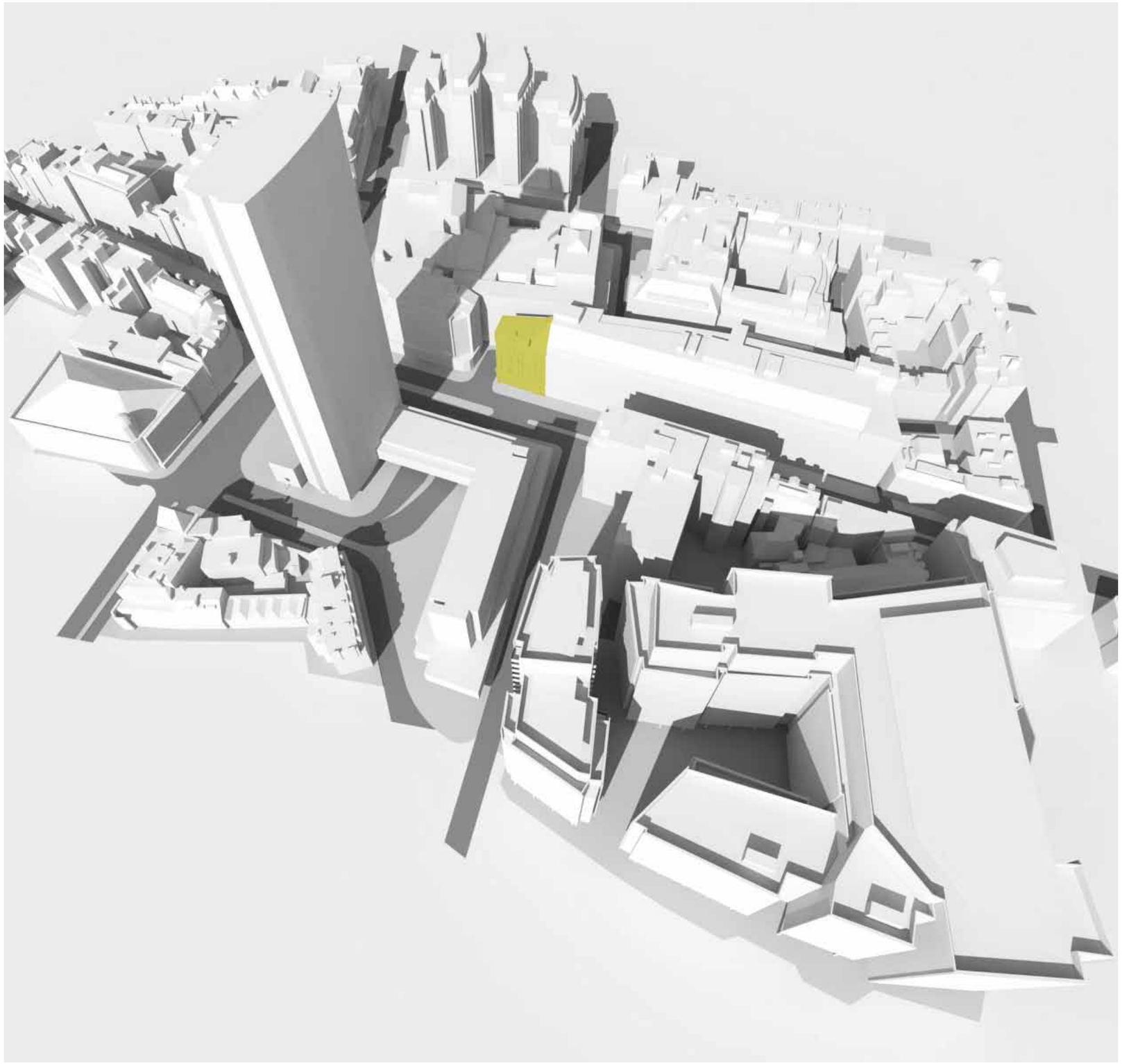


New Oxford Street Elevation 1962



New Oxford Street Elevation 1993

5.0: Proposed Development :
Description and Floor Plans



5.0: Proposed Development : Description and Floor Plans

EXISTING BUILDING CONDITION:

The existing building currently includes retail (Starbucks shop) at the ground and first floors with staff areas within the basement and vacant secondary office accommodation in the floors above (2 - 6). This office space is generally of poor quality and inefficient in terms of layout.

The site is located on the border of the quieter residential area of Bloomsbury and the much livelier areas of Soho and Covent Garden. It is therefore considered that the site would be entirely appropriate for either residential use or potentially serviced apartments.

The building is sited on a prominent corner of New Oxford Street, this provides great views out onto the junction of Tottenham Court and Oxford Street, this area is currently under going redevelopment with Tottenham Court Road tubestation having the new crossrail extension added and new buildings and plaza at street level.

Given the neighbouring building heights and precedent extensions including the rest of the adjoining terrace (Prospect House), there appears to be scope for additional height, subject to appropriate design. Any roof top feature will be prominent when viewed from the end of Tottenham Court road junction and Earnshaw Street which joins new Oxford Street opposite the Site. The views down from Centre Point Tower are important, the shape of this extension and its materials will be key to making it a 'small jewel' within the city.

Potential extension designs can be informed by adjacent Architectural drivers (neighbouring roof shapes and recent roof top extensions). Sunlight/daylight and Rights to Light issues may also play a part in the massing of any extension.

The materials could be of a traditional 'roof' material metal cladding (of various colour tones), or have elements of stone where it would tie into the existing facade. Using glass or other more reflective materials would enhance the design and add to the potential 'jewel' quality.

The rear facade (Bainbridge Street) is currently of a simple red brick material with simple punched windows, this will remain mostly untouched apart from where new windows will be required for the proposed design.

PROPOSED DESIGN CONCEPT:

Following our pre-planning application meeting (11th July 2012), the proposed extension was 'revisited' and redesigned to become a 'softer' piece of Architecture, applying rounded corners at all edges and a clearer defined window opening strategy. We believe that this 'revisited' design has a sense of place sitting on top of 112-116 New Oxford Street, and is piece of urban skyscape that will blend into the existing surrounding London fabric.

The new roof addition will be 'blended' into the neighbouring roof profile, by taking on board the same slope of the neighbouring roof (Prospect House). With an extra slope along the Bainbridge Road elevation, the overall form has been shaped and considered within the wider context of the neighbouring buildings and long sight lines from the Tottenham Court Road junction.

This new extension will appear to rise up from behind the existing stone facade along New Oxford Street and Bainbridge Road, with the sight lines form street level any view of the new extension will be minimal.

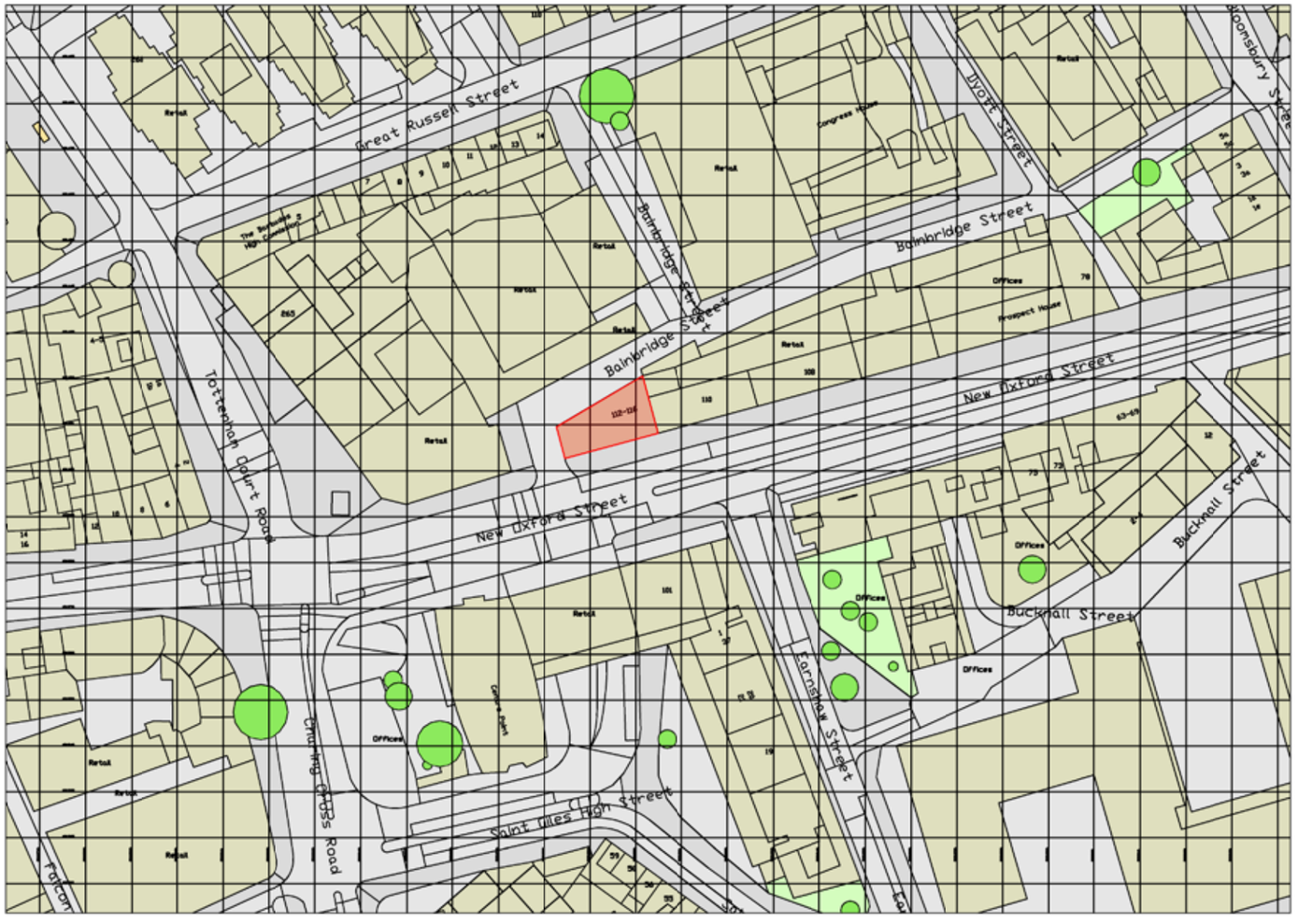
The proposed cladding to our extension will also add to the Architectural 'blending' of this new piece of skyscape Architecture. Our proposed finish is a modern interpretation of traditional roof finishes that are generally found within the London area. The material will be a copper based product, and the colour choices we are considering are Brass or gold. These colours and the finish will best respond to the stone of the main facade, and fade over time to become more muted.

This cladding proposal shall be made up of small 'diamond' shingles. This cladding 'style' will be best at creating the sloping sides and curves of our design proposal, and again are common within London skyline. Around the Dormer windows the same cladding finish colour will be used, but as a single cladding strip forming a strong clean edge to each dormer.

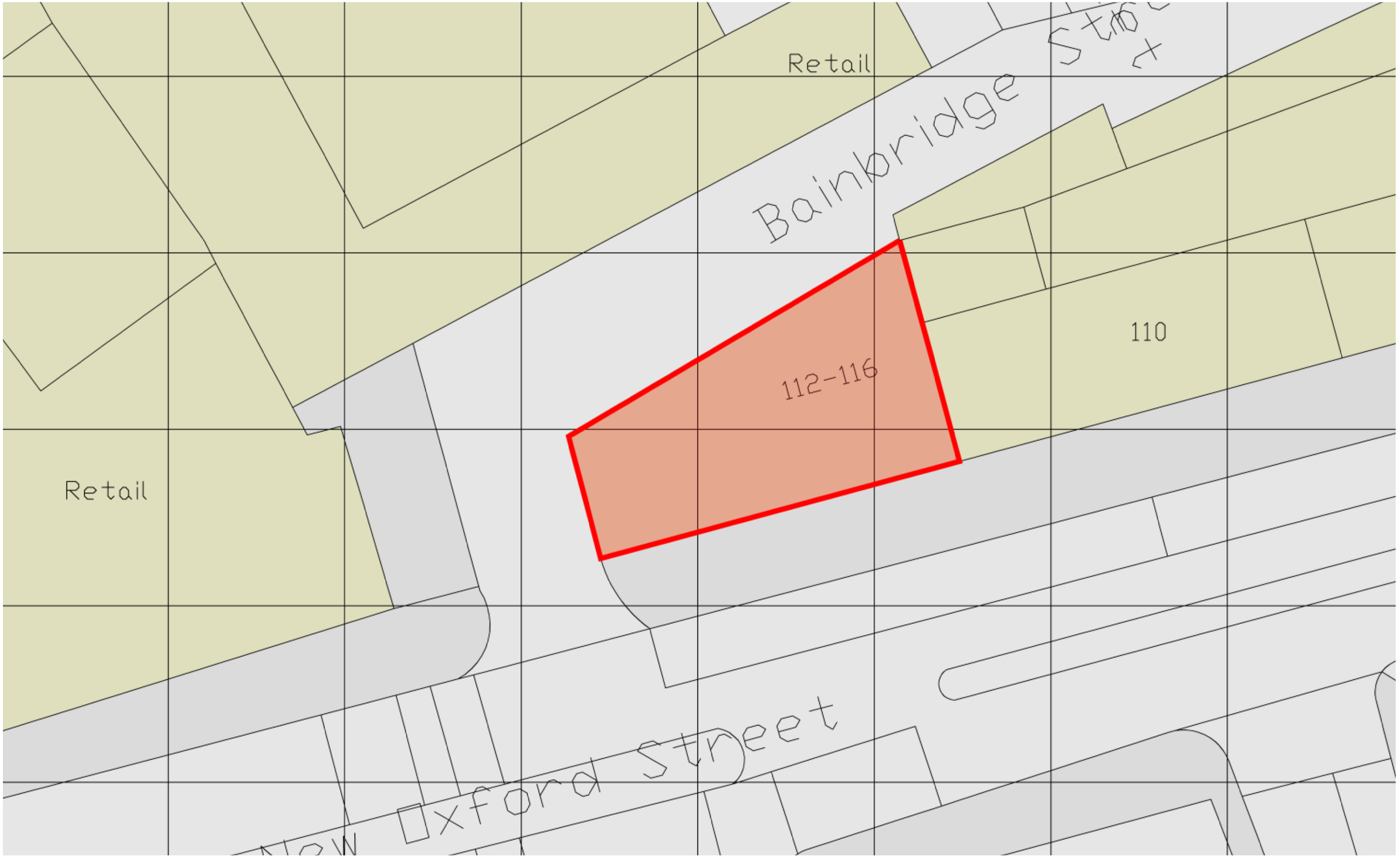
The existing stone parapet which forms the current roof top edge (sixth floor) will be extended along to the neighbouring party wall on Prospect House; this will reinforce its existing strong building line, which at present is broken by the existing sloping roof structure.

5.1: Proposed Development :

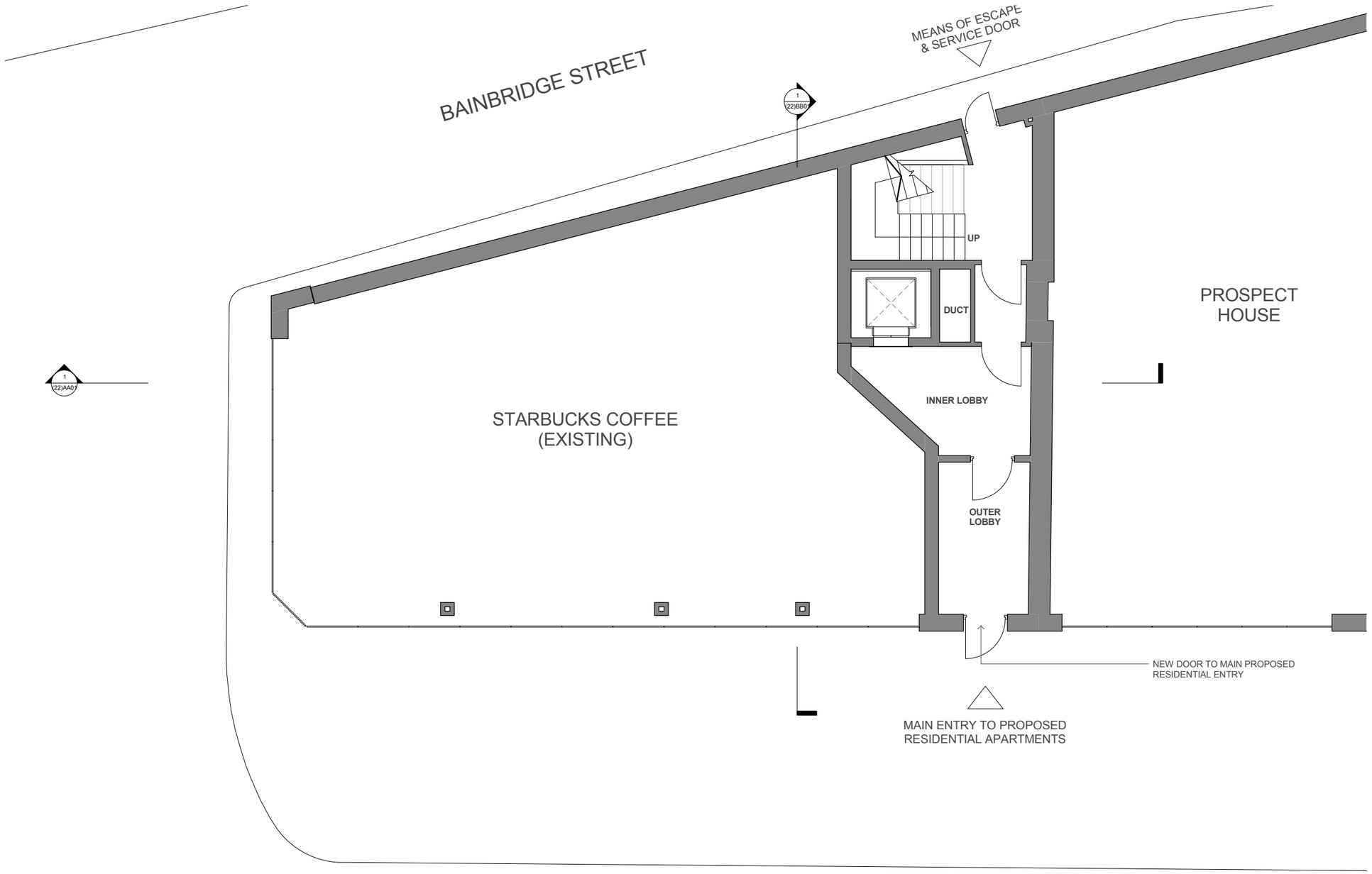
Site Location Plan @ 1:1250



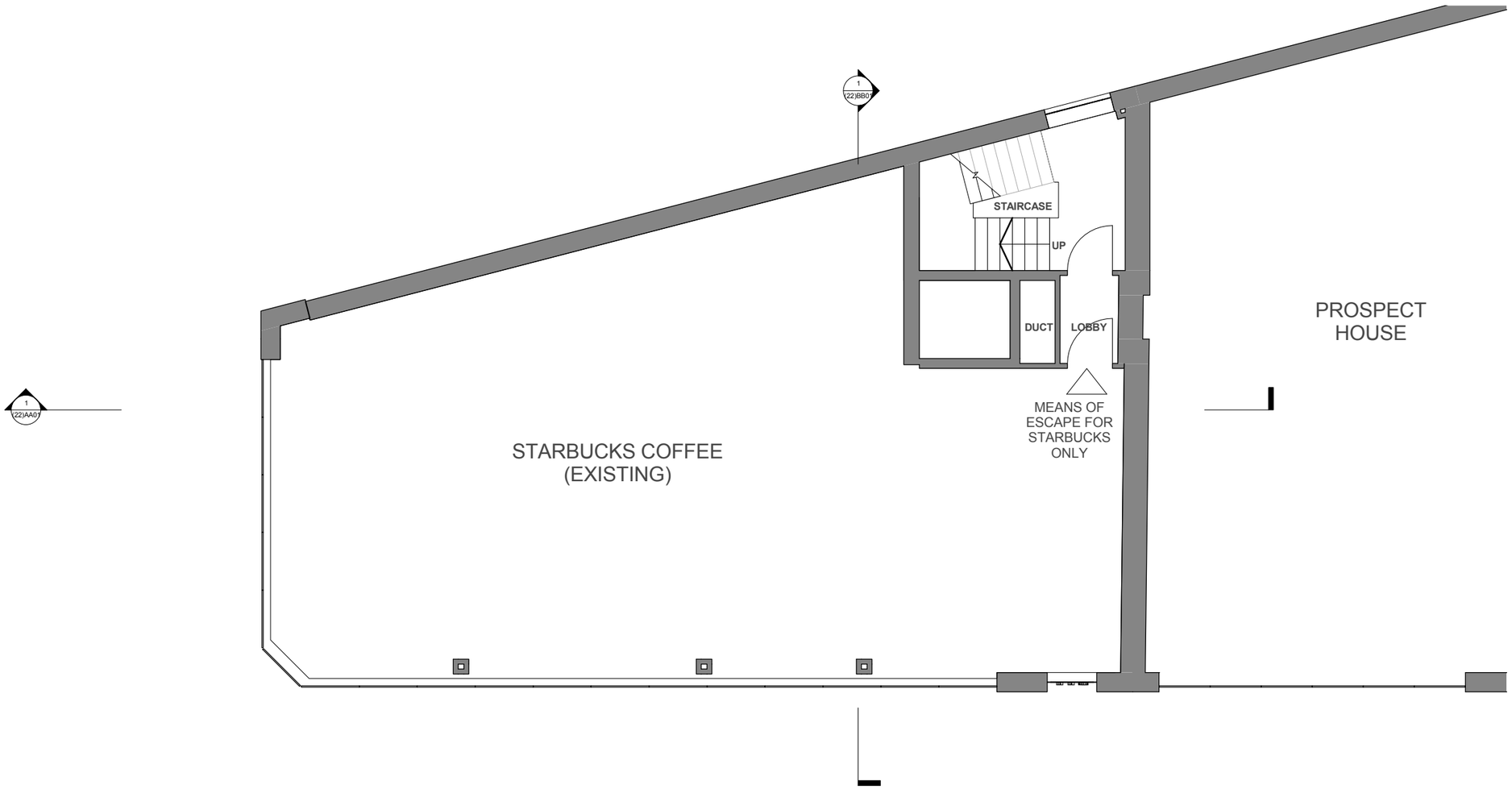
5.2: Proposed Development :
Site Block Plan @ 1:200



5.3: Proposed Development :
Ground Floor @ 1:1000



5.4: Proposed Development :
First Floor @ 1:1000



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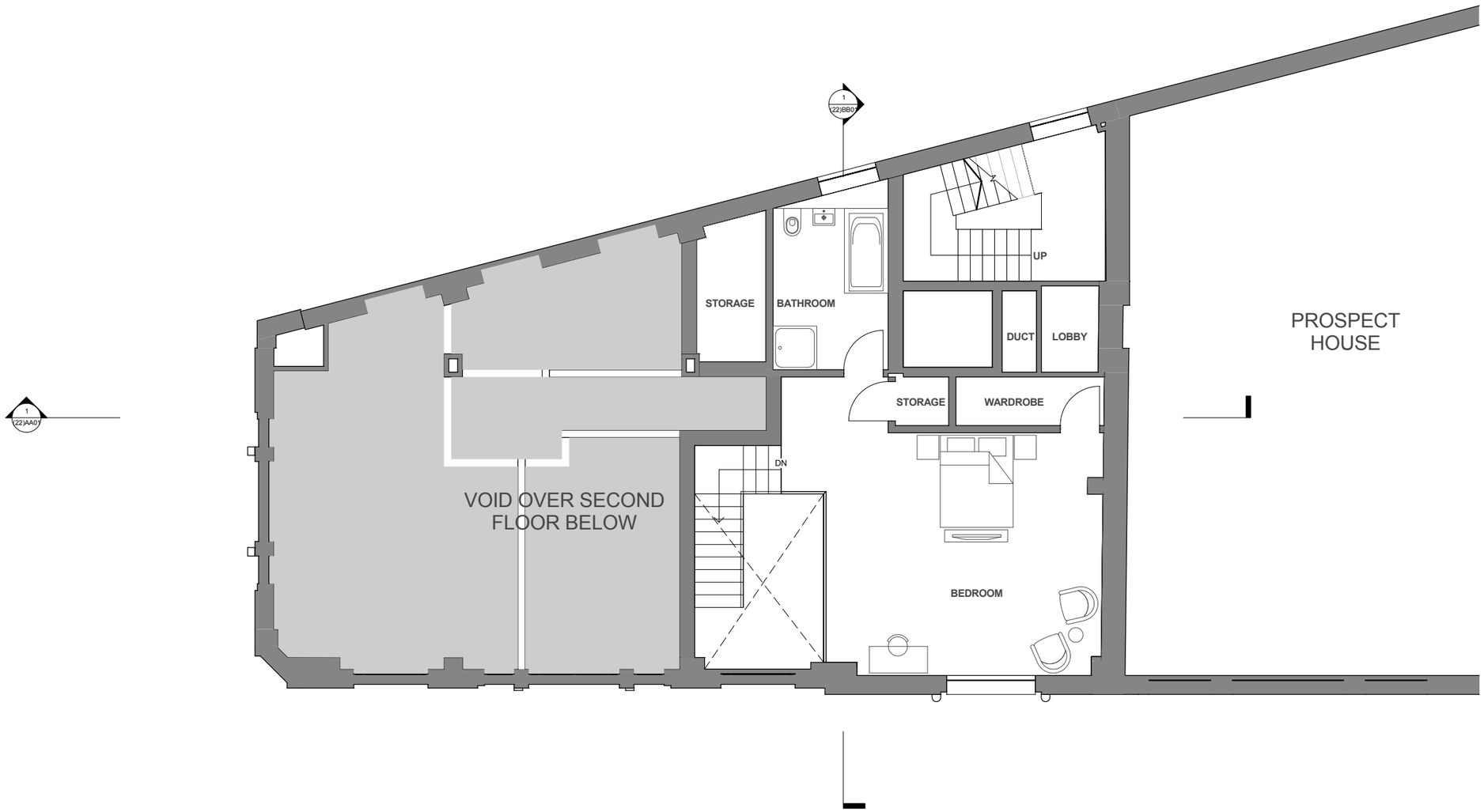
5.5: Proposed Development :
Second Floor @ 1:1000

5.6: Proposed Development :
Third Floor @ 1:1000



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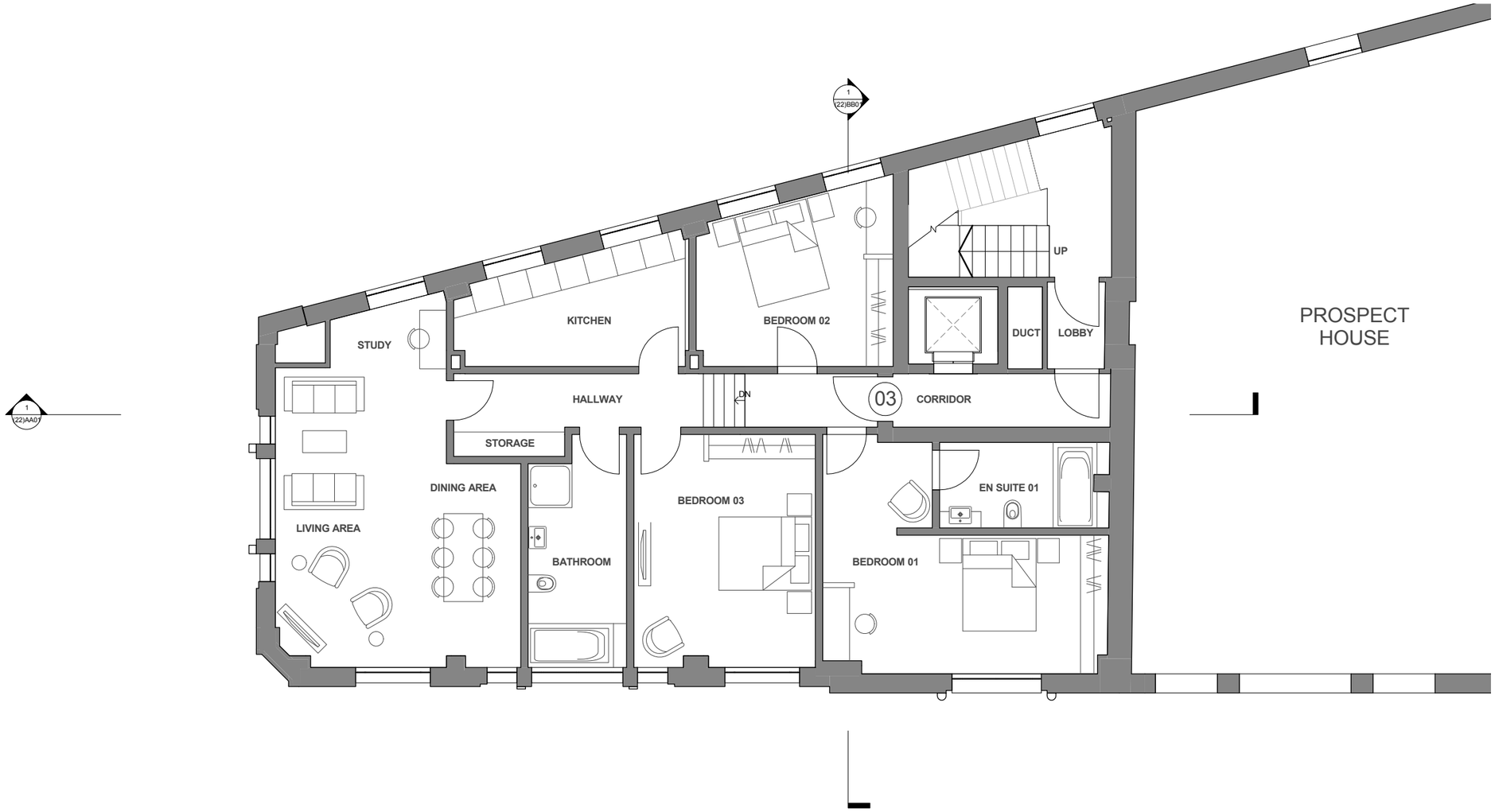
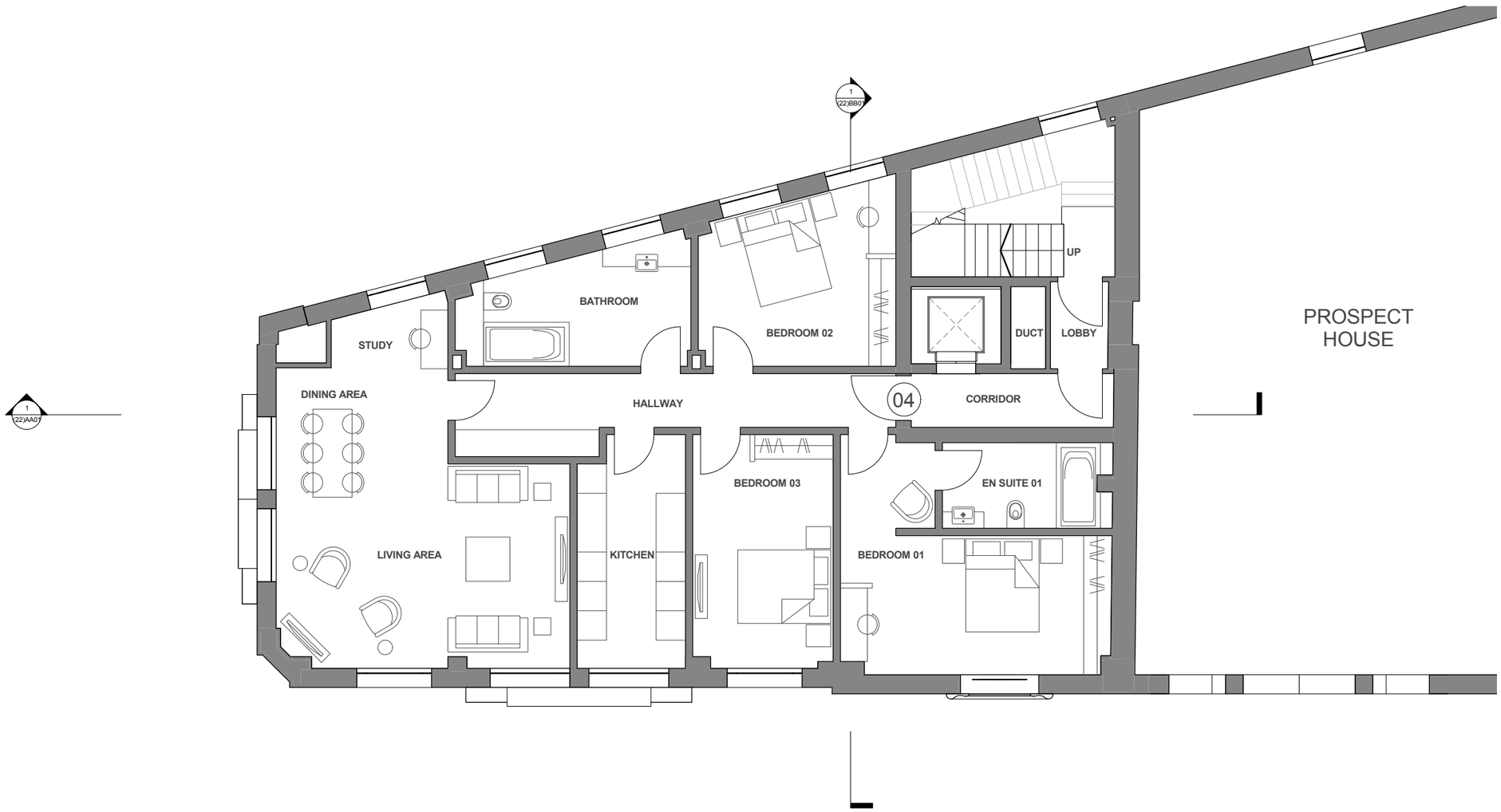
5.7: Proposed Development :
Fourth Floor @ 1:1000



5.8: Proposed Development :
Fifth Floor @ 1:1000



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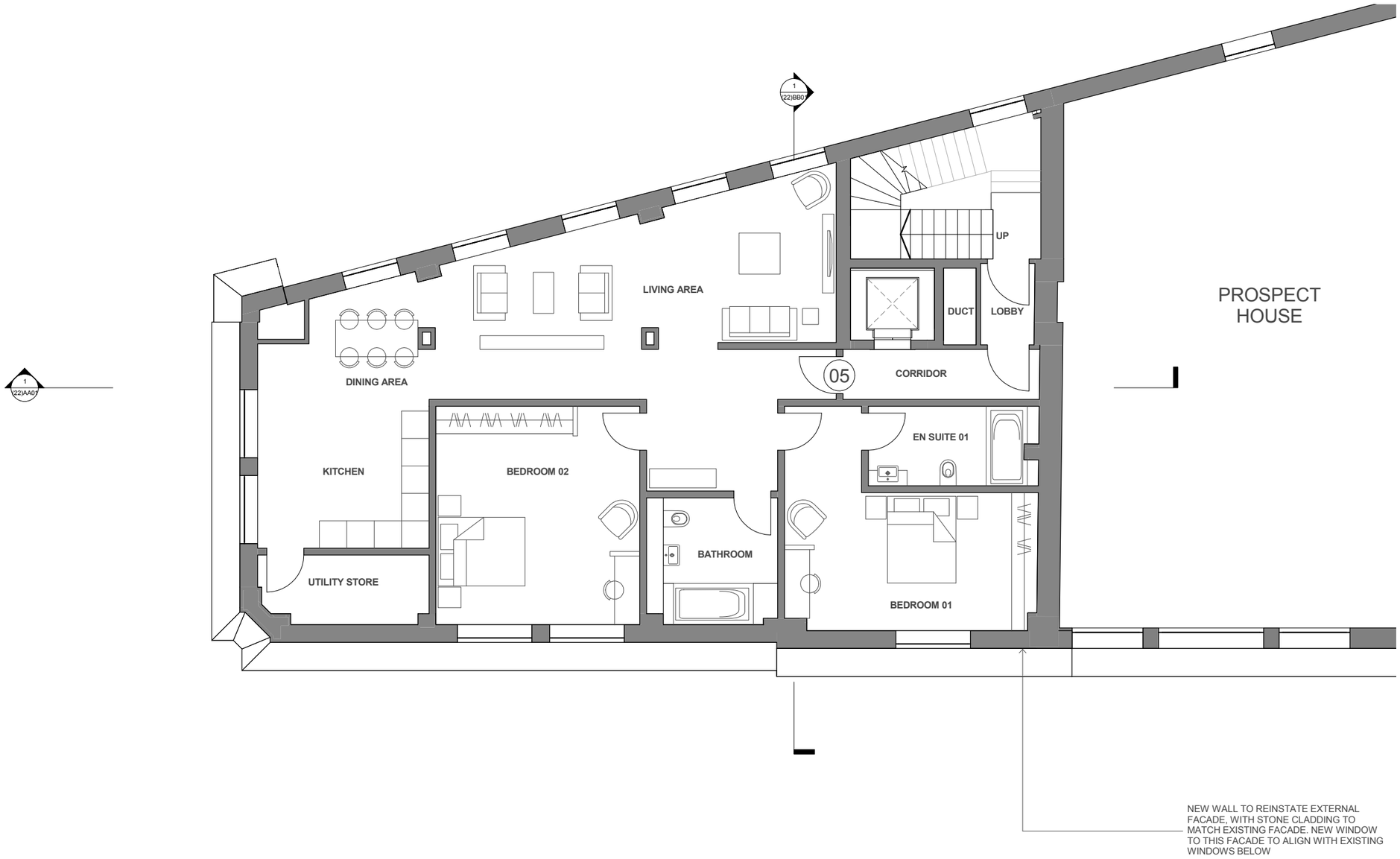
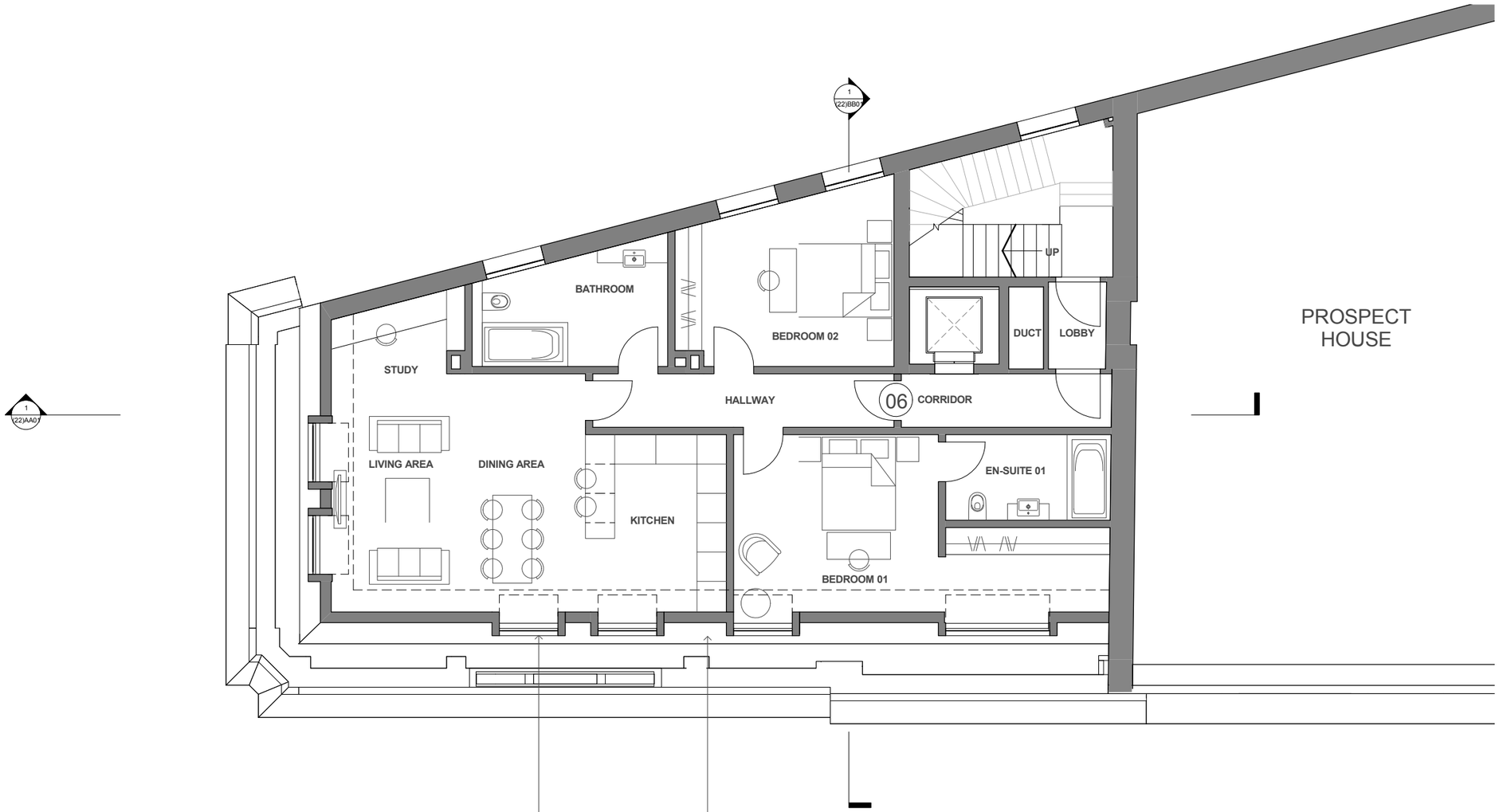
5.9: Proposed Development :

Sixth Floor @ 1:1000



5.10: Proposed Development :
Seventh Floor @ 1:1000

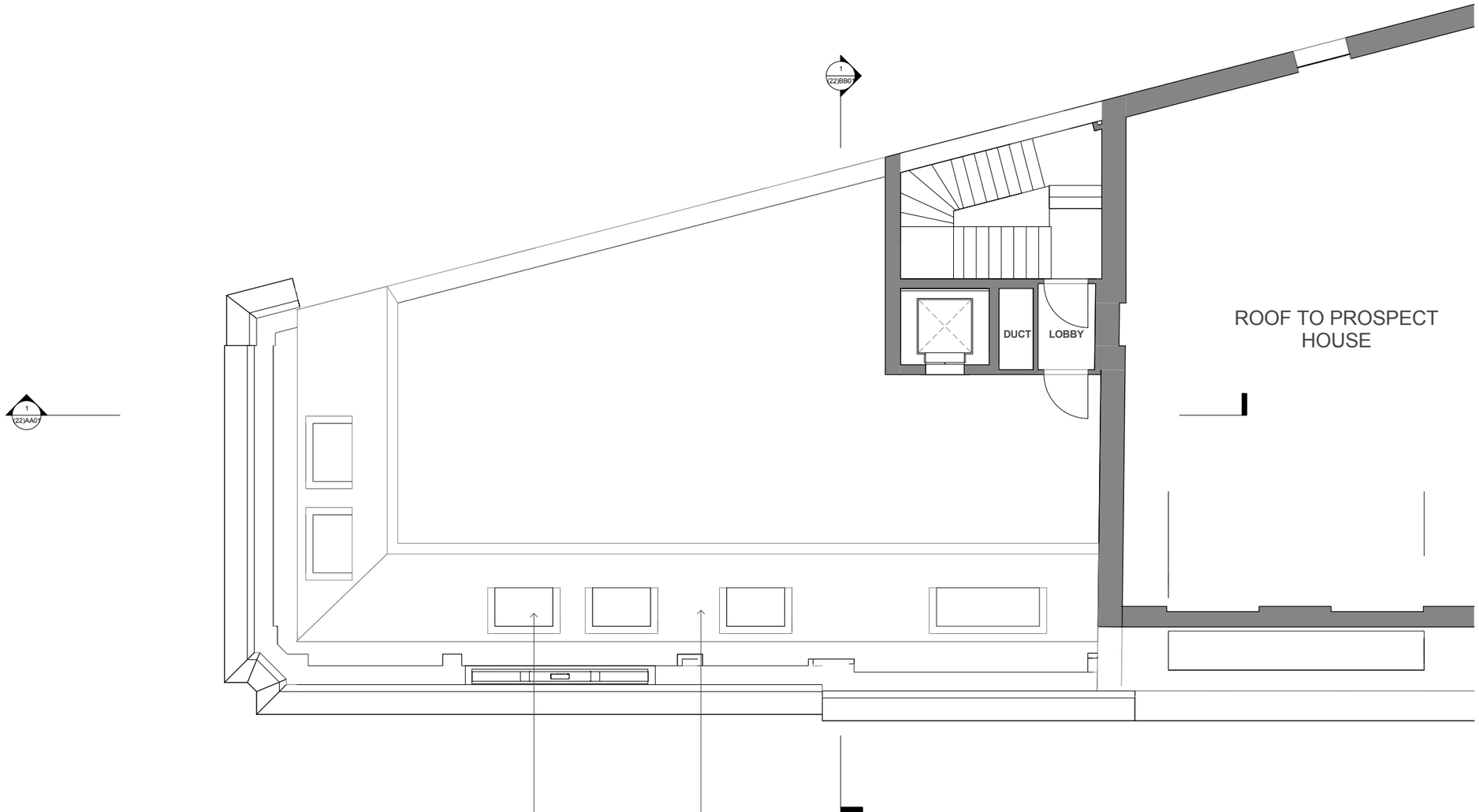


ORMER WINDOWS TO EXTENSION WITH
DOW FRAME MADE OUT OF MATCHING
CLADDING MATERAL & COLOUR

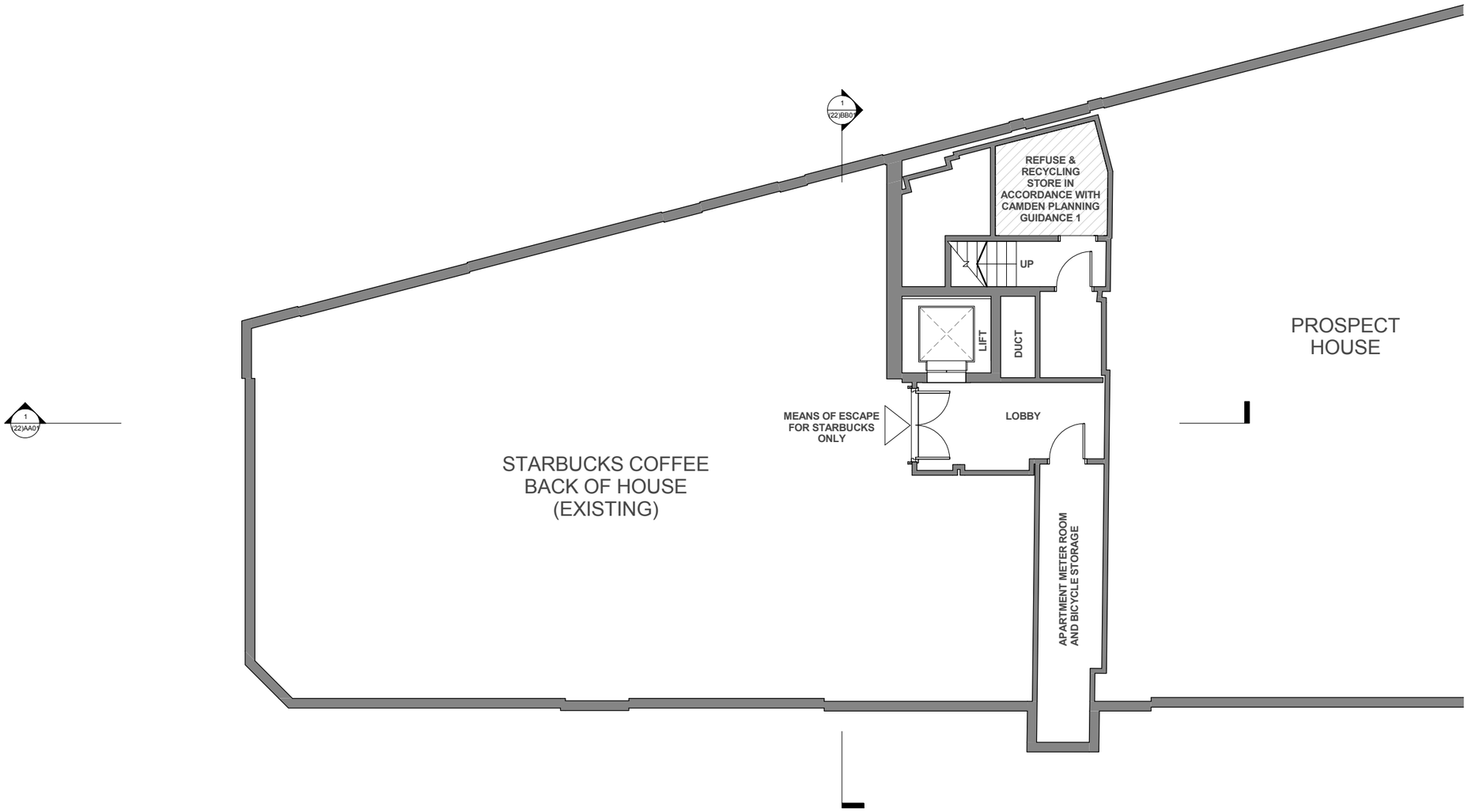
NEW ROOF EXTENSION, SET BACK FROM THE
MAIN EXISTING FACADE. CLAD IN METAL PANELS
IN A 'DIAMOND' SHINGLE PATTERN.
BRASS/GOLD FINISH AND COLOUR TO MAIN
EXTENSION BODY SUBJECT TO APPROVAL

5.11: Proposed Development :

Roof Plan @ 1:1000



5.13: Proposed Development :
Basement Plan @ 1:1000



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5.14: Proposed Development :
Proposed Area Schedule

Apartment 01

GA Level 03	Apartment 01	8.88 m²	Bathroom
GA Level 03	Apartment 01	32.00 m²	Bedroom
GA Level 03	Apartment 01	3.89 m²	Storage
GA Level 02	Apartment 01	7.78 m²	Kitchen
GA Level 02	Apartment 01	11.82 m²	Living Area
GA Level 02	Apartment 01	6.80 m²	Dining Room
GA Level 02	Apartment 01	12.62 m²	Stairs & Circulation
GA Level 03	Apartment 01	3.05 m²	Wardrobe
GA Level 03	Apartment 01	1.10 m²	Storage
		87.93 m²	

Apartment 02

GA Level 02	Apartment 02	11.22 m²	Kitchen
GA Level 02	Apartment 02	7.25 m²	Bathroom
GA Level 02	Apartment 02	13.35 m²	Bedroom 01
GA Level 02	Apartment 02	4.89 m²	Hall
GA Level 02	Apartment 02	15.19 m²	Bedroom 02
GA Level 02	Apartment 02	18.10 m²	Living Area
GA Level 02	Apartment 02	8.37 m²	Dining Area
		78.37 m²	

Apartment 03

GA Level 04	Apartment 03	5.98 m²	En Suite 01
GA Level 04	Apartment 03	20.67 m²	Bedroom 01
GA Level 04	Apartment 03	17.65 m²	Bedroom 03
GA Level 04	Apartment 03	9.09 m²	Bathroom
GA Level 04	Apartment 03	17.32 m²	Living Area
GA Level 04	Apartment 03	10.53 m²	Kitchen
GA Level 04	Apartment 03	13.69 m²	Bedroom 02
GA Level 04	Apartment 03	9.51 m²	Hall
GA Level 04	Apartment 03	10.13 m²	Dining Area
GA Level 04	Apartment 03	3.05 m²	Study
		117.61 m²	

Apartment 04

GA Level 05	Apartment 04	10.00 m²	Hall
GA Level 05	Apartment 04	13.70 m²	Bedroom 02
GA Level 05	Apartment 04	10.54 m²	Bathroom
GA Level 05	Apartment 04	5.98 m²	En Suite 01
GA Level 05	Apartment 04	19.26 m²	Bedroom 01
GA Level 05	Apartment 04	13.57 m²	Bedroom 03
GA Level 05	Apartment 04	22.74 m²	Living Area
GA Level 05	Apartment 04	10.21 m²	Kitchen
GA Level 05	Apartment 04	8.88 m²	Dining Area
GA Level 05	Apartment 04	3.06 m²	Study
GA Level 05	Apartment 04	1.62 m²	Storage
		119.53 m²	

Apartment 05

GA Level 06	Apartment 05	21.31 m²	Bedroom 02
GA Level 06	Apartment 05	7.82 m²	Bathroom
GA Level 06	Apartment 05	19.68 m²	Bedroom 01
GA Level 06	Apartment 05	25.54 m²	Living Area
GA Level 06	Apartment 05	6.37 m²	En Suite 01
GA Level 06	Apartment 05	12.21 m²	Kitchen
GA Level 06	Apartment 05	5.40 m²	Store
GA Level 06	Apartment 05	8.70 m²	Dining Area
GA Level 06	Apartment 05	15.20 m²	Hall
		122.24 m²	

Apartment 06

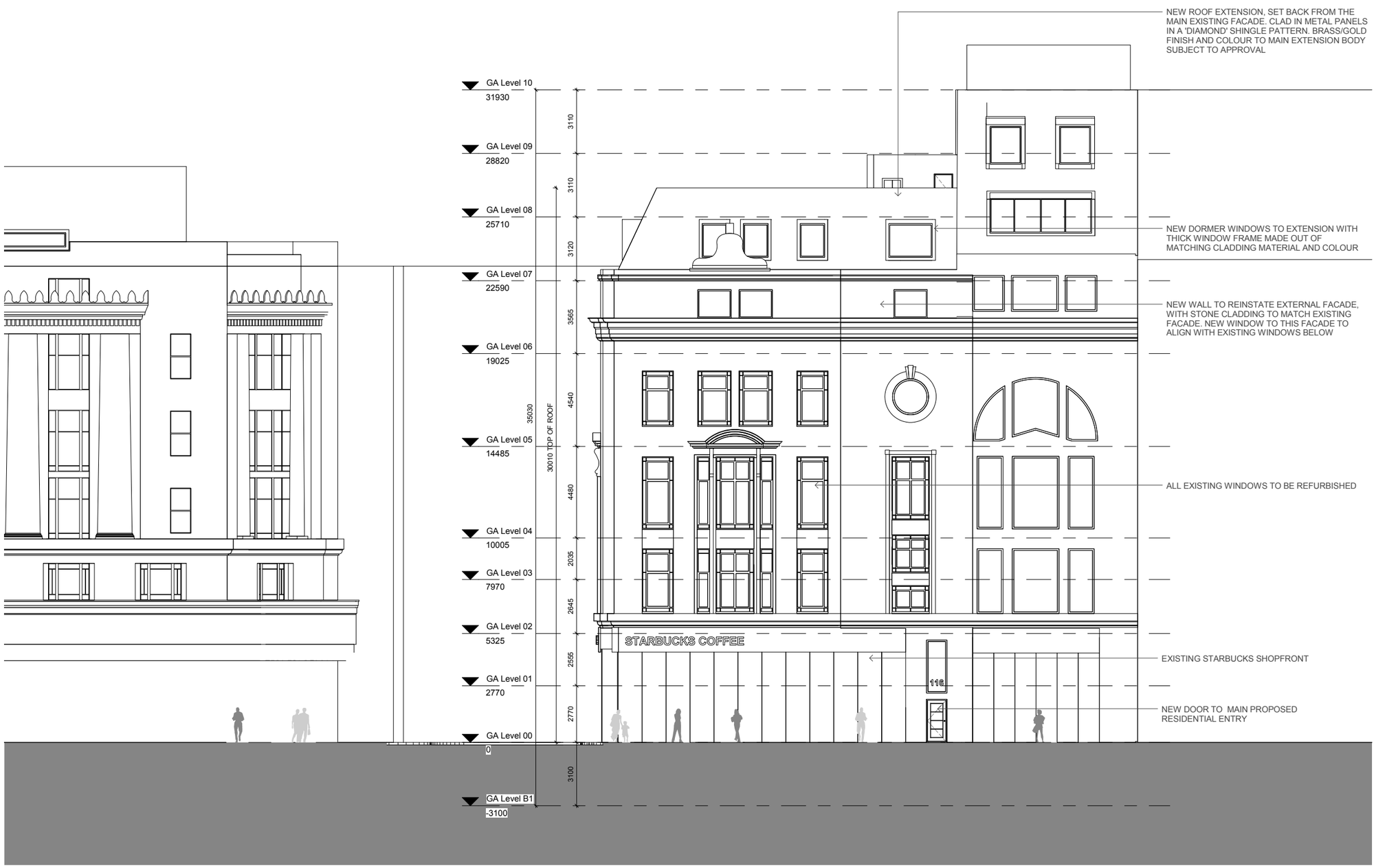
GA Level 07	Apartment 06	24.61 m²	Bedroom 01
GA Level 07	Apartment 06	6.75 m²	Hall
GA Level 07	Apartment 06	14.73 m²	Bedroom 02
GA Level 07	Apartment 06	8.79 m²	Bathroom
GA Level 07	Apartment 06	34.32 m²	Living Area
GA Level 07	Apartment 06	11.75 m²	Kitchen
GA Level 07	Apartment 06	5.91 m²	En Suite 01
		106.86 m²	

Lobby

GA Level 00	Lobby	8.57 m²	Inner
GA Level 00	Lobby	6.81 m²	Outer
		15.38 m²	

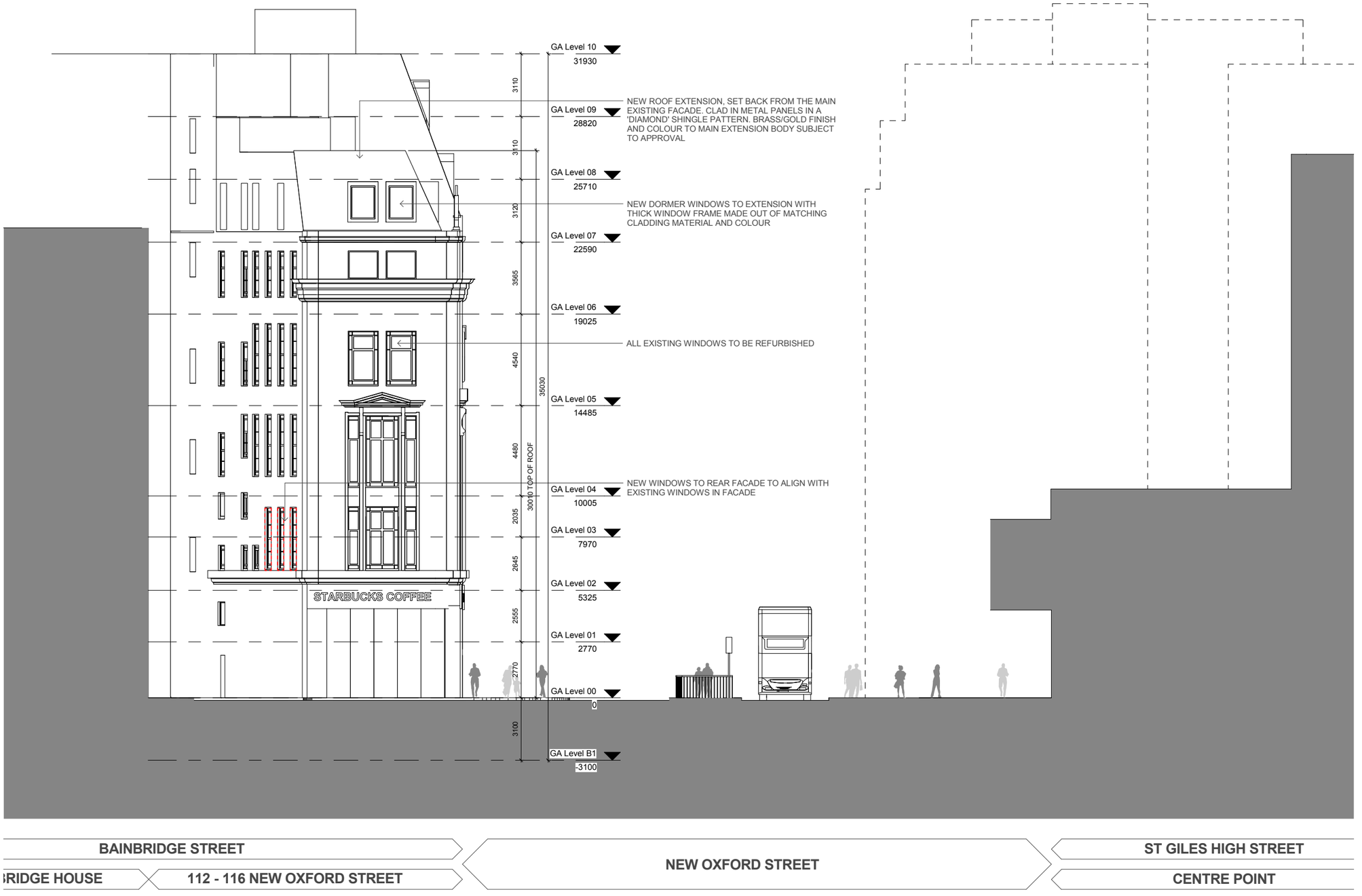
Area Schedule (Gross Building)	
Level	Area
GA Level B1	37.61 m²
GA Level 00	44.45 m²
GA Level 01	23.81 m²
GA Level 02	174.74 m²
GA Level 03	80.04 m²
GA Level 04	174.65 m²
GA Level 05	174.65 m²
GA Level 06	174.63 m²
GA Level 07	148.42 m²
GA Level 08	125.00 m²
	1157.99 m²

5.15: Proposed Development :
New Oxford Street Elevation



1 GA South Elevation
2|1001
1 : 100

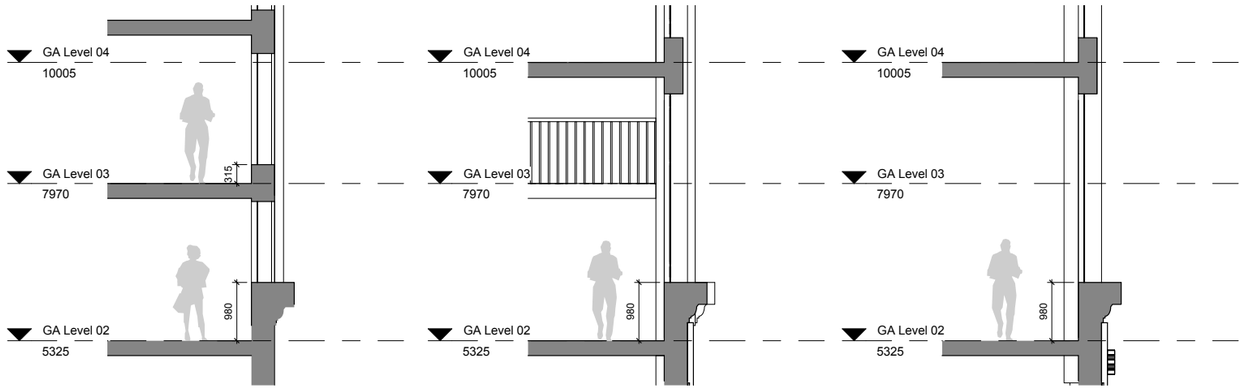
5.16: Proposed Development :
Bainbridge Street Elevation



5.17: Proposed Development :
Bainbridge Street Elevation

Benoy ZaniaUniversal

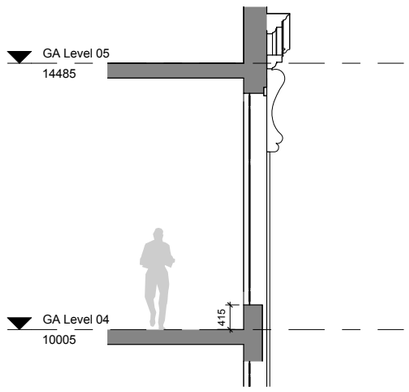
5.18: Proposed Development :
Window Sill Heights



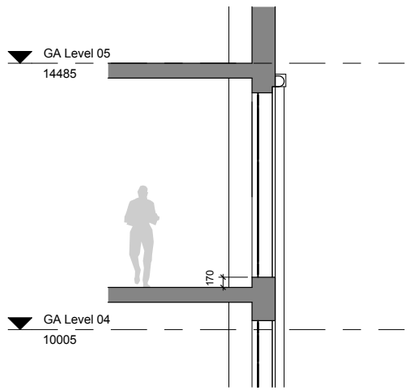
2 (20)1001 Window - Apartment 01a 1 : 50

3 (20)1001 Window - Apartment 01b 1 : 50

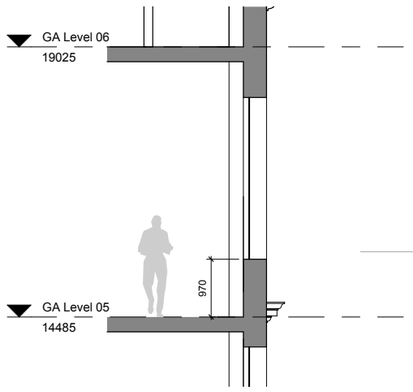
4 (20)1001 Window - Apartment 02 1 : 50



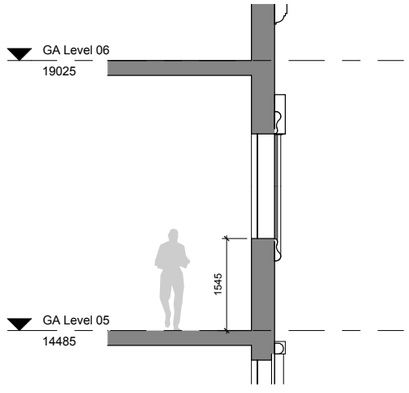
5 (20)3001 Window - Apartment 03a 1 : 50



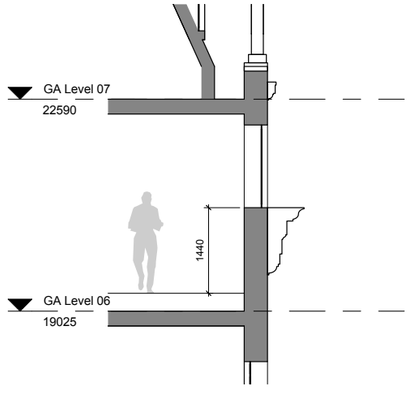
6 (20)3001 Window - Apartment 03b 1 : 50



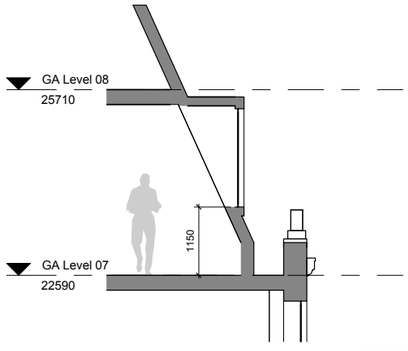
7 (20)5001 Window - Apartment 04a 1 : 50



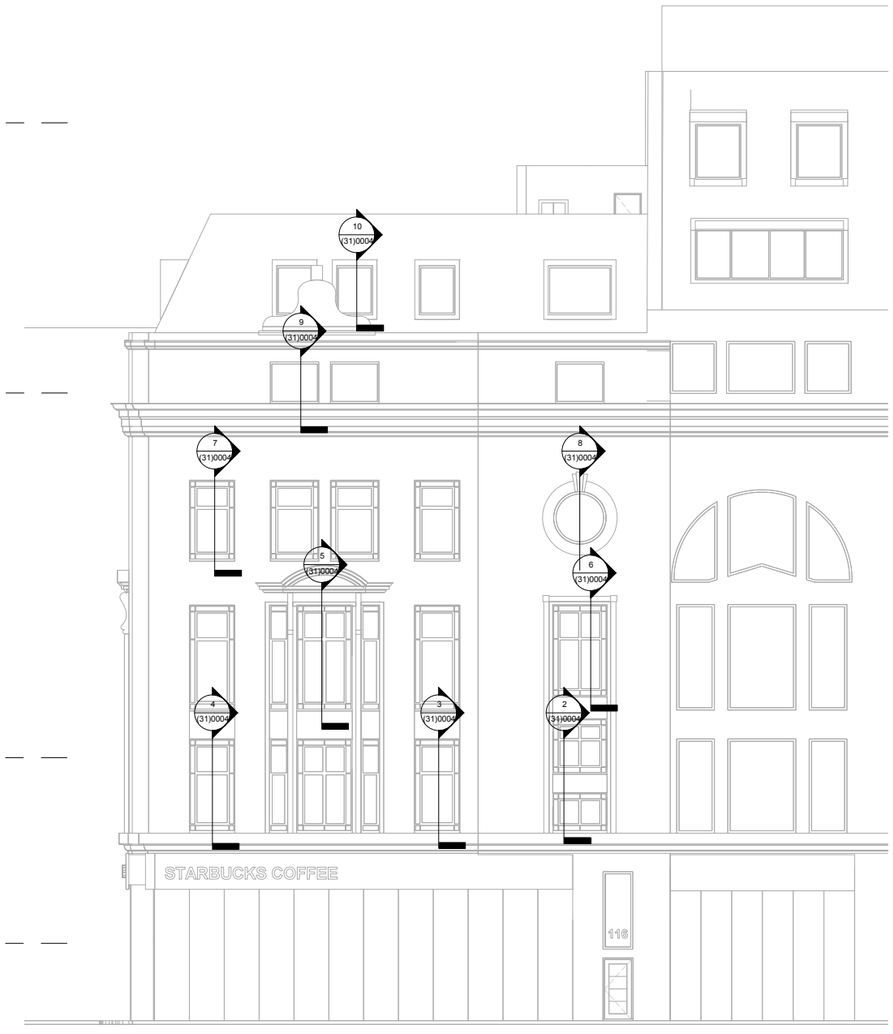
8 (20)5001 Window - Apartment 04b 1 : 50



9 (20)6001 Window - Apartment 05 1 : 50



10 (20)7001 Window - Apartment 06 1 : 50



1 (32)1001 Key Sil Elevation - South 1 : 100

5.18: Proposed Development :
Coloured Elevations;
New Oxford Street

Benoy ZaniaUniversal

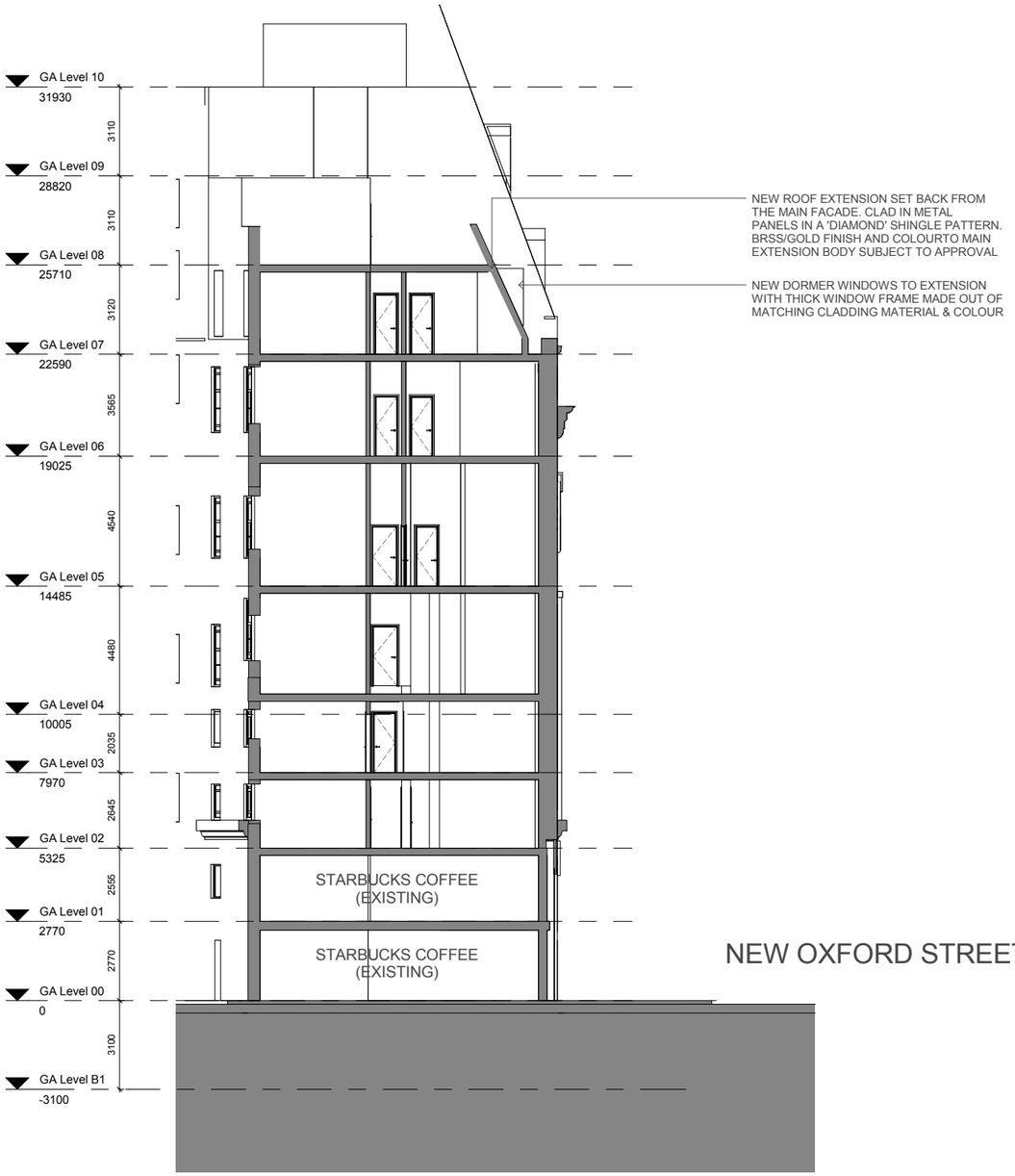
5.19: Proposed Development :

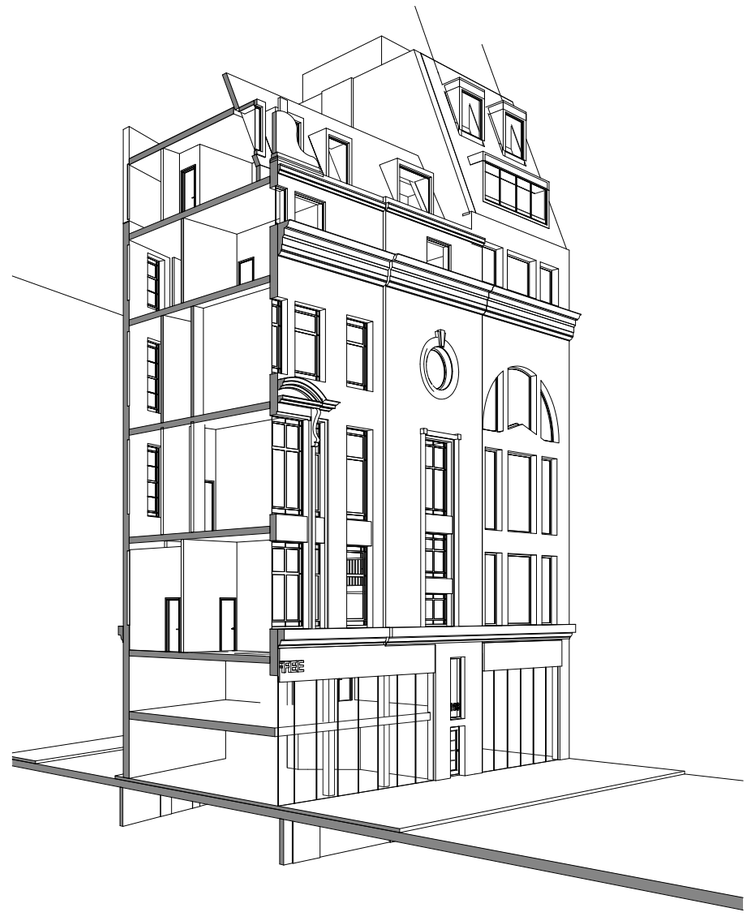
Coloured Elevation; Bainbridge Street

5.20: Proposed Development :
Coloured Elevation;
Bainbridge Street

Benoy ZaniaUniversal

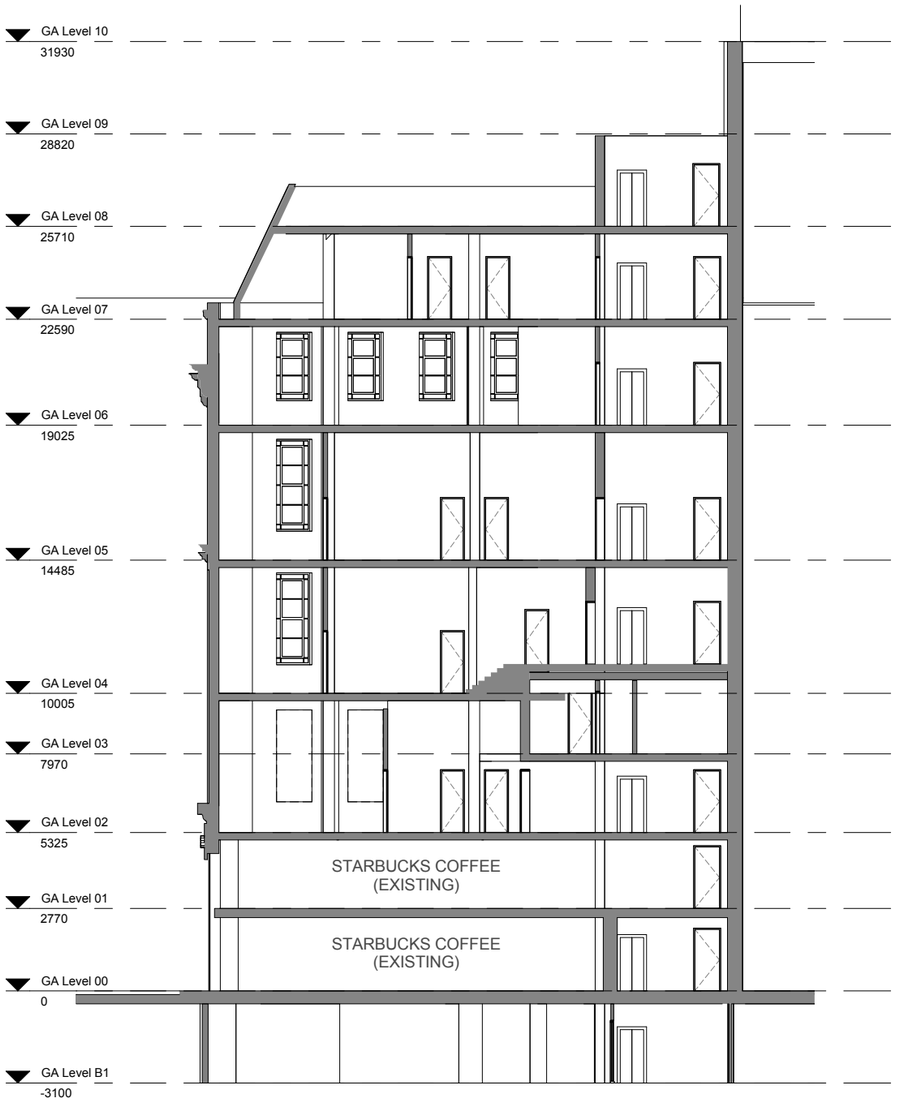
5.21: Proposed Development :
Short Cross Section

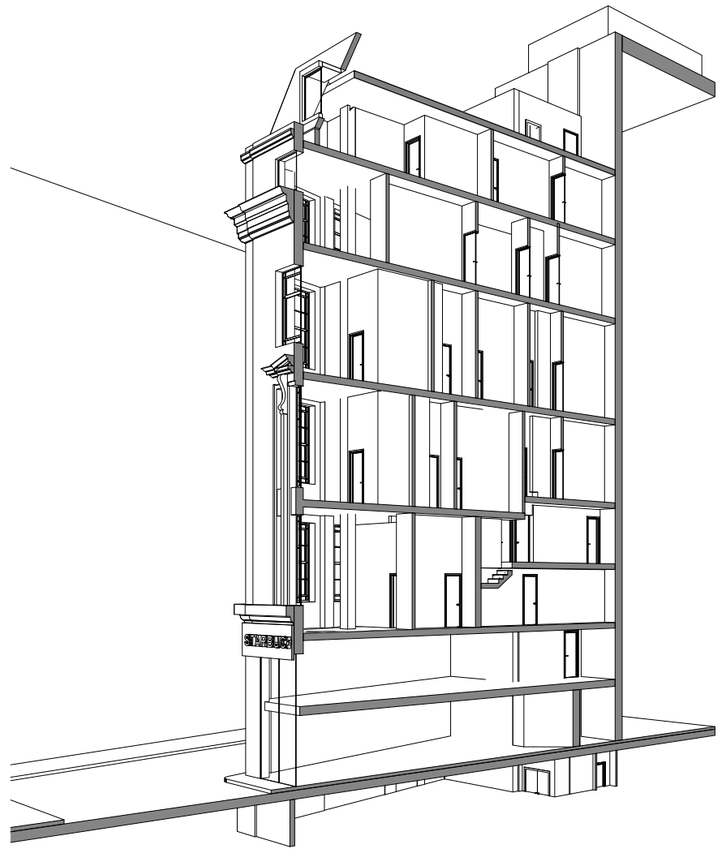




Benoy ZaniaUniversal

5.22: Proposed Development :
Long Cross Section





6.0: Proposed Development :
Photomontage Within Context
View From Tottenham Court Road Junction

6.0: Proposed Development :
Photomontage Within Context
View From New Oxford Street

7.0: Supporting Statements:

In addition to the provision of the planning and regeneration benefits which are intrinsic to the proposed scheme, it is anticipated that an appropriate package of Section 106 contributions will be negotiated and agreed with London Borough of Camden in due course in accordance with the test set out in the Community Infrastructure Regulations 2010.

It is anticipated that planning obligations could include the following areas:

- Affordable Housing
- Education
- Public Open Space
- Transport
- CIL (Community Infrastructure levy)

As part of the Planning Submission we are aware that a series of statements and reports have been requested by the camden Council which are listed below:

- Marketing
- local procurement and Local Employment
- Listed Building / Conservation Area Appraisal
- Affordable Housing
- Secure By Design
- Accessibility Statement
- Life Time Homes
- Service management Plan
- Construction Management Plan

7.1: Supporting Statements :
Marketing Report

Report relating to

112-116 New Oxford Street, W1

Contents

1. Introduction and location

For research reporting purposes the subject property is classed as Grade B office space due to the fact that it has not undergone any significant refurbishment/development works in the last five-years and due to its configuration and size of floor plates.

The subject property lies on the southern edge of the Camden borough close to the boundary with the City of Westminster. Its location aligns it more closely with characteristics of the West End office market as opposed to Camden, in terms of supply and demand trends. The majority of office stock in Camden falls within the Savills research boundary of the Noho submarket. Noho runs from Woburn Place/Southampton Row to Portland Place, and is bounded to the north and south by Euston Road and Oxford Street respectively.

For clarity, analysis of the supply and demand trends for the purposes of this report will be based on the Noho submarket.

2. Market Commentary

2.1 Supply

The Noho submarket is the West End's largest submarket with an office stock figure of approximately 13m sq ft, this is 11% of the West End's total office stock.

We estimate there is 592,000 sq ft of available space in the submarket, this equates to a vacancy rate of 5%, this is above the overall vacancy rate of the wider West End which currently stands at 3.8%.

58% of space is of Grade A quality, this is just under 343,000 sq ft of available Grade A space. The recent rise in Grade A space in Noho is the result of 90,000 sq ft of developments completing in Noho and entering the supply figures this year. 42% of all space available in Noho is of Grade B quality, this is 250,000 sq ft of available Grade B space.

Our supply data estimates that office property in Noho has been vacant on average around 1.3 years. When analysing the amount of time Grade A and Grade B quality space has been available, the difference is significant, on average Grade A space has been vacant for 0.7 years whilst Grade B space on average is available for 1.7 years.

Figure 1 shows the percentage breakdown of available office property in Noho. 100% of all office space available more than two years in the submarket is of Grade B quality, putting this in to context this equates to149,000 sq ft of Grade B office space being vacant for more than two years.

Figure 2.1 Years vacant by grade

Years Vacant	Grade A	Grade B
Less than 1 year	80%	20%
More than 1 less than 2	56%	44%
More than 2 less than 3	0%	100%
More than 3 less than 4	0%	100%
More than 4 less than 5	0%	100%
More than 5	0%	100%

An important factor to take in to consideration when assessing the potential impact of a loss in office space is to look at the 'years of supply' in the area. In the national market place two years of supply suggests an average level of supply.

Across all grades of office space in Noho, years of supply stands at 1 year, suggesting that the market is under supplied, however this is more or less in-line with the wider West End market. 11 out of 12 submarkets in the West End are currently under supplied in terms of years of supply.

2.2 Development

After four years of restricted levels of development activity in the West End, 2013 will see a return to average levels of development activity reaching 1.8m sq ft.

In Noho, development activity has also picked up with approximately 678,000 sq ft of developments and extensive refurbishments to enter the supply figures over the next two years (2013-14). The average level of completions seen per annum in Noho is 290,000 sq ft, in 2013 220,200 sq ft will be complete, down on the average. 2014 however, will see a return to above average levels of completions at 457,500 sq ft.

Figure 2 shows a list of developments that are due for completion in the Noho submarket over the next two years (2013-14).

Figure 2.2 Development pipeline in Noho

Building	STREET	PC	TYPE	SPECULATIVE	Timing	STATUS
St George's Court, 2-12	Bloomsbury Way / 2-28 New Oxford St	WC1	refurb	152,239	Q3 2013	U/C
2	Stephen Street, W1	W1	refurb	68,000	Q3 2013	U/C
Walmar House, 288/300	Regent street	w1	refurb	40,000	Q1 2014	U/C
1	Mabledon Place	WC1	dev	87,500	Q1 2014	PPG
Fitzroy Place	Mortimer Street	W1	dev	260,000	Q4 2014	APP
Regent House	Edgware Road/George St	W1	dev	50,000	Q4 2014	site
61-63	Tottenham Court Road	W1	dev	20,000	Q4 2014	PPG
West End Delivery Office	Newman Street/Rathbone place	W1	dev	230,000	Unknown	SITE
Euston Station		NW1	dev	150,000	Unknown	APP

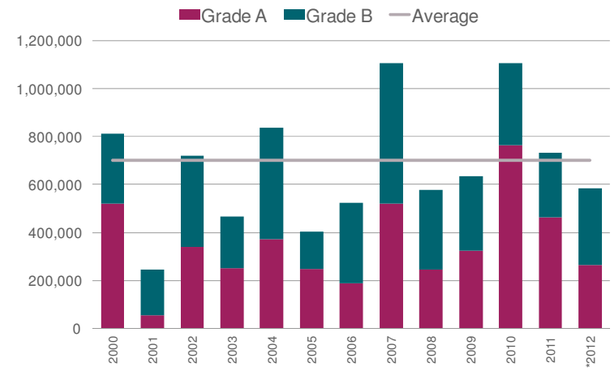
Although not in the immediate vicinity of the subject property the regeneration of King's Cross will play in important part in shaping the future of the wider Camden office market. The site spans 67 acres and over the next 10 years, 50 buildings totalling 8m sq ft, 20 new streets and 10 new public spaces will be created. 3.4m sq ft office space will be delivered, up to 2,000 homes and serviced apartments, 500,000 sq ft of retail, up to 300 hotel bedrooms and 650 student units.

Focussing on the office element, 3.4m sq ft of office space in some 23 buildings will be built. A number of these buildings are already designed and some have consented planning. 184,000 sq ft in two buildings is being speculatively built at the scheme, 57,000 sq ft at 1 Pancras Square will be delivered in Q3 2013 and 127,000 sq ft at 2 Pancras Square will be delivered in Q2 2014. 568,000 sq ft has already been pre-let at the scheme, including BNP Paribas taking 350,000 sq ft in 2010, in 2011 Camden Council took 150,000 sq ft, Hoare Lea took 22,000 sq ft and Argent took 9,000 sq ft.

2.3 Take-up

Take-up in 2011 reached 731,500 sq ft, this is up on the 10-year average of 600,000 sq ft. As the graph below demonstrates there has been a bias towards Grade A quality space in recent years in the Noho market. Over a five-year period (2007-11) 56% of space taken has been of Grade A quality. 63% of space taken in 2011 was of the best quality.

Figure 2.3 Take-up in Noho



*As at end Sept 12

As at end September 2012 take-up has reached 583,000 sq ft, this was boosted by two large deals of 97,000 sq ft at Greater London House to Asos and 44,000 sq ft at Oxford House, 76 Oxford Street to Publicis. Both deals were Grade B lettings, thus skewing Grade A office take-up in 2012 to be just 45%, down on the average of 56%. With just under 120,000 sq ft of space under offer in Noho, we estimate take-up levels to come in at average levels.

The structure of office demand in Noho mirrors that of the West End as a whole, with no dependency on any one business sector. The most dominant business sector over the period of 2007-2011 has been the Creative sector, taking a 21% share. The Professional and Public Services sector take the next largest shares with 14% and 16% respectively.

Going forward, the Public Sector's share of take-up in this market is likely to decline as the Government Property Unit (GPU) seeks to rationalise its central London office property needs. According to figures from the GPU, the government occupies 10m sq ft offices in central London, 57% of which is leasehold. The GPU's aspiration is to reduce occupancy by 45-50% over the next decade. Furthermore, over the next three years (2012-14), Oxford Economics forecasts Public sector employment to fall by 3.3% in Westminster and 3.1% in Camden. These factors are likely to result in a rise of tenant returns from this sector of Grade B quality office space back in to the market.

7.1: Supporting Statements :
Marketing Report

3. Summary

- There is a substantial amount of long term vacant (more than 2 years) Grade B office floor space available in Noho, approximately 149,000 sq ft.
- Development pipeline in Noho is returning to average levels, we estimate 678,000 sq ft of developments to enter the supply figures over the next two years (2013-14). This will help up soak up average levels of demand expected over the next three years.
- The biggest take-up of new space by tenants is of Grade A floorspace (on average).
- There is a significant amount of new Grade A floor space at Kings Cross.
- The strategic relocation of Government Departments to outside of London will increase supply and vacancy levels.

Important Note

Finally, in accordance with our normal practice, we would state that this report is for general informative purposes only and does not constitute a formal valuation, appraisal or recommendation. It is only for the use of the persons to whom it is addressed and no responsibility can be accepted to any third party for the whole or any part of its contents. It may not be published, reproduced or quoted in part or in whole, nor may it be used as a basis for any contract, prospectus, agreement or other document without prior consent, which will not be unreasonably withheld.

As is customary with such reports, our findings should be regarded as valid for a limited period of time and should be subject to examination at regular intervals.

Whilst every effort has been made to ensure that the data contained in it is correct, no responsibility can be taken for omissions or erroneous data provided by a third party or due to information being unavailable or inaccessible during the research period. The estimates and conclusions contained in this report have been conscientiously prepared in the light of our experience in the property market and information that we were able to collect, but their accuracy is in no way guaranteed.

7.2: Supporting Statements: Local Procurement and Local Employment

The proposed development at 112-116 New Oxford Street is for residential use. With this use there is no perceived local or long term employment associated with our Planning Application.

Naturally, there is some potential employment in terms of ‘types’ of services the apartments could generate, (EG Cleaning, Laundry etc).

Potentially there could be a requirement for an inhouse secure/commissionaire ‘role’ but this would need to be discussed at length with the developer and form part of a service plan for the residential development long term.

During the construction phase, it is likely that the contractor would be using local tradesman, or subcontractors. Any materials being used for the construction would be sourced locally through building suppliers.

All sub-consultants on the client side are likely to be London based.

7.3: Supporting Statements : Affordable Housing / Viability

The proposed development at 112-116 New oxford Street will have 8 new apartments within it.

The building Gross External Area (GEA) is 1157.99 sq m (gross) including the proposed extension.

The requirement for affordable housing does not therefore apply as the development does not:-

- Provide an additional 1,000 sq m. or more (gross) of housing in use class C3 or C4, or
- Provide an addition of 200 sq m or more (gross) of non-residential floor space.
- Involves the loss of affordable housing floor space.
- Provide 10 apartments.

The apartments type breakdown is as follows numbers are 4, 3 bedroom apartments and 1, 1 bedroom sudio apartment, and 2, 2 bedroom apartment.

This provides us with 57.1% 3 bedroom apartments which meets the Councils requirements for a mix of greater than 28.5% of 2 bedroom apartments, 14.2% of 1 bedroom apartments.

Whilst the proposals are to a high standard and will provide well designed accommodation that meets the needs of a range of occupiers it is not practical to include affordable housing within this development which is relatively small and primarily market housing.

7.4: Supporting Statements :
Conservation Area Appraisal Design Statement

The Design Team, have had consultations with Camden Council Planning Officers and The Principal Planner (Conservation and Design). The design proposal was explained to both Camden Council officers along with the aid explanatory visuals.

After these meetings our design booklet was sent to local conservation area bodies, Covent Garden Community Association and The Bloomsbury Association for their review. (The responses received by the Design Team from these organisations are on the facing page). The Design Team have taken note of the comments made, and have responded by amending their original design to aline itself with certain concerns raised.

The building is not listed, however it is considered to make a positive contribution to the character and appearance of the conservation area. The Design Team has, from the out set being aware of the local significance of the 112-116 New Office Street location. Not just in terms of its strong presence from the corner of Oxford Street and Tottenham Court Road, but also with its facade forming the ‘end piece’ to Prospect House.

The proposed extension has not been conceived or designed as a dominant piece of architecture, but as a modest ‘addition’ which is read as part of the Cities ‘Skyscape’. Its form responds to the floor plan of the main building below. The extension also sits back from the New Oxford Street facade edge, and the facade turning the corner onto Bainbridge Street. But it sits flush with the main rear Bainsbridge facade. All new window openings within the extension have been designed as ‘Dormer’ types, which is in keeping with the wider architectural context.

The proposed materials for the new extension will be metal panels, in the form of ‘Diamond’ shingles. The colour will be a Brass/Gold colour, which over time will mute to give a softer colour. The Dormer windows within the new extension will also be of the same material finish and will give a strong ‘frame’ to the new windows. The new portion of stone which will form the completed Sixth floor level shall mater the main facade.

The main facade to new oxford Street will not be altered externally, all existing windows will be maintained and refurbished. The Bainsbridge Street rear facade will have new windows inserted into it, but these will follow (where possible) the current fenestration rhythm. The existing windows both on the front and rear facades will be refurbished during the construction.

Demolition of some ‘parts’ of the existing building will be necessary to complete the proposed redevelopment, the Design Team have limited the extent of any demolition work, the main area where this takes place will be at roof level. The proposed demolition will allow for the new extension to take place. To make the apartments work on certain floors, new window openings will needed these will be cut into the existing rear brickwork facade. Any work carried out will be made good and repaired with matching materials. (Please refer back to section 3.0 As Existing drawings to see the extent of the proposed demolition work).

7.5: Supporting Statements :
Conservation Area Appraisal Comments On Proposed Design

RECEIVED 9th OCTOBER 2012

Thank you for the updated drawing. In my view this is a significant improvement. The roof extension is much more contextual whilst still retaining a distinctly contemporary appearance. It would also be useful to have some perspective drawings from street level as the roof extension does appear bulkier than it is likely to from the public realm. We will still need to be satisfied that the roof extension sits comfortably on the building in terms of those key medium and long distance views along New Oxford Street.

Thank you

Hannah Walker

Principal Planner (Conservation and Design)

RECEIVED 24th SEPTEMBER 2012

We've read the documentation re the above property and have also seen Bloomsbury's response to it. The property is right on the border between Bloomsbury and Covent Garden, at least it is in terms of how we've divided the area between us for commenting purposes.

Stephen Heath has provided comprehensive comment and we particularly support the comments on the following:

1. Any type of short-term rental is something we feel very strongly about as we see a steady stream of conversions from office to residential with small units being proposed that are clearly aimed at the letting market. Such usage has no positive effect on the local community.

2. We support Bloomsbury's proposal to aggregate S106 monies in order to provide affordable housing within the immediate area where the money is created. At the moment it disappears into a general pot.

4. The views mentioned by Stephen are of concern to us also.

The other points are not ones to which we are likely to add very much.

Thank you for inviting our comment.

Regards

Mike Leeson

Covent Garden Community Association

RECEIVED 16th SEPTEMBER 2012

Thank you for getting in touch with us prior to the application being submitted. You have asked for our initial comments and these follow.

1. In terms of use, whilst residential is the obvious choice for this and other low grade office buildings in the area, we would be nervous about serviced apartments or any other form of short-term rental. However, we would like to see the case for this change clearly set out and consideration given to the points we make below.

2. Under current policy, affordable housing provision will need to be addressed. Your client will not wish to provide it on site and the Council will probably settle for a financial contribution. We feel that off-site local provision is becoming an increasingly attractive proposition through change of use and refurbishment of low grade office buildings elsewhere in established residential 'quarters' such as Bloomsbury Village, Covent Garden and Soho. We will be looking to promote this as a solution as we have done for the adjacent change of use of Centre Point to residential. This, in itself, has proved controversial and there would seem to be an intriguing possibility for your client to enter into some sort of agreement with Almacantar whereby the affordable housing generated by Centre Point might itself be provided in 112-116 New Oxford Street.

3. An issue that is starting to concern many is loss of this type of office accommodation which is driving many smaller businesses out of the area so a change of use to residential is not such a clear issue with us as it might once have been. We will seek to encourage change of use in established residential 'quarters' but we do not view this as the character of New Oxford Street.

4. We are impressed by the thought that has gone into the design proposal so far. In principle, we see it as an improvement - an approach that we feel we could support - but suggest that the extension of the building needs to be considered more carefully with the oblique street views of the terrace of which it is a part. There is a consistent architectural expression that extends from Bainbridge Street to Dyott Street, into which a contemporary intervention needs to be inserted very carefully, particularly in its relationship to neighbouring listed buildings. The sense of continuity and the trace of history should not be entirely negated. The massing images in Sections 5 and 6 of the Extensions Studies document need to show the adjoining buildings in more detail for the proposals to be convincing and we are not sure that the analysis undertaken so far has fully addressed all the issues. We would like the views over the top of the Dominion Theatre from Bedford Square to be taken into account along with the very prominent view from the top of Charing Cross Road. VVIs for key views should be submitted with the application.

5. Roofscape is important and we expect to see a more thorough analysis of what sort of plant is likely to be at roof level. Building Control is unlikely to be very happy with a single stair serving a building of this height and this infers a fire engineered solution with roof mounted smoke extract plant. How is the proposal going to accommodate this? Also how is window cleaning going to be dealt with? In any solution, we would like to see some evidence of a legally binding agreement with the adjoining owner to deal with the unsightly and obtrusive plant at roof level adjacent to the party wall that presently dominates the view from Oxford Street.

6. Street level impact is crucial not only in terms of urban design but also for making the development commercially attractive, particularly on the Bainbridge Street frontage. There are serious problems here with drug related crime and anti-social behaviour and the lack of any active frontage on this side of the street is a major contributory factor. We would like to see early consideration given to this in a crime impact assessment that is developed with the local Police Safer Neighbourhood Team with the ambition of establishing some form active frontage to Bainbridge Street. It would be unfortunate if it is only a refuse store. A sensitive approach to retail signage and CCTV would also be beneficial.

7. We are not at all happy with Park House being quoted as a design precedent to emulate. It was a mistake that Westminster will regret for decades and we would not like to see any references to its visual vulgarity at the other end of Oxford Street.

8. As mentioned earlier, being located in an area that is of interest to Covent Garden Community Association and the Soho Society, as well as ourselves, we suggest that you also seek their views. We are therefore copying this message to them and we may, in due course, decide to submit joint comments on the application.

We hope that this is constructive and would be happy to let you have our further thoughts on proposals as they develop.

Regards,

Stephen Heath

On behalf of the Bloomsbury Association

7.6: Supporting Statements :
Secured-By-Design

The Design Team, have been in consultation with the local Secure-by-design officer, where the project was described in detail.

The principle points covered in our meeting were the:

- Change of use
- The shared escape with Starbucks from the first floor and Back of House basement area.
- Accessibility at the ground floor.
- Crime prevention methods to main front door.
- The use of external lighting to ground floor areas.

Below is a list of the keys points which will be reviewed and actioned in more detail when 112-116 New Oxford Street moves into development stage.

1. All communal and residential doors will be to BS pas 23/24 2012. This will include every flat entrance door. Fire doors on stairs to this standard will be required. There should not be a mix at any level between residents and customers of the ground level shop.

2. Windows - None applicable.

3. Refuse and cycle store - These will have fit for purpose self closing and locking door. If further entry can be gained into the building then a further door to BS PAS 23/24 must be fitted. This is the general requirements, although specific details are not known at this time.

4. Post boxes - A through the wall scheme could be fitted or a foyer with BS PAS 23/24 2012 door fitted with post boxes located in this foyer.

5. Lighting of the property will be to a uniform level.

6. Utility meters will be located in central location.

7. Access control will be video and audio and No trades button fitted.

8. An alarm should be considered. The scheme requires a fused spur be fitted near the entrance to each flat to facilitate an alarm.

9. CCTV should be considered and the information commissioner's guidelines complied with. http://www.ico.gov.uk;

10. Lift control may be activated with the use of a fob.

7.7: Supporting Statements:
Service Management Plan

The basic planning arrangement will comprise of 6 dwellings above an existing ‘Starbucks’ Coffee Shop.

GENERAL:

The main entrance is on New Oxford Street this will be for residents to enter their property on a daily basis’s. Their are two lobbies proposed an outer lobby and an inner lobby. The outer lobby will contain wall mounted post boxes for all the apartments, the inner lobby will be kept clear to allow for maximum space in front and around the lift doors.

The existing entrance on Bainbridge Street will be maintained, but used for Means of escape from the apartments and ‘Existing Starbucks’ coffee shop and service entrance for the apartments (this would entail removal of refuse, and goods deliveries).

The main stair will be clear of obstacles, doors on to every apartment floor will have provision for them to be locked, and access to them via keys provided to residents.

CLEANING/REFUSE:

It is hoped that as part of the agreement between the building owner and any tenants that all apartments would be cleaned by the same cleaning company allowing for all refuse to be removed (both from the apartments and the building) by one organisation. This arrangement could extend to recycling and window cleaning. A clearly defined area (within the basement) has been allocated for the storage of refuse and recycling as marked on the proposed drawings.

BIKE STORAGE:

In section 7.10, we explain in more detail our aspiration in providing cycles for each of the apartments to be created within this development. But this storage would be within the basement area allowing residents to store their cycles without the need for having them within their apartments or main circulation areas.

INCOMING SERVICES METERS:

These would be installed within one of the basement rooms, these would be set within a cupboard which would allow meter reading to take place without the need for external meter reading staff to enter individual apartments. The access to this room could be made via the Bainsbridge Street service door.

7.8: Supporting Statements :
Accessibility Statement

Underlying Philosophy
The client for the project, Zania Universal, is committed to a policy of equality, inclusion and accessibility in the delivery of the proposed re-development of 112-116 New Oxford Street. This statement aims to ensure maximum awareness by the design team of the various needs of those with physical and/or mental impairments, as well as other groups with access needs such as parents with children, and the elderly.

Consultation
The project is being designed to comply with the following in so far as they apply to each use:

- The Building Regulations 2000 'Access to and use of Buildings' Approved Document 'M' 2004 edition.
- British Standard Code of Practice 8300:2009, 'Design of Buildings and their Approaches to meet the needs of Disabled People'.
- EN 81-70: 2003 'Accessibility to lifts for persons including persons with high disability'
- Disability Discrimination Act 1995 and 2005.
- DDA Code of Practice - 'Rights of Access: services to the public, public authority functions, private clubs and premises'.
- British Standards 5588- '8': Code of Practice for means of escape for disabled people (no longer current but cited in the Building Regulations).
- British Standard 9999.
- Guidance in the use of Tactile Planning: DTLR Mobility and Inclusion Unit.

Other informative documents consulted include:
- Inclusive Environments 'Designing for Accessibility' 2004 Edition.

7.8: Supporting Statements :
Accessibility Statement

Item	Contents
1.0	Introduction
1.1	Purpose of Report
1.2	Proposal
2.0	Provision for Access to and use of building
2.1	Principle entrance from street
2.2	Entrance hallway
2.3	Access to upper storeys
2.4	Access within flats
2.5	Wheelchair housing standards provision for 1 flat.
3.0	Access standards & Guidance
3.1	Approved Document Part M
3.2	BS 8300:2009 Design of buildings and their approaches to meet the needs of disabled people
3.3	Camden Planning Guidance CPG2

1.0	Introduction
1.1	Purpose of Report - This access statement includes an assessment of the level of access and provision for people with disabilities, considering the guidance laid out in Approved document M and Camden Planning Guidance CPG2.
1.2	Proposal - The proposal is to extend and refurbish an existing building which currently comprises a shop at ground and first floors with offices above on four floors. It is proposed that an additional floors is incorporated and the offices are converted to provide 6 flats.
2.0	Provision for Access to and use of building
2.1	Principle entrance from street – The entrance to the building is on New Oxford Street and is level with a clear opening door width of at least 775mm and an accessible threshold.
2.2	Entrance hallway – The hallway is 1500mm wide.
2.3	Access to upper storeys – A lift will be provided that has a) a clear landing of 1500mm x 1500mm in front of its entrance, b) a door will be 800mm wide, c) a car whose width is at least 900mm and depth of 1250mm, d) has landing and car controls which are not less than 900mm and not more than 1200mm above the landing and the car floor, at a distance of not more than 400mm from the front wall, e) with suitable tactile indication on the landing and adjacent to the lift call button to identify the storey in question, f) with suitable tactile indication on or adjacent to the lift buttons within the car to confirm the floor selected, g) incorporates a signalling system which gives visual notification that the lift is answering a landing call and a “dwell time” of 5 seconds before its doors begins to close after they are fully open; the system may be overridden by a door re-activating device which relies on appropriate electronic methods, but not a door edge pressure system, provided that the minimum time for a lift door to remain fully open is 3 seconds and; h) incorporates visual and audible indication of the floor reached.
2.4	Access within flats – The corridors within all flats have an unobstructed width of 1150mm and all door widths will be a minimum of 800mm which complies with AD – M, table 4. This is to facilitate access into habitable rooms and a room containing a WC.
2.5	Wheelchair housing standards provision for 1 no flat – CPG 2 requires that 10% of flats will comply with wheelchair housing standards and meet the criteria for Lifetime homes. Flat number 06 has been planned to meet these standards including the 16 Lifetime homes criteria demonstrated in the schedule within this section.

7.9: Supporting Statements :
Life Time Homes

LIFETIME HOMES CRITERIA	KEY OBJECTIVES	DETAILED CRITERIA	PROPOSALS TO MEET STANDARD
Parking (width or widening capability)	Provide, or enable by cost effective adaptation, parking that makes getting into and out of the vehicle as convenient as possible for the widest range of people (including those with reduced mobility and/or those with children). General Note: Criterion 1 is not relevant to developments that do not contain any parking provision (for specific requirements refer to Camden Development Policy – DP18 Parking standards and limiting the availability of car parking – which specifically discourages on-site parking	a) 'On plot' (non-communal) parking: Where a dwelling has car parking within its individual plot (or title) boundary, at least one parking space length should be capable of enlargement to achieve a minimum width of 3300mm. b) Communal or shared parking: Where parking is provided by communal or shared bays, spaces should be provided with a width of 3300mm and in accordance with the specification give in Appendix 2 on page 65 or www.lifetime-homes.org.uk	This criterion is not relevant as the development does not contain parking provision.
Approach to dwelling from parking (distance, gradients and widths)	Enable convenient movement between the vehicle and dwelling for the widest range of people, including those with reduced mobility and/or those carrying children or shopping.	The distance from the car parking space of Criterion 2 to the dwelling entrance (or relevant block entrance or lift core), should be kept to a minimum and be level or gently sloping. The distance from visitors parking to relevant entrances should be as short as practicable and be level or gently sloping.	This criterion is not relevant as the development does not contain parking provision.
Approach to all entrances	Enable, as far as practicable, convenient movement along other approach routes to dwelling (in addition to the principal approach from a vehicle required by Criterion 2) for the widest range of people.	The approach to all entrances should preferably by level or gently sloping, and in accordance with the specification give at www.lifetime-homes.org.uk	The approach to the development is level along the existing pavements of New Oxford Street Main front entrance and Bainbridge Street to the rear means of escape and servicing only.
Entrances	Enable ease of use of all entrances for the widest range of people. Note: For the purpose of requirement d) and e) of this Criterion, main entrances are deemed to be; the front door to an individual dwelling, the main communal entrance door to a block of dwellings, plus any other entrance door associated with the approach route from parking required by Criterion 2.	All entrances should: a) Be illuminated b) Have level access over the threshold; and c) Have effective clear opening widths and nibs as specified given at www.lifetimehomes.org.uk d) In addition, main entrances should also: e) Have adequate weather protection* f) Have a level external landing.*	a)The main communal entrance is illuminated by existing street lamps in New Oxford Street this will be enhanced by the provision of new wall mounted lighting. Entrances to all apartments will be illuminated by ceiling or wall mounted lights. b) The main communal entrance and all apartment entrances have level access over the threshold. c) The main entrance door has a minimum width of 800mm and all entrances to apartments have a minimum width of 775mm. e) The main communal entrance is existing and does not have the weather protection that a canopy or porch would provide. As the entrance is off a main street we consider that a canopy would not be appropriate. In any event the entrance is not in an exposed location in terms of weather. f) The main entrance has a level external landing which is the existing pavement.

7.9: Supporting Statements :
Life Time Homes

LIFETIME HOMES CRITERIA	KEY OBJECTIVES	DETAILED CRITERIA	PROPOSALS TO MEET STANDARD
Communal stairs and lifts	Enable access to dwellings above the entrance level to as many people as possible.	a) Communal Stairs Principal access stairs should provide easy access in accordance with the specification given at www.lifetimehomes.org.uk, regardless of whether or not a lift is provided. b) Communal Lifts Where a dwelling is reached by a lift, it should be fully accessible in accordance with the specification give at www.lifetimehomes.org.uk Note: provision of a lift is not a Lifetime Homes requirement, but is recommended where dwellings are not entered at the same level as the main block entrance.	) The principal access stair to the apartments is existing and is 1040mm wide between the wall and the handrail. The risers are 179mm. Each flight comprises 8 risers which gives a total rise of 1432mm. b) A new communal lift is being installed which is fully accessible as noted in paragraph 2.3 of the access statement.
Internal doorways and hallways	Enable convenient movement in hallways and through doorways.	Movement in hallways and through doorways should be as convenient to the widest range of people, including those using mobility aids or wheelchairs, and those moving furniture or other objects. As a general principle, narrower hallways and landing will need wider doorways in their side walls. The width of doorways and hallways should confirm to the specification given at www.lifetimehomes.org.uk	Hallways are 1100mm wide. Doorways are 775mm wide.
Circulation Space	Enable convenient movement in rooms for as many people as possible.	There should be space for turning a wheelchair in dining areas and living rooms and basic circulation space for wheelchair users elsewhere.	There is ample space for turning a wheelchair in the dining area as demonstrated on the annotated flat plan.
Entrance level living space	Provide accessible socialising space for visitors less able to use stairs.	A living room / living space should be provided on the entrance level of every dwelling (See Appendix 1 on page 65 or www.lifetimehomes.org.uk for definition of ‘entrance level’) Note: Entrance level generally means the storey containing the entrance door to the individual dwelling. It may refer to the first storey that contains a room (habitable or non-habitable) if the entrance door leads directly to an ‘easy-going’ stair.	The living room / living space is on the entrance level only, one apartment layout does not conform to this arrangment due to an exisitng floor level difference.
Potential for entrance level bed-space	Provide space for a member of the household to sleep on the entrance level if they are temporarily unable to use stairs.	In dwellings with two or more storeys, with no permanent bedroom on the entrance level, there should be space on the entrance level that could be used as a convenient temporary bed-space (see Appendix 1 on page 65 or www.lifetimehomes.org.uk for definition of ‘entrance level’)	All bedrooms are on the entrance level, one apartment layout does not conform to this arrangment due to an exisitng floor level difference. However two of the three bedrooms do conform to this requirment.

7.9: Supporting Statements :
Life Time Homes

LIFETIME HOMES CRITERIA	KEY OBJECTIVES	DETAILED CRITERIA	PROPOSALS TO MEET STANDARD
Entrance level toilet and shower drainage	Provide an accessible toilets and potential showering facilities for: a) Any member of the household using the temporary entrance level bed space of Criteria 9, and: b) Visitors unable to use stairs.	Where an accessible bathroom, in accordance with Criterion 14, is not provided on the entrance level of a dwelling, he entrance level should have an accessible toilet compartment, with potential for a shower to be installed – as detailed in the specification given at (see Appendix 1 on page 65 or www.lifetimehomes.org.uk for definition of 'entrance level')	An accessible bathroom is provided. The en-suite is also capable of having a shower installed.
Toilet and bathroom walls	Ensure future provision of grab rails is possible, to assist with independent use of toilet and bathroom facilities.	Walls in all bathrooms and toilet compartments should be capable of firm fixing and support for adaptations such as grab rails.	Walls in toilets and bathrooms will accommodate grab rail fixings.
Stairs and potential through-floor lift in dwelling	Enable access to storeys above the entrance level for the widest range of households.	The design within a dwelling of two or more storeys should incorporate both: a) Potential for stair lift installation; and b) A suitable identified space for a through-the-floor lift from the entrance level to a storey containing a main bedroom and a bathroom satisfying Criterion 14.	All apartments are of a single storey.
Potential for fitting of hoists and bedroom/bathroom relationship	Assist with independent living by enabling convenient movement between bedroom and bathroom facilities for a wide range of people.	Structure above a main bedroom and bathroom ceilings should be capable of supporting ceiling hoists and the design should provide a reasonable route between this bedroom and the bathroom.	The floors are existing and comprises of concrete encased steel beams with hollow pot infills and are capable of supporting a hoist.
Bathrooms	Provide an accessible bathroom that has ease of access to its facilities from the outset and potential or simple adaptation to provide for different needs in the future.	An accessible bathroom, providing ease of access in accordance with the specification give at www.lifetimehomes.org.uk should be provided in every dwelling on the same storey as a main bedroom.	The bathroom is of sufficient size to be wheelchair accessible and as such has potential for adaption for different needs.
Glazing and window handle heights	Enable people to have a reasonable line of sight form a seated position in the living room and to use at least one window for ventilation in each room.	Windows in the principal living space (typically the living room), should allow people to see out when seated. In addition, at least on opening light in each habitable room should be approachable and usable by a wide range of people - including those with restricted movement and reach. Note: in kitchens areas or bathrooms with only one window situated behind kitchen units or bathroom fittings, the requirement for a potential clear approach space to that window need to apply. However, the window handle height/control requirement remains applicable. Any other window within the kitchen area or bathroom, not behind fittings, is required to satisfy both the approach and window handle/control height requirements.	The windows are existing and part of an architecturally sensitive façade and as such will not comply in terms of height. However, the window handle height/controls will be selected to suit those with restricted movement and limited reach.
Location of service controls	Locate regularly used service controls, or those needed in an emergency, so that they are usable by a wide range of household members – including those with restricted movement and limited reach.	Service controls should be within a height band of 450mm to 1200mm from the floor and at least 300mm away from any internal room corner.	Service controls will be within a height band of 450mm to 1200mm from the floor and at least 300mm away from any internal room corner in accordance with AD part M1 diagram 29.

7.10: Supporting Statements :
Transport / Car Free Housing

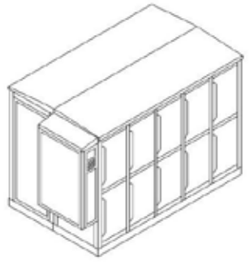
112-116 New Oxford Street Site has a high public transport accessibility rating (PTAL) of 6B. Its position sitting right next to the underground interchange of Tottenham Court Road Tube Station allows future residents easy access to the London under ground system. This station is currently under going a massive enlargement and extention (the addition of Cross Rail) which will increase the accessability for public transport to the site and surrounding context.

At street level there are ample bus stops within a short walk from the front door of the development which add to residents ability to travel locally and beyond by a secondary mode of public transport.

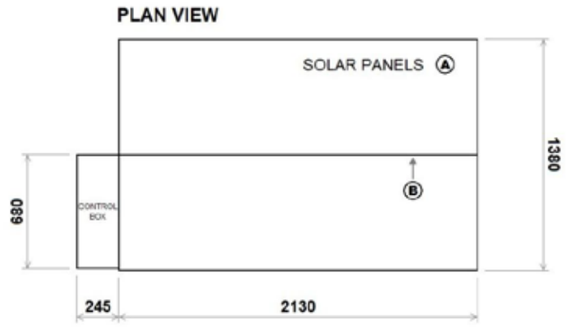
We have always beleived that no car parking provision would be needed for the proposed development. However we are wishing to provide cycle provision (folding bikes) which would be securly stored within the basement area. These would be 'given' to each of the apartments created within the new development. Allowing the owner to make a choice of either public transport or cycling as a mode of transport around town.

The recomended minimum number of bicycles has been given to us as 9.

As part of our Planning Application Submission we are showing examples of the type of storage and bikes which could be provided within the development.



BROMPTON DOCK 20 - BAY UNIT (BACK - TO - BACK)

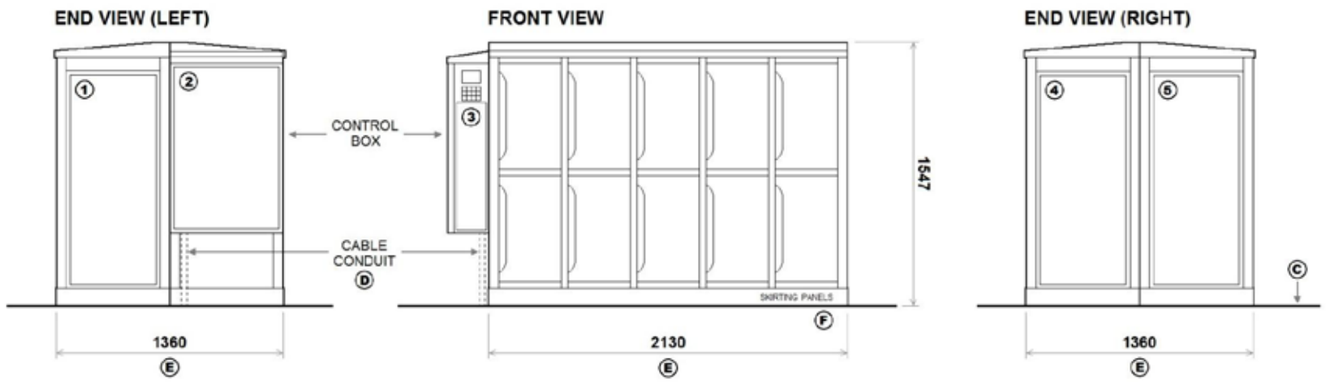


ALLOW A ONE METRE WIDE ACCESS SPACE AROUND THE DOCK

①-⑤
VINYL INFORMATION DISPLAY PANELS

IF THE DOCK HAS TO BE PLACED UP AGAINST A WALL, A SEPARATE SIGN WILL BE REQUIRED FOR THE VINYL PANELS

Ⓐ-Ⓕ
SEE NOTES ON NEXT PAGE



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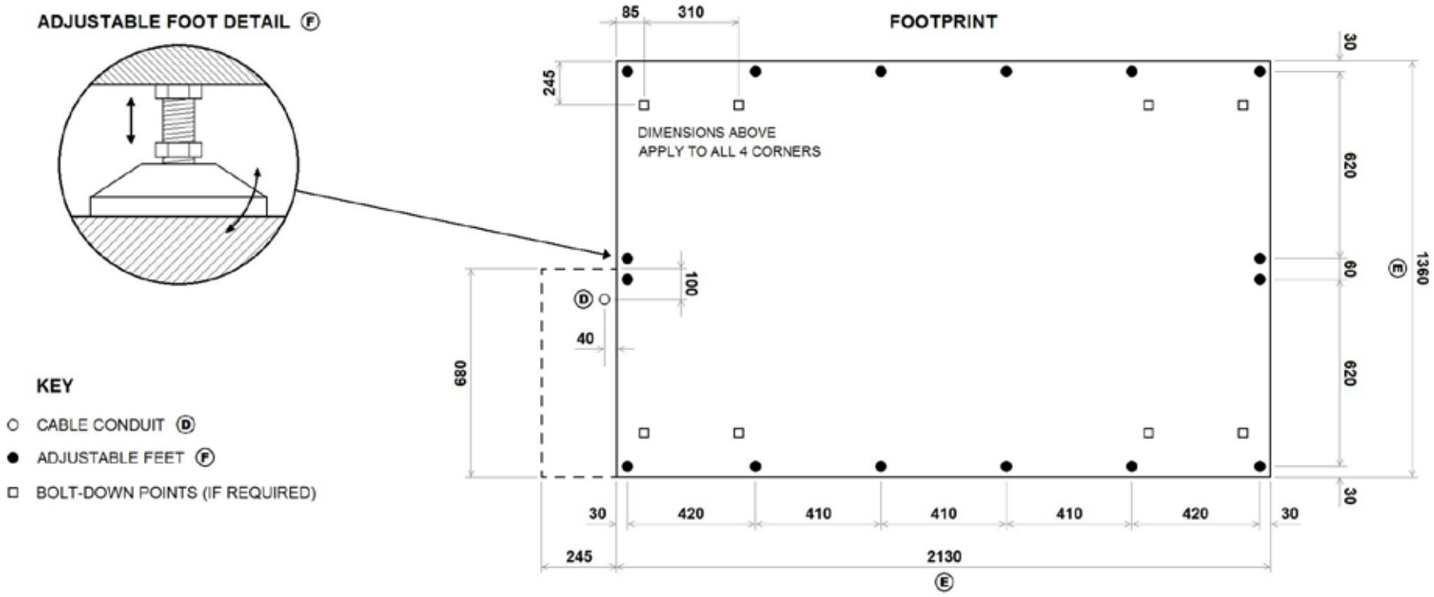
7.10: Supporting Statements:
Transport / Car Free Housing



DATA

WEIGHT OF DOCK (LOADED WITH BIKES):	**1270 kg**
WEIGHT OF DOCK (EMPTY):	**1050 kg**
WEIGHT OF ONE BIKE:	**11 kg**
AVERAGE POINT LOAD ON EACH FOOT:	**72.5 kg**

NOTES

Ⓐ Some docks will have a solar panel, which should be placed on a south-facing roof.
Solar-powered docks do not require a mains electricity supply and there will be no cable conduit.

Ⓑ Back panels are not required along the centre of the dock.

Ⓒ Installation is easiest if the dock is placed on level concrete or tarmac. The adjustable feet can also accommodate ground which is sloping – see Ⓕ.

Ⓓ There will be a cable conduit if the dock is powered by mains electricity, in which case there will not be solar panels.

Ⓔ Add 4 mm to these dimensions if the skirting is to be included.

Ⓕ The feet can be adjusted so that the base of the dock is between 26 mm and 95 mm from the ground. This allows the dock to be placed on sloping ground.
Skirting panels between 26 mm and 146 mm high can be provided to conceal the feet.
If the slope is more extreme and the base of the dock needs to be raised more than 95 mm above the ground, then separate blocks will be required for the feet to stand on.

Project Address	**112-116 NEW OXFORD STREET, LONDON, WC1A 1HH**
Client	**Zania Universal Properties**
Start Date	**TBC**
Programme	**TBC**
Contracts Manager	**TBC**
Review Date	**TBC**
Brief Scope of Work	**General refurbishment and conversion works and additional single storey roof extension to seven storey steel framed building**

#	Method Statement	Y	N	N/A	Site Specific Methodology	General Methodology
1	**Site setup**				**Asbestos (Pre Start)** The existing building has already been stripped out and any potential asbestos has been removed **Welfare and Site set up** Site setup and welfare will be located in a temporary room constructed within the property being refurbished. This room will include power water and toilet facilities, a drying room and canteen area. **Hoarding;** The site hoarding will be minimal in this instance as the property is currently only accessible via the rear access door on Bainbridge Street. Hoarding and gates will be placed to the main entrance (subject to local authority approval). **Access** Primary access for deliveries will be via the rear access door at ground floor level on Bainbridge Street. This route will be kept clear for access, materials and in the case of emergency. **Road and Street works;** To be confirmed during works, street level evidence of water, gas and electric, also major foul drainage through site. Incoming services will be located and identified as part of the works. See services section below. We do not anticipate any works in the public highway other than demolished materials and site refuse operations. Banksman will be in attendance and where necessary we will employ road cleaners to ensure any exported material is not left on the local road network.	• Site setup and welfare will be located in a in a temporary room constructed in the property. This room will include power water and toilet facilities, a drying room and canteen area. • Arrange for and obtain all necessary local & statutory authority permits and licences from the local authority. • Deliver skips and construct welfare facilities. • Construct Hoarding to the proposed rear entrance. Paint, make good and erect safety signage and permissions. Door to be fitted with secure lock. • Obtain all available information relating to existing services where applicable. • Obtain all information relating to existing Asbestos content where applicable. • Identify services and investigate by hand excavation. • Identify incoming mains supply. Arrange for qualified electrician to erect and test temporary electrical installation with suitable RCD. Ensure the provision of Temporary electrical installation certificate. • Where applicable and in agreement with the client, apply dust protection to ground floor.

#	Method Statement	Y	N	N/A	Site Specific Methodology	General Methodology
					Fire One site box will be set up in the site office and additional fire points will be installed as the works progress to each respective staircase landing level. The fire points will include for means of raising the alarm. We will develop and maintain our site fire plan for the site as the works progress. **Site Electrics** We assume a main board is available in which we will be utilising for works and possibly welfare. To be isolated and site supply will be taken from here, it is not anticipated this will be required to be moved. All will be isolated and temporary board provided for all 110v transformers.	• Foreman must ensure he has been fully briefed by his line manager in safety critical elements of the structural works including, but not exclusively; • Location of Load bearing positions • Location of incoming services including main sewer • Sequence of works defined by engineers drawing. Suggested Structural sequence drawings available at time of writing.

7.11: Supporting Statements:
Construction Management Plan

2	**General Site maintenance and housekeeping**				**Housekeeping (Throughout)** Standard HSE procedures to be applied, ensure housekeeping through regular removal of waste to skips, control of material call offs and provision of adequate labour to maintain access and cleanliness. Be aware of existing resident and agree arrangements for waste management and general coordination, cooperation with others will be essential.	**General Issues:** • Housekeeping to be maintained at all times. • Access routes and emergency escape routes to be kept free from debris, waste materials and training leads. • Where possible, 110V distribution leads to be suspended from ceilings to prevent trips. • Manual handling issues arise from the man handling of any material where there is a risk of injury. Operatives to be trained or instructed in the correct lifting and carrying procedures. • Any mechanical aids identified (barrows, rollers, conveyors etc) to be in good condition and well serviced. **Site Deliveries & Waste:** • Location for the storage of materials to be identified before the delivery arrives. • Deliveries to be bounded within the specified area and stacked in a safe manner. • Any special wastes to be identified and segregated from general waste.
3	**Strip out and Demolitions**				**Demolition** Demolition involves demolition of the existing part pitched roof construction. Temporary scaffolding will be installed as required by the temporary works engineer while the pitched roof is being removed.	
#	**Method Statement**	**Y**	**N**	**N/A**	**Site Specific Methodology**	**General Methodology**
4	**Material Logistics**				**General Principles** Due to the restricted nature of the access and the location of the site we will need to set up a compound within the existing building to temporarily house material/equipment. This compound will be located on one of the lower floors with easy access onto Bainbridge Street level.	• Temporarily close off footpath and divert pedestrians while filling any skips. • Regular inspections of road surface to be made. • Clean road surface regularly with brush. • Ensure suitable lighting and signage on footpath and on the skip itself.
5	**Steelwork and Temporary bracing**				**Structural Steelwork;** Steel beams and framework along with metal stud infill walls will be installed in various locations across the building width in accordance with the engineers detail and sequencing. This is primarily to support the new single storey roof extension. Any potential temporary propping will remain in place in accordance with the temporary works design sequence.	
6	**Existing Services** a. Service Moves (Gas, Water, Electric) b. General Moves c. Existing Drainage Moves				Gas, water and electric services to be blocked at building entrance by specialist subcontractor. Free use of services must be supplied for the works.	
7	**Any other information**				A considerable number of neighbouring buildings all of which will be sensitive to traditional statutory nuisance, noise ducts vibration etc.	

8.0: Appendixes :

8.1: Appendixes :
Daylight / Sunlight Assessment

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Chartered Surveyors

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Daylight and Sunlight Study
112 to 116 New Oxford Street, London WC1A 1HH

2nd January 2013

RICS
The mark of property professionalism worldwide

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CONTENTS

1 EXECUTIVE SUMMARY

1.1 Overview

1.1.1 Right of Light Consulting has been commissioned to undertake a daylight and sunlight study in connection with the development at 112 to 116 New Oxford Street, London WC1A 1HH. The aim of the study is to check whether or not the proposed habitable floors receive satisfactory levels of daylight and sunlight.

1.1.2 The study is based on the numerical tests laid down in the Building Research Establishment (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a good practice guide' by P J Littlefair 2011.

1.1.3 Appendix 1 identifies the windows analysed in this study. The numerical test results (including all calculation workings) are provided in Appendix 2. No sky line contours are presented in Appendix 3.

1.1.4 Right of Light Consulting confirms that the proposed design satisfies all of the requirements set out in the BRE guide 'Site Layout Planning for Daylight and Sunlight'.

2 INFORMATION SOURCES

2.1 Documents Considered

2.1.1 This report is based on the following drawings:

BNY-MA(20)0001	Ground Floor Plan	Rev 1
BNY-MA(20)1001	First Floor Plan	Rev 1
BNY-MA(20)2001	Second Floor Plan	Rev 1
BNY-MA(20)3001	Third Floor Plan	Rev 1
BNY-MA(20)4001	Fourth Floor Plan	Rev 1
BNY-MA(20)5001	Fifth Floor Plan	Rev 1
BNY-MA(20)6001	Sixth Floor Plan	Rev 1
BNY-MA(20)7001	Seventh Floor Plan	Rev 1
BNY-MA(21)AA01	Elevation AA – South	Rev 1
BNY-MA(21)BB01	Elevation BB – West	Rev 1
BNY-MA(21)CC01	Elevation CC – North	Rev 1
BNY-MA(22)AA01	Section AA - East / West	Rev 1
BNY-MA(22)BB01	Section BB - North / South	Rev 1

3 METHODOLOGY OF THE STUDY

3.1 BRE Guide : Site Layout Planning for Daylight and Sunlight

3.1.1 The study is based on the numerical tests laid down in the Building Research Establishment (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a good practice guide' by P J Littlefair 2011.

3.1.2 The standards set out in the BRE guide are intended to be used flexibly. In instances where there is a special requirement for daylight or sunlight, higher levels may be deemed necessary. In other situations, such as with urban developments, lower daylight and sunlight levels may be unavoidable. The following statement is quoted directly from the BRE guide:

3.1.3 "The guide is intended for building designers and their clients, consultants and planning officials. The advice given is not mandatory and this document should not be considered as an instrument of planning policy. Its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly because natural lighting is only one of the many factors in site layout design."

3.2 Interior Daylighting

3.2.1 The interior daylighting recommendations set out in BRE guide are based on British Standard BS 8206 Part 2 and the Chartered Institute of Building Services Engineers Applications Manual on window design. Collectively, the guides set out three main criteria for interior daylighting. These are summarised as follows:

3.2.2 Test 1 Average Daylight Factor *(df)*

The Average Daylight Factor can be calculated using the following formula:

$$df = \frac{T\ Aw\ \theta}{A\ (1-R^2)}\ \%$$

Where

T is the diffuse visible transmittance of the glazing (BRE standard of 0.68)
Aw is the net glazed area of the window (m^2)
A is the total area of the room surfaces (m^2)
R is their average reflectance
Θ is the angle of visible sky in degrees

The Average Daylight factor test is applied to habitable rooms within domestic properties. A kitchen is generally deemed to be a habitable room if it is large enough to accommodate a dining area. If the kitchen is small or if the property has a separate dining area then the accepted practice is to treat the kitchen as a non habitable room.

For the purpose of this study we have assumed BRE internal reflectance values pertaining to medium wooden floors, light painted walls and light painted ceilings.

The guide recommends an Average Daylight Factor of 5% or more if there is no supplementary electric lighting, or 2% or more if supplementary lighting is provided. There are additional minimum recommendations for dwellings of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms.

A special procedure is required for floor to ceiling windows such as patio doors. If part of a window is below the height of the working plane (a horizontal plane 0.85m above the floor in housing), this portion should be treated as a separate window. The ADF for this window has an extra factor applied to it, to take account of the reduced effectiveness of low level glazing in lighting the room. A value equal to the floor reflectance may be taken for this factor. The ADF for the portion of the window above the working plane is calculated in the normal way without this additional factor, and the ADFs for the two portions are added together.

3.2.3 Test 2 Room Depth

If a daylit room is lit by windows in one wall only, the depth of the room L should not exceed the limiting value given by:

$$\frac{L}{W} + \frac{L}{H} \leq \frac{2}{1-R_b}$$

Where

W is the room width
H is the window-head height above floor level
R_b is the average reflectance of the surfaces in the rear half of the room

3.2.4 Test 3 Position of the no sky line

If a significant area of the working plane lies beyond the no sky line (i.e. it receives no direct skylight), then the distribution of daylight in the room will look poor and supplementary electric lighting will be required.

The no sky line assessment is not applicable where a room derives its daylight solely from a light well or atrium. In these situations the room relies on borrowed light instead of direct skylight.

3.3 Sunlight to Windows

3.3.1 The BRE guide recommends that where possible each dwelling should have at least one main living room window that faces within 90 degrees of due south. However, the guide acknowledges that this is not always possible when it comes to flats.

3.3.2 The BRE sunlight tests should be applied to all main living rooms and conservatories which have a window which faces within 90 degrees of due south. The guide states that sunlight is viewed as less important in kitchens and bedrooms. In non-domestic buildings, any spaces which are deemed to have a specific requirement for sunlight should be checked.

3.3.3 The BRE guide recommends that main living room windows should receive 25% of the total annual probable sunlight hours, including 5% of the annual probable sunlight hours during the winter months between 21st September and 21st March.

4 RESULTS OF THE STUDY

4.1 Window Reference Points

4.1.1 Refer to Appendix 1 for a drawing which identifies the positions of the windows analysed in this study.

4.2 Numerical Results and No Sky Line Contours

4.2.1 The numerical test results including all calculation workings are provided in Appendix 2. No sky line contours for the habitable rooms are presented in Appendix 3.

4.3 Interior Daylighting

4.3.1 All rooms meet or surpass the BRE Average Daylight Factor targets.

4.3.2 All rooms pass the room depth test.

4.3.3 No sky line contours for all living rooms and kitchens are presented in Appendix 3. The BRE guide explains that daylight distribution to bedrooms is less important. However, for completeness we have also presented the no sky line contours for all bedrooms. The contours illustrate that all living rooms and kitchens receive good access to daylight over a significant part of the working plane. Two of the bedrooms do not achieve ideal daylight distribution. However, we are of the opinion that the distribution of daylight is acceptable bearing in mind there are no specific daylight distribution requirements for bedrooms. The proposed design meets the requirement set out in paragraph 2.1.13 which explains that where there is a choice it is best to site the living room and kitchen away from obstructions.

4.4 Sunlight to Windows

4.4.1 All living rooms have at least one main window which faces within 90 degrees of due south. All main windows pass both the total annual sunlight hours test and the winter sunlight hours test. The proposed development therefore satisfies the BRE direct sunlight to windows requirements.

4.5 Conclusion

4.5.1 Right of Light Consulting confirms that the proposed design satisfies all of the requirements set out in the BRE guide 'Site Layout Planning for Daylight and Sunlight'.

5 CLARIFICATIONS

5.1 General

5.1.1 The report provided is solely for the use of the client and no liability to anyone else is accepted.

5.1.2 We have undertaken the survey following the guidelines of the RICS publication "Surveying Safely".

5.1.3 Where limited access is available, reasonable assumptions will have been made.

5.1.4 Right of Light Consulting have endeavoured to include in the report those matters, which they have knowledge of or of which they have been made aware, that might adversely affect the validity of the opinion given.

5.1.5 Right of Light Consulting will notify those instructing them immediately and confirm in writing if for any reason the report requires any correction or qualification.

5.1.6 Right of Light Consulting confirm that they have used their best endeavours to ensure that the facts stated in this report are correct and that the opinions expressed represent a true and complete professional opinion.

5.2 Project Specific

5.2.1 None

APPENDIX 2

DAYLIGHT AND SUNLIGHT CALCULATIONS

Appendix 2 - Average Daylight Factor (ADF)
112 to 116 New Oxford Street, London WC1A 1HH

Reference	Target ADF based on room use		Average Daylight Factor Coefficients					Actual ADF	
	Primary room use	ADF	T	Aw	A	R	Theta	ADF	Result
Proposed 2nd Floor									
Window 1	Bedroom	1.0%	0.68	1.99	60.65	0.69	59.8	**2.5%**	**Pass**
Window 2	Living Room	1.5%	0.68	3.88	95.24	0.71	61.1	**3.4%**	**Pass**
Window 3			0.68	1.57	124.44	0.68	59.3	1.0%	
Window 4			0.68	4.74	124.44	0.68	60.7	3.0%	
Window 5			0.68	1.55	124.44	0.68	59.4	0.9%	
Total ADF for room	Living Room	1.5%						**4.9%**	**Pass**
Window 6			0.68	3.88	115.35	0.68	60.9	2.6%	
Window 7			0.68	1.45	115.35	0.68	43.0	0.7%	
Window 8			0.68	4.18	115.35	0.68	41.1	1.9%	
Total ADF for room	Bedroom	1.0%						**5.2%**	**Pass**
Window 9	Kitchen	2.0%	0.68	3.04	52.83	0.72	31.0	**2.5%**	**Pass**
Window 10			0.68	1.24	57.84	0.68	29.4	0.8%	
Window 11			0.68	1.24	57.84	0.68	29.6	0.8%	
Total ADF for room	Bedroom	1.0%						**1.6%**	**Pass**
Proposed 3rd Floor									
Window 12 (lower)			0.68	0.34	83.82	0.69	61.5	0.0%	
Window 12 (upper)			0.68	2.4	83.82	0.69	62.5	2.4%	
Total ADF for room	Living Room	1.5%						**2.4%**	**Pass**
Window 13	Bedroom	1.0%	0.68	1.29	57.46	0.7	34.9	**1.0%**	**Pass**
Proposed 4th Floor									
Window 14 (lower)			0.68	0.22	91.26	0.7	64.3	0.0%	
Window 14 (upper)			0.68	4.32	91.26	0.7	65.7	4.1%	
Total ADF for room	Living Room	1.5%						**4.1%**	**Pass**
Window 15 (lower)			0.68	0.2	82.42	0.71	63.9	0.0%	
Window 15 (upper)			0.68	4.16	82.42	0.71	65.6	4.6%	
Total ADF for room	Bedroom	1.0%						**4.6%**	**Pass**
Window 16 (lower)			0.68	0.08	125.82	0.68	62.0	0.0%	
Window 16 (upper)			0.68	1.69	125.82	0.68	63.2	1.1%	

Appendix 2 - Average Daylight Factor (ADF)
112 to 116 New Oxford Street, London WC1A 1HH

Reference	Target ADF based on room use		Average Daylight Factor Coefficients					Actual ADF	
	Primary room use	ADF	T	Aw	A	R	Theta	ADF	Result
Window 17 (lower)			0.68	0.24	125.82	0.68	63.4	0.0%	
Window 17 (upper)			0.68	5.09	125.82	0.68	64.2	3.3%	
Window 18 (lower)			0.68	0.08	125.82	0.68	62.0	0.0%	
Window 18 (upper)			0.68	1.66	125.82	0.68	63.2	1.1%	
Total ADF for room	Living Room	1.5%						**5.5%**	**Pass**
Window 19 (lower)			0.68	0.2	123.52	0.68	63.6	0.0%	
Window 19 (upper)			0.68	4.16	123.52	0.68	65.2	2.8%	
Window 20 (lower)			0.68	0.07	123.52	0.68	46.8	0.0%	
Window 20 (upper)			0.68	1.55	123.52	0.68	49.7	0.8%	
Window 21 (lower)			0.68	0.21	123.52	0.68	45.2	0.0%	
Window 21 (upper)			0.68	4.49	123.52	0.68	48.1	2.2%	
Total ADF for room	Bedroom	1.0%						**5.8%**	**Pass**
Window 22	Kitchen	2.0%	0.68	3.04	53.55	0.72	43.4	**3.4%**	**Pass**
Window 23			0.68	2.15	79.56	0.7	45.1	1.6%	
Window 24 (lower)			0.68	0.1	79.56	0.7	38.8	0.0%	
Window 24 (upper)			0.68	2.05	79.56	0.7	42.1	1.4%	
Total ADF for room	Bedroom	1.0%						**3.0%**	**Pass**
Proposed 5th Floor									
Window 25	Bedroom	1.0%	0.68	1.54	131.74	0.73	68.1	**1.2%**	**Pass**
Window 26	Bedroom	1.0%	0.68	3.33	93.16	0.72	67.9	**3.4%**	**Pass**
Window 27			0.68	3.55	202.85	0.66	67.8	1.4%	
Window 28			0.68	3.55	202.85	0.66	67.6	1.4%	
Window 29			0.68	3.33	202.85	0.66	67.3	1.3%	
Window 30			0.68	3.24	202.85	0.66	63.5	1.2%	
Window 31			0.68	3.24	202.85	0.66	62.2	1.2%	
Total ADF for room	Living Room	1.5%						**6.5%**	**Pass**
Window 32			0.68	3.04	69.98	0.7	63.4	3.7%	
Window 33			0.68	3.04	69.98	0.7	63.5	3.7%	
Total ADF for room	Kitchen	2.0%						**7.4%**	**Pass**
Window 34			0.68	3.04	90.93	0.7	63.5	2.9%	
Window 35			0.68	2.15	90.93	0.7	60.9	1.9%	
Total ADF for room	Bedroom	1.0%						**4.8%**	**Pass**

Appendix 2 - Average Daylight Factor (ADF)
112 to 116 New Oxford Street, London WC1A 1HH

Reference	Target ADF based on room use		Average Daylight Factor Coefficients					Actual ADF	
	Primary room use	ADF	T	Aw	A	R	Theta	ADF	Result
Proposed 6th Floor									
Window 36	Bedroom	1.0%	0.68	1.81	104.59	0.72	71.0	**1.7%**	**Pass**
Window 37			0.68	1.34	205.6	0.64	35.6	0.3%	
Window 38 (lower)			0.68	3.28	205.6	0.64	28.1	0.1%	
Window 38 (upper)			0.68	11.14	205.6	0.64	43.5	2.7%	
Window 39 (lower)			0.68	1.92	205.6	0.64	25.7	0.0%	
Window 39 (upper)			0.68	6.54	205.6	0.64	46.1	1.7%	
Window 40			0.68	2.26	205.6	0.64	84.9	1.1%	
Total ADF for room	Kitchen/Living/Study	1.5%						**5.9%**	**Pass**
Window 41			0.68	2.26	81.88	0.7	84.5	3.1%	
Window 42			0.68	2.26	81.88	0.7	84.3	3.1%	
Total ADF for room	Bedroom	1.0%						**6.2%**	**Pass**
Proposed 7th Floor									
Window 43	Bedroom	1.0%	0.68	2.61	75.82	0.71	67.0	**3.1%**	**Pass**
Window 44			0.68	2.61	169.45	0.65	71.4	1.3%	
Window 45			0.68	2.61	169.45	0.65	71.2	1.3%	
Window 46			0.68	2.61	169.45	0.65	70.8	1.3%	
Window 47			0.68	9.76	169.45	0.65	113.5	7.7%	
Total ADF for room	Kitchen	2.0%						**11.6%**	**Pass**
Window 48 (lower)			0.68	0.2	84.26	0.69	85.7	0.0%	
Window 48 (upper)			0.68	2.07	84.26	0.69	86.4	2.8%	
Window 49 (lower)			0.68	0.2	84.26	0.69	85.8	0.0%	
Window 49 (upper)			0.68	2.07	84.26	0.69	86.5	2.8%	
Total ADF for room	Bedroom	1.0%						**5.7%**	**Pass**

Appendix 2 - Room Depth Calculation
112 to 116 New Oxford Street, London WC1A 1HH

Room	Room Depth Coefficients				Room Depth Calculation			Result
	L	W	H	Rb	L/W + L/H	<=	2/1-Rb	
Proposed 2nd Floor								
Window 1	2.9	4.9	2.3	0.71	1.85	<=	6.85	Pass
Window 2	4.6	3.3	4.2	0.74	2.49	<=	7.61	Pass
Window 3	4.8	4.8	4.2	0.73	2.14	<=	7.33	Pass
Window 4	4.8	4.8	4.2	0.73	2.14	<=	7.33	Pass
Window 5	4.8	4.8	4.2	0.73	2.14	<=	7.33	Pass
Window 6	6.1	3.6	4.2	0.74	3.15	<=	7.69	Pass
Window 7	3.6	6.1	4.2	0.74	1.45	<=	7.69	Pass
Window 8	3.6	6.1	4.2	0.74	1.45	<=	7.69	Pass
Window 9	2.7	2.5	4.1	0.75	1.74	<=	8.16	Pass
Window 10	3.6	4.2	2.3	0.71	2.42	<=	6.89	Pass
Window 11	3.6	4.2	2.3	0.71	2.42	<=	6.89	Pass
Proposed 3rd Floor								
Window 12	5.9	5.4	2.5	0.72	3.45	<=	7.05	Pass
Window 13	3.7	4.1	2.5	0.71	2.38	<=	6.93	Pass
Proposed 4th Floor								
Window 14	2.9	5.6	3.8	0.73	1.28	<=	7.43	Pass
Window 15	4.6	2.6	4.3	0.75	2.84	<=	7.9	Pass
Window 16	4.8	4.8	4.3	0.73	2.12	<=	7.36	Pass
Window 17	4.8	4.8	4.3	0.73	2.12	<=	7.36	Pass
Window 18	4.8	4.8	4.3	0.73	2.12	<=	7.36	Pass
Window 19	6.1	3.6	4.3	0.74	3.11	<=	7.76	Pass
Window 20	3.6	6.1	4.3	0.74	1.43	<=	7.76	Pass
Window 21	3.6	6.1	4.3	0.74	1.43	<=	7.76	Pass
Window 22	2.7	2.5	4.4	0.76	1.69	<=	8.17	Pass
Window 23	3.7	4.2	3.8	0.73	1.85	<=	7.48	Pass
Window 24	3.7	4.2	2.9	0.73	2.16	<=	7.48	Pass
Proposed 5th Floor								
Window 25	4.8	5.9	3.5	0.74	2.18	<=	7.66	Pass
Window 26	4.8	3.1	4.0	0.75	2.75	<=	7.85	Pass
Window 27	6.1	7.8	4.0	0.72	2.31	<=	7.05	Pass
Window 28	6.1	7.8	4.0	0.72	2.31	<=	7.05	Pass

Appendix 2 - Room Depth Calculation
112 to 116 New Oxford Street, London WC1A 1HH

Room	Room Depth Coefficients				Room Depth Calculation			Result
	L	W	H	Rb	L/W + L/H	<=	2/1-Rb	
Window 29	6.1	7.8	4.0	0.72	2.31	<=	7.05	Pass
Window 30	7.8	6.1	4.0	0.72	3.23	<=	7.05	Pass
Window 31	7.8	6.1	4.0	0.72	3.23	<=	7.05	Pass
Window 32	2.1	4.9	4.4	0.76	0.91	<=	8.22	Pass
Window 33	2.1	4.9	4.4	0.76	0.91	<=	8.22	Pass
Window 34	3.7	4.2	4.4	0.74	1.72	<=	7.72	Pass
Window 35	3.7	4.2	3.5	0.74	1.94	<=	7.72	Pass
Proposed 6th Floor								
Window 36	4.8	5.4	3.4	0.73	2.3	<=	7.42	Pass
Window 37	2.6	4.2	3.1	0.72	1.46	<=	7.22	Pass
Window 38	5.9	9.5	3.1	0.72	2.52	<=	7.22	Pass
Window 39	9.5	5.9	3.1	0.72	4.67	<=	7.22	Pass
Window 40	6.0	9.1	3.5	0.72	2.37	<=	7.22	Pass
Window 41	3.5	4.6	3.5	0.73	1.76	<=	7.49	Pass
Window 42	3.5	4.6	3.5	0.73	1.76	<=	7.49	Pass
Proposed 7th Floor								
Window 43	3.0	4.5	3.2	0.73	1.6	<=	7.4	Pass
Window 44	5.9	9.1	3.2	0.72	2.49	<=	7.12	Pass
Window 45	5.9	9.1	3.2	0.72	2.49	<=	7.12	Pass
Window 46	5.9	9.1	3.2	0.72	2.49	<=	7.12	Pass
Window 48	3.8	4.6	3.0	0.73	2.09	<=	7.38	Pass
Window 49	3.8	4.6	3.0	0.73	2.09	<=	7.38	Pass

Appendix 2 - Sunlight to Windows

112 to 116 New Oxford Street, London WC1A 1HH

Reference	Use Class	Annual Probable Sunlight Hours	
		Total	Winter
Proposed 2nd Floor			
Window 2	Living Room	40%	12%
Window 4	Living Room	43%	13%
Proposed 3rd Floor			
Window 12	Living Room	35%	11%
Proposed 4th Floor			
Window 14	Living Room	41%	13%
Window 17	Living Room	44%	15%
Proposed 5th Floor			
Window 28	Living Room	48%	16%
Proposed 6th Floor			
Window 38	Kitchen/Living/Study	26%	10%
Proposed 7th Floor			
Window 45	Kitchen	64%	22%

8.2: Appendixes :
Energy / Renewable Energy Statement

112-116 New Oxford Street

Energy Strategy Report

Project:	112-116 New Oxford Street
Version:	1.0
Author:	Stathis Eleftheriadis
Date:	19 December 2012

Contents

EXECUTIVE SUMMARY

This report details the proposed energy strategy for the 112-116 New Oxford Street scheme, which entails the refurbishment of an existing property in the London Borough of Camden. The 7-storey development comprises of 7 refurbished flats and 1 additional new flat on the roof top.

The proposed development addresses national planning policies on energy; in particular, mitigation of climate change and energy security through energy efficiency enhancements and use of alternative energy technologies. In order to reduce the carbon footprint of the building beyond the requirements of current regulatory and market standards, the development will benefit from the following integrated systems:

- Passive design features
- Energy efficiency measures
- Low and zero carbon technologies

The building fabric U-values will meet or exceed the Part L 2010 requirements where applicable. Energy efficient light fittings will minimise the electricity demand for lighting.

An energy assessment has been carried out based on design information to identify the most appropriate renewable strategy. The proposed strategy has the potential to provide a 14.1% improvement over the baseline environmental performance of the new unit (TER) and 43% DER improvement for the refurbished units through a combination of measures.

Although, due to restrictions in available space on the development, the scheme only uses solar PV to contribute a 7.3% reduction of CO_2 emissions, the development does not achieve the policy for a 25% total reduction. However, considering the nature of the development this is the maximum improvement that can be achieved through passive design measures, energy efficient equipment and renewable technologies.

1. INTRODUCTION

1.1. Site analysis

The 112-116 New Oxford Street development is located in the London Borough of Camden. The development will involve 1 additional storey being added to the existing property, resulting in 8 1, 2 & 3 bedroom flats within a 7-storey building. The proposed development is mainly contained within the existing envelope of the building, with a new roof and external walls being erected for a 7th floor flat.

Fig 1 - Proposed front view of the 112-116 New Oxford Street development

1.2. Objective

This report summarises the work undertaken to support the development of an energy strategy for the 112-116 New Oxford Street scheme. This work has resulted in a strategy that requires design, technical and commercial decisions in order to continue the design development and ultimately select the final solution for ensuring a low carbon development.

This report outlines the energy strategy for the development, including passive design, energy and CO_2 footprint of the proposed scheme, and renewable energy options.

The final proposed strategy would allow the scheme to demonstrate compliance with the guidelines set out by the London Borough of Camden and the London Plan in demonstrating a positive commitment to sustainability through providing environmental improvements.

112-116 New Oxford Street
Energy Strategy Report
PRICE&MYERS Consulting Engineers

2. POLICY

2.1. London Borough of Camden

Policy CS13, paragraph 13.9

- 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.
- Development involving a change of use or a conversion of 5 or more dwellings or 500sq m of any floorspace, will be expected to achieve 60% of the un-weighted credits in the Energy category in their EcoHomes or BREEAM assessment, whichever is applicable.
- Special consideration will be given to buildings that are protected e.g. listed buildings to ensure that their historic and architectural features are preserved.

2.2. The London Plan Policies on Energy

Policy 5.2: Minimising Carbon Dioxide Emissions

Planning decisions
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 Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emission reductions in buildings:

Residential buildings:
2010 – 2013: 25% improvement over Part L 2010

Non-domestic buildings:
2010 – 2013: 25% improvement over Part L 2010

Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy. This report contains a detailed energy assessment in line with the requirements of policy 5.2.

112-116 New Oxford Street
Energy Strategy Report
PRICE&MYERS Consulting Engineers

Policy 5.7: Renewable Energy

Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

There is a presumption that all major development proposals will seek to reduce carbon dioxide emissions by at least 20% through the use of on-site renewable energy generation wherever feasible. Development proposals should seek to utilise renewable energy technologies such as: biomass heating; cooling and electricity; renewable energy from waste; photovoltaics; solar water heating; wind and heat pumps. The Mayor encourages the use of a full range of renewable energy technologies, which should be incorporated wherever site conditions make them feasible and where they contribute to the highest overall and most cost effective carbon dioxide emissions savings for a development proposal.

2.3. The London Mayor's Energy Strategy

The Mayor of London has published strategies on air quality, biodiversity, noise, transport, waste and other environmental issues, aimed at improving the quality of life and promoting sustainable development within London. Among the aims and objectives of the Energy Strategy are minimising the impact of London's energy production and consumption on public health, and on the local and global environment, and reducing London's contribution to climate change by minimising emissions of CO_2 from all sectors (Commercial, domestic, industrial and transport) through energy efficiency, CHP, use of renewable energy and cleaner fuels.

Alongside the policies in The London Plan, the Energy Strategy emphasises the importance of energy and associated CO_2 emissions in planning decisions within the capital.

8.2: Appendixes :
Energy / Renewable Energy Statement

3. APPROACH

The approach to achieving the planning policy energy objectives has been to consider strategies and technologies to achieve a low energy and carbon footprint for the scheme.

As a refurbishment development the energy strategy for the scheme follows the energy hierarchy:

- Using less energy by passive design
- Supplying energy efficiently
- Using renewable energy sources to reduce CO_2

This energy strategy examines the energy performance of the proposed 112-116 New Oxford Street development as follows:

- Section 4 contains the passive design and energy efficiency measures that will be considered in the scheme. This section describes targets and recommended/ proposed actions to achieve these targets.
- Section 5 contains the estimated carbon footprint for this site including passive design and energy efficiency measures identified in section 4.
- Section 6 analyses Low and Zero Carbon Energy Systems to offset emissions.
- Section 7 summarises the overall carbon reductions that could be achieved by the scheme.

112-116 New Oxford Street
Energy Strategy Report
PRICE&MYERS Consulting Engineers

4. PASSIVE DESIGN

Passive design measures have been considered throughout the pre-planning stage to reduce energy demand. Opportunities for daylighting, efficient ventilation and passive solar heating have been identified.

4.1 Solar Gain Control & Daylighting

The U-Values of all glazed elements will exceed Building Regulations standards, and incorporate low emissivity coating, resulting in an efficient balance between passive solar gain and the thermal losses from each room.

Daylight levels are high throughout and are supplemented with 100% use of low energy lighting. The use of a roof light within the basement kitchen will help ensures optimum levels of daylight throughout the day.

4.2 Energy Efficiency

Studies have been carried out to determine the energy and carbon emissions benefits of various enhancements to the thermal performance of the new proposed building envelope, by using increased U-Values for new elements and improving overall air tightness, resulting in a significant improvement over Building Regulations standards. The property has been designed to be naturally ventilated, reducing additional energy loads for the building.

Table 4-1 shows a summary of the proposed U-values, air tightness, heating and ventilation strategy for the development. These measures will be considered for the development and have been assumed for the analysis at this stage.

Element	Measure
External Walls- Refurbished	0.20 W/m^{2}K
External Walls- New	0.15 W/m^{2}K
Roof	0.13 W/m^{2}K
Windows (& Doors with > 60% Glazing)	1.5 W/m^{2}K
Air Tightness - Refurbished	7 m^3/m^2/h
Air Tightness - New	5 m^3/m^2/h
Thermal Bridging	Default(0.150)
Heating System	(Modulating) Gas fired boilers (90% efficient)
Ventilation System	Natural Ventilation with extract fans for bathroom/kitchen

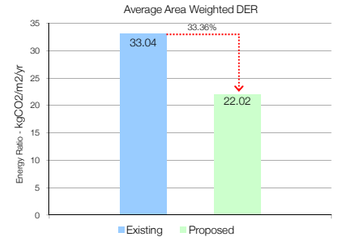
Table 4-1: Passive design measures and proposed services

112-116 New Oxford Street
Energy Strategy Report
PRICE&MYERS Consulting Engineers

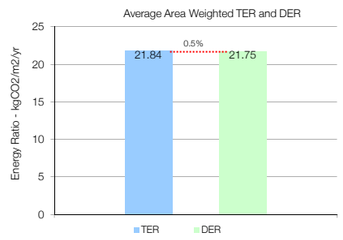
4.3 Energy Conservation Measures

Additional energy conservation measures that will help to reduce energy consumption in use have been identified as follows:

- All new white goods selected for this development are rated A or A+ in the EU energy-labelling scheme for domestic appliances and B rated wash dryers if specified.
- Low use water fittings throughout (water consumption is to be less than 125 litres/person/day); helping to reduce hot and cold water demand.
- Movement and daylight sensors fitted to lighting for common and external areas.
- Time and temperature zone space heating controls.



Graph 4-2: Percentage improvement of Dwelling Emission Rate (DER) – Refurbished units



Graph 4-3: Percentage improvement of Dwelling Emission Rate (DER) over the Target Emission Rate (TER) for the base case – New Unit

8.2: Appendixes :
Energy / Renewable Energy Statement

5. ESTIMATED ENERGY AND CO_2 FOOTPRINT

Table 5-1 below outlines the estimated total energy demand and associated carbon emissions for the 112-116 New Oxford Street development, taking into account the passive measures identified in the previous section. The consumption is estimated based on the use of typical systems utilising gas central heating, in order to estimate the baseline CO_2 emissions for the site. Alternative fuel sources are investigated in the following sections. Any CO_2 savings from the use of renewable technologies are compared with the 'typical' gas case, as this is the lowest carbon solution for dwellings not benefitting from renewables.

The calculations have been based on SAP outputs, with an inclusion for appliance use (un-regulated emissions) not covered by SAP (based on BRE methodology). Full details of assumptions are included in Appendix A.

Energy & CO_2											
	Gas Demand				Electricity Demand					Total Energy (kWh/yr)	Total CO_2 (kg/yr)
	Space heating (kWh/yr)	Hot Water (kWh/yr)	Total (kWh/yr)	Gas CO_2 (kg/yr)	Pumps & Fans (kWh/yr)	Lighting (kWh/yr)	Appliances (kWh/yr)	Total (kWh/yr)	Electricity CO_2 (kg CO_2/yr)		
Refurbished	32,067	14,763	**46,830**	9,272	965	2,106	17,774	**20,845**	10,777	**67,675**	**20,049**
New Unit	6,454	2,426	**8,880**	1,758	175	376	3,145	**3,696**	1,911	**12,576**	**3,669**
Total	**38,521**	**17,189**	**11,030**	**2,297**	**1,140**	**2,482**	**20,919**	**24,541**	**12,688**	**80,251**	**23,718**

Table 5-1: Estimated energy demand and CO_2 emissions of the site by energy source

6. LOW AND ZERO CARBON ENERGY SYSTEMS

There is a target within the borough to achieve a 20% reduction of CO_2 emissions through the use of on-site renewable technologies. The following table outlines the LZC technologies that have been considered for the site and the technical feasibility for each has been discussed based on the energy demand and site constraints.

Technology	Description	Advantages	Disadvantages	Feasibility	
Solar Thermal Collectors	Solar thermal collectors can be used to provide hot water They can provide up to approximately 50% of the hot water demand	No noise issues associated with Solar thermal collectors No additional land use from the installation of solar thermal collectors Low maintenance and easy to manage Low capital cost	The hot water cylinder will need to be larger than a traditional cylinder Consideration will need to be given to the space required for the solar array and the orientation Needs unobstructed space on roof	The development has a small flat onto which a small solar thermal array could be placed However due to the nature of the development it is a little impractical to use a centralised hot water system, making it difficult to distribute the hot water between the residential and office spaces	×
Photovoltaic Panels (PV)	Photovoltaic (PV) panels provide noiseless, low-maintenance, carbon free electricity using the energy emitted from the sun	Can have significant impact on carbon by offsetting electricity which has a high carbon footprint Low maintenance No noise issues No additional land use from the installation of PV panels Bolt on technology that does not need significant amounts of auxiliary equipment	High capital investment required RHI tariffs to be reduced, so less financially attractive Needs unobstructed space on roof	The development has a small flat roof onto which a small solar PV array could be placed. This would help contribute to the electricity demand of the property There is no other available space within the development due to limits on the front roof and so only a small sized array could be installed – it is not expected that this can achieve a 20% reduction in CO_2 emissions alone	✓

CHP (Combined Heat & Power)	CHP systems use an engine driven alternator to generate electricity while using the waste heat from the engine, jacket and exhaust to provide heating and hot water. Economic viability relies on at least 4000 hours running time per annum	Mature technology High CO_2 savings	Cost of the system is relatively high for small schemes such as this Only appropriate for large development with high heat loads	The development is not large enough for CHP to be a viable system	×
Biomass Heating	Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating, though most commonly in the form of wood chip boilers	Potential to reduce large component of the total CO_2 A biomass boiler would replace a standard gas heating system so some of the cost may be offset through money saved on a traditional boiler	Regular maintenance will be required Availability of fuel may become a problem, therefore limited cost saving for residents The noise generated by a biomass boiler is similar to that of a gas boiler. It is advisable not to locate next to particularly sensitive areas such as bedrooms A plant room and fuel store will be required which may take substantial space from the proposed development or surroundings The fuel will need to be delivered, which can cause issues with access Biomass is often not a favoured technology in new developments due to the potential local impacts of NOx emissions and delivery vehicles	Biomass is not considered feasible for such a development due to issues of fuel storage, access for delivery vehicles and local NOx emissions	×

Benoy ZaniaUniversal

8.2: Appendixes :
Energy / Renewable Energy Statement

Wind Turbines (Vertical Axis)	Most small-scale (1-25kW) wind turbines can be mounted on buildings though this is generally not recommended. Larger turbines require concrete foundations at ground level in a suitable, unobstructed site	Low noise Bolt on technology that does not need significant amounts of auxiliary equipment	Low energy output particularly in urban environments, therefore not suitable here High visual impact Noise (and sometimes vibration) impact High capital cost	The development is not appropriate for this technology as wind speeds and profiles are inadequate in this urban area	×
Ground Source Heat Pumps (GSHP) – Heating & Cooling	A ground loop heat exchanger offers efficient heating of a space in winter, as the temperature of the ground (below approx 2m) remains almost constant all year round The same loop of pipe and compressor allows heat from the building to be rejected (via a highly efficient compressor) into the soil, dissipating heat from the space and providing cooling	Low maintenance and easy to manage Optimum efficiency when used with under-floor heating systems As heat pumps would replace standard heating systems, some of the cost may offset through money saved on a traditional boiler	The heat pump has a noise level around 45-60dB so some attenuation may be required and it should be sensibly located Relatively high capital cost Requires electricity to run the pump, therefore limited carbon savings in most cases For communal systems a plant room is required which may take additional land from the proposed development/surroundings	There is very limited external space associated with the development; therefore a horizontal loop system is not practical A borehole system could be utilised, however the cost of such a system is considered not financially viable for a project of this scale	×

Air Source Heat Pump (ASHP) - Heating	Air Source Heat Pumps extract latent energy from the air in a manner similar to ground source heat pumps	ASHP systems are generally cheaper than GSHP as there is no requirement for long lengths of buried piping Low maintenance and easy to manage Optimum efficiency with under-floor heating systems As heat pumps would replace standard heating systems, some of the cost may offset through money saved on a traditional boiler	The heat pump has a noise level around 50-60dB so some attenuation may be required and it should be sensibly located. The potential noise from the external unit may mean there is local opposition to their installation Requires electricity to run the pump, therefore limited carbon savings in most cases For communal systems plant room required which may take additional land from the proposed development/surroundings Potential noise issues	The use of an ASHP is unlikely to be feasible due to the poor performance of such as system	×

Table 6-1: Feasibility of LZC technologies for the site

Due to the space restrictions of this site, the majority of the LZC technologies are unpractical for use on this development. There is a small space suitable for a solar panel installation on the roof and it is proposed that a solar PV system be installed as the energy generated can be easily distributed between the residential flats.

To achieve a 20% reduction in CO_2 emissions through the sole use of on-site renewables, a second LZC system would need to be employed. The only appropriate systems would be Ground Source Heat Pumps with vertical boreholes or Air Source Heat Pump. Both systems are considered financially impractical and instead it is proposed that CO_2 emission reductions are achieved through the combination of a solar PV system and an improved building fabric to reduce energy demand.

7. SUMMARY OF ESTIMATED CO_2 EMISSIONS REDUCTIONS

The energy demand and potential impact on CO_2 of the inclusion of renewable technologies has been considered for the development. Due to space limitations on the site there is little scope for a financially viable LZC technology to be utilised and achieve a 20% reduction in CO_2 emissions alone. The development has a small flat roof and it is proposed that a solar PV array is installed here to contribute as much as possible to the site's energy demand. Further reductions of CO_2 emissions can be achieved by using a high performing building fabric, energy efficient equipment and mechanical ventilation heat recovery within the flats.

		Energy & CO_2				Life cycle carbon and cost analysis		
Renewable Systems	**Energy provided by technology** (kWh/yr)	**% of site electricity demand met**	**CO_2 saved by technology** (kgCO_2/yr)	**% site CO_2 saving (inc appliance)**	**Improvement in DER over TER(New unit)**	**25 year CO_2 saving**	**Estimated capital cost**	**Payback time** (including capital & installation costs, maintenance etc.)
Photovoltaics (4.25 kWp) for the residential flats Total Gross panel area ~23.6m^2 @ 10° orientation Module output ~0.18 kWp/m^2 (Area and efficiency may vary on specification at tender stage)	3,267	13.3%	1,728	7.3%	14.1%	43,200	£7-10k	~6-11yrs[1]

Table 0-1: CO_2 savings from renewable technologies

The above table shows the CO_2 savings from the largest PV system array that can be installed on the site, taking into account available roof area and limitation of the technologies. The PV system will offset 7.3% of the site's CO_2 emissions (Figure 7-1) and result in a 14.1% improvement over Part L 2010 for the new unit (Figure 7-2). For the refurbished units the average area weighted DER improvement is 43 %(Figure 7-3) over the existing development. For a detailed breakdown of the DER & TER; refer to the SAP worksheets in the Appendix.

Figures 7-1, 7-2 and 7-3 below show the overall impacts in terms of carbon of renewable technologies.

[1] This payback time has been calculated based on the assumption that FiT payments will be claimed

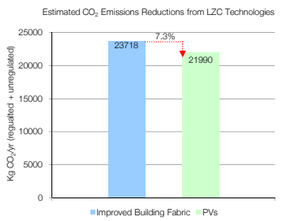


Figure 7-1: Estimated Reduction in CO_2 Emissions with Solar PV

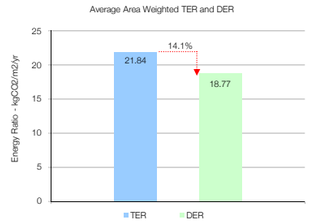


Figure 7-2: Site improvement in DER over TER - New Unit

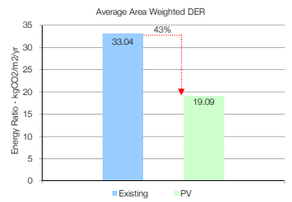


Figure 7-3: Percentage improvement of Dwelling Emission Rate (DER) – Refurbished units

7.1 BREEAM Credits

The SAP calculations carried out for the refurbished flats confirm that credits can be achieved for the BREEAM Domestic Refurbishment assessment as follows.

Ene 1 – Improvement in Energy Efficiency Rating

For the refurbished units the improvement in EER from the existing property to the proposed dwelling is 9.7, which equates to 2 credits being achieved.

Ene 2 – Energy Efficiency Rating Post Refurbishment

The post refurbishment EER is 82.75 which equates to 7 credits.

Ene 3 – Primary Energy Demand

For the refurbished units the primary energy demand is 101.75 kWh/m2/yr which equates to 14 credits.

8. CONCLUSION

For the 112-116 New Oxford Street development, a combination of passive design measures has been identified to help to reduce the energy load.

Significant improvements to the building fabric, energy efficient equipment, improved water use efficiency, the use of occupant controls and a solar PV array has been demonstrated to provide a 14.1% improvement over the baseline levels for the new unit and 43% improvement for the refurbished units.

The 112-116 New Oxford Street development has been shown to demonstrate a significant improvement from the existing condition. Although on-site renewable technologies have not been able to contribute to a 20% reduction in CO_2 emissions alone, given the limitations on site and the size of the development, solar PV has been shown to provide a 7.3% reduction in CO_2 emissions for the site.

The advised option will be considered at the detailed design and construction stages and adequate provisions made to ensure that the various carbon reduction targets are met.

The figures in this report are based on preliminary analysis only, and further detailed studies will be required before specifying any of the potential systems.

8.2: Appendixes :
Energy / Renewable Energy Statement

8.2: Appendixes :
Energy / Renewable Energy Statement

APPENDIX A

A-1 The following tables show the energy assumptions used for the energy and CO_2 calculations.

The calculations have been based on SAP results with an inclusion for appliance use not covered by SAP (based on BRE methodology) for the student accommodation units.

The appliances figure is based on the BRE calculation formula for appliances and cooking. Taken from Code for Sustainable Homes in ENE 7 Table 1.4 notes, as below:

A-2 [3] Kg CO_2/year from appliances and cooking. See Ene 1:

$$99.9 \times (TFA \times N)^{0.4714} - (3.267 \times TFA) + (32.23 \times N) + 72.6$$

Where TFA = Total Floor area and N = Number of Occupants

For TFA < 43 m^2; N = 1.46

TFA ⩾ 43 m^2; N = 2.844 × (1 – exp(–0.000391 × TFA^2))

Residential		
Energy Demands		Source
Use Type	Demand/m^2	
Heating	66.06	SAP Calculations
DHW	29.48	
Fans/Pumps/Controls	1.96	
Lighting	4.26	
Appliances	35.9	BRE Methodology

APPENDIX B

The following tables show figures used in the energy and CO_2 calculations to estimate energy produced and CO_2 savings from renewable technologies. These figures can be used to validate the results.

CO2 Intensity Values	
Gas Intensity	0.198 kgCO_2/kWh
Electricity Intensity	0.517 kgCO_2/kWh
Grid displaced electricity intensity	0.529 kgCO_2/kWh
Biodiesel carbon intensity	0.025 kgCO_2/kWh

Renewable Technology Efficiencies	
PV energy produced per kWp	858.4 kWh/kWp
PV kWp per m^2 panel	0.18 kWp/m^2
Efficiency of solar thermal collectors	600 kWh/m^2
COP of GSHP	4
Boiler efficiency	90%

Fuel Prices	
Gas	£0.04/kWh
Electricity	£0.11/kWh

APPENDIX C

Available Grants

The following table summarises grants that may be available for funding renewable technologies for this project.

Grant	Run By	Who Can Apply	What Microgeneration Technologies Are Covered?	Grant Availability
Feed in Tariff	Ofgem (paid by energy companies)	Open to all (max system sizes apply)	• Anaerobic Digestion • Hydro • Micro CHP (pilot) • PV • Wind	Applies to all MCS (Microgeneration Certification Scheme - www.microgenerationcertification.org) Installations post 15th July 2009. (PV – new lower tariff for installations post 1st April 2012)
Renewable Heat Incentive (RHI)	Ofgem	Open to all (max system sizes apply)	• Biomass • Bioliquids • Biogas • GSHP • ASHP • Solar Thermal	Applies to all MCS (Microgeneration Certification Scheme - www.microgenerationcertification.org) Installations post 15th July 2009. Recently announced that RHI will be going ahead in June 2011.
Community Sustainable Energy Programme (CSEP)	BRE	Not-for-profit community based organisations	• Solar photovoltaics • Solar thermal hot water • Wind turbines • Heat pumps • Automated wood pellet stoves • Wood fuelled boiler systems • Micro-hydro turbines	Both capital and project development grants are available under this scheme. Capital grants are available. Money is allocated in rounds. Please visit www.communitysustainable.org.uk for more information.

Carbon Emission Reduction Target (CERT)	Energy	Housing sector (new & existing)	• Energy efficiency measures in existing homes. Renewable technologies installed to offset carbon emissions over and above planning requirements.	CERT money comes direct from energy companies and can usually be accessed through renewable technology suppliers who have set up deals with these companies. E.g. EON provide funding for GSHP & ASHP through Calorex. Find out from suppliers if they have access to this funding when getting costs.
Bioenergy Capital Grant	(DECC) Department of Energy & Climate Change	Industrial, commercial sector (This includes, but is not restricted to, public and private limited companies (Ltd and plc), sole traders, farmers etc) Community sector (This includes, but is not restricted to, schools, colleges, universities, hospitals, local authorities, housing associations, charities etc.)	• Biomass heat boilers and biomass combined heat and power (CHP) equipment, including anaerobic digesters for heat-only or CHP.	Up to 40% of the capital cost & Installation of the difference in cost of installing the biomass boiler or CHP plant compared to installing the fossil fuel alternative. Max £500,000. Funding is available in rounds. Check http://www.bioenergycapitalgrants.org.uk/ to see if a round is open now or will be available in time for your development.

APPENDIX D

Domestic 'As Designed' SAP Calculations

8.2: Appendixes :
Energy / Renewable Energy Statement

Full SAP Calculation Printout

Property Reference: 21686_New Ofxord Street_03Flat **Issued on Date:** 17.Dec.2012
Survey Reference: PVs **Prop Type Ref:**
Property: 112-116, New Oxford Street, LONDON, WC1A 1HH,

SAP Rating:	83 B	**CO2 Emissions (t/year):**	0.71	**DER:** 20.17 Pass	**Reduction:** 8.6%	**FEE:** 50.5	**ZC8:**	0.00
Environmental:	89 B	**General Requirements Compliance:**	Pass	**TER:** 22.06		**HLP:** 1.26	**Energy cost:**	£ 247
CfSH Results		**Version:** CfSH November 2010		**ENE1 Credits:** 1.0	**ENE2 Credits:** 0.0	**ENE7 Credits:** 0	**CfSH Level:**	3

Surveyor: admin admin, Tel: unknown
Address:
Client:

Software Version: Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18
SAP version: SAP 2009, Regs Region: England and Wales (Part L1A 2010), Calculation Type: New Dwelling As Designed

CALCULATION DETAILS for survey reference no 'PVs'
SAP2009 - 9.81 input data (DesignData) - Page: 1 of 22

```
-------------------------------------------------------------------------------------------------------------
          SAP2009 Input Data
-------------------------------------------------------------------------------------------------------------
FullRefNo:                      PVs
Sap Version:                    SAP 2009
Regs Region:                    England & Wales
Region:                         Thames Valley
Calculation Type:               New Build (As Designed)
DwellingOrientation:            South East
Property Type:                  Flat, End-Terrace
Storeys:                        1
Date Built:                     2012
Sheltered Sides:                2
Sunlight Shade:                 Average or unknown
Measurements                    Perimeter, Floor Area, Storey Height
    1st Storey:                 19.4, 38.86, 2.74
Living Area:                    20.88 m2, fraction: 53.7%
Thermal Mass:                   Simple calculation
Thermal Mass Simple:            Medium
Thermal MassValue:              250
External Walls                  Nett Area, Gross Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
    External Wall               20.106, 25.076, 190, , CavityWallDensePlasterDenseBlock, , Cavity, 0, 0.2, Calculate
    Corridor Wall               26.19, 28.08, 190, , CavityWallDensePlasterDenseBlock, , Cavity, 0.43, 0.2257336343115l2, Gross
Party Walls                     Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
    Party Wall                  44.02, 180, , PartyWallDensePlaster, , Solid, 0, 0
External Roofs                  Nett Area, Gross Area, Kappa, Construction, Element, UValueFinal
Party Ceilings                  Area, Kappa, Construction, Element
    Ceiling                     38.86, 100, PartyFloorConcreteSlab, ,
Heat Loss Floors                Area, Kappa, Construction, Element, Type, UValueFinal, ShelterFactor
Party Floors                    Area, Kappa, Construction, Element
    Floor                       38.86, 100
Description                     Data Source, Type, Glazing, Glazing Gap, Argon Filled, Solar Trans, Frame Type, Frame Factor, U Value
    Windows                     Manufacturer, Window, Double glazed, , , 0.76, , 0.7,
    Door                        Manufacturer, Solid Door, , , , , , ,
Openings                        Opening Type, Location, Orientation, Curtain Type, Overhang Ratio, Wide Overhang, Width, Height, Count, Area, Curtain Closed
    Windows SE                  Window, External Wall, Southeast, None, 0, , 0, 0, 0, 3.42,
    Windows NW                  Window, External Wall, Northwest, None, 0, , 0, 0, 0, 1.55,
    Door                        Solid Door, Corridor Wall, Northeast, , , , 0, 0, 0, 1.89,
Conservatory:                   None
Draught Proofing:               100
Draught Lobby:                  No
Thermal Bridges                 Default,
    Y                           0.15
Pressure Test:                  True
Designed q50:                   7
AsBuilt q50:                    4
Property Tested:                False
Mechanical Ventilation          None
Chimneys MHS:                   0
Chimneys SHS:                   0
Chimneys Other:                 0
Chimneys Total:                 0
Open Flues MHS:                 0
Open Flues SHS:                 0
Open Flues Other:               0
Open Flues Total:               0
Intermittent Fans:              2
Passive Vents:                  0
Flueless Gas Fires:             0
Cooling System                  None
Light Fittings:                 5
LEL Fittings:                   5
Percentage of LEL Fittings:     100
External Lights Fitted:         No
External LELs Fitted:           No
Electricity Tariff:             Standard
Main Heating 1
    Description
    Percentage                  100
    MHS                         BGW - Mains gas BGW Post 98 Combi condens. with auto ign.
    SAP Code                    104
    Boiler Efficiency Type      Sedbuk 2009
    Efficiency                  90
    Model Name                  tbc
    Manufacturer                tbc
    MHS Controls                CBI
    Delayed Start Stat          No
    Ctrl SAP Code               2110
```

CALCULATION DETAILS for survey reference no 'PVs'
SAP2009 - 9.81 input data (DesignData) -
Page: 2 of 22

```
    Burner Control          OnOff
    Boiler Compensator      None
    Flue Type               Balanced
    Fan Assisted Flue       Yes
    Pumped                  Pump in heated space
    Heat Emitter            Radiators
    Combi boiler type       Standard Combi
    Combi keep hot type     None
Main Heating 2               None
Smoke Control Area           Unknown
Community Heating            None
Secondary Heating            None
Water Heating
    Type                    MainHeating1
    WHS                     HWP -
    Low Water Usage         Yes
    SAP Code                901
    Hot Water Cylinder      None
Flue Gas Heat Recovery System None
Waste Water Heat Recovery    none
PV Unit
    Type                    One Dwelling
    PVUnit 1                Cells Peak = 0.28, Orientation = South, Elevation = Horizontal, Overshading = NoneOrLittle
Wind Turbine                 None
Terrain Type:                Urban
Small Scale Hydro            None
Special Features             None

------------------------------------------------------------------------------------------------------------------------
```


CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF FABRIC ENERGY EFFICIENCY
Page: 3 of 22

```
SAP 2009 WORKSHEET FOR New Build (As Designed)   BRE SAP Worksheet 9.90
CALCULATION OF FABRIC ENERGY EFFICIENCY
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18
--------------------------------------------------------------------------------------------------------

--------------------------------------------------------------------------------------------------------
1. Overall dwelling dimensions
--------------------------------------------------------------------------------------------------------

                                                                    Area        Storey height          Volume
                                                                    (m2)             (m)                (m3)
Ground floor                                                   38.8600 (1b)   x     2.7400 (2b)   =   106.4764 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)         38.8600                                          (4)
Dwelling volume                                             (3a)+(3b)+(3c)+(3d)+(3e)...(3n) =   106.4764 (5)

--------------------------------------------------------------------------------------------------------
2. Ventilation rate
--------------------------------------------------------------------------------------------------------

                                           main        secondary          other            total       m3 per hour
                                          heating       heating
Number of chimneys                           0     +        0      +        0       =        0 * 40 =      0.0000 (6a)
Number of open flues                         0     +        0      +        0       =        0 * 20 =      0.0000 (6b)
Number of intermittent fans                                                                  2 * 10 =     20.0000 (7a)
Number of passive vents                                                                      0 * 10 =      0.0000 (7b)
Number of flueless gas fires                                                                 0 * 40 =      0.0000 (7c)

                                                                                          Air changes per hour
Infiltration due to chimneys, flues and fans   = (6a)+(6b)+(7a)+(7b)+(7c) =         20.0000 / (5) =      0.1878 (8)
Pressure test                                                                                              Yes
Measured/design q50                                                                                     7.0000
If based on air permeability value, then (18) = [(17)/20]+(8),  otherwise (18) = (16)                   0.5378 (18)
Number of sides on which dwelling is sheltered                                                          2      (19)

Shelter factor                                                          (20) = 1  - [0.075 x (19)]  =    0.8500 (20)
Infiltration rate adjusted to include shelter factor                          (21) = (18) x (20)   =    0.4572 (21)

                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Wind speed    5.4000    5.1000    5.1000    4.5000    4.1000    3.9000    3.7000    3.7000    4.2000    4.5000    4.8000    5.1000 (22)
Wind factor   1.3500    1.2750    1.2750    1.1250    1.0250    0.9750    0.9250    0.9250    1.0500    1.1250    1.2000    1.2750 (22a)
(22b)m        0.6172    0.5829    0.5829    0.5143    0.4686    0.4457    0.4229    0.4229    0.4800    0.5143    0.5486    0.5829 (22b)
Effective ach  0.6904    0.6699    0.6699    0.6323    0.6098    0.5993    0.5894    0.5894    0.6152    0.6323    0.6505    0.6699 (25)

--------------------------------------------------------------------------------------------------------
3. Heat losses and heat loss parameter
--------------------------------------------------------------------------------------------------------

Element                                          Gross       Openings      NetArea      U-value       A x U      K-value       A x K
                                                  m2            m2            m2         W/m2K          W/K       kJ/m2K        kJ/K
Door                                                                       1.8900       1.0000       1.8900                      (26)
Windows (Uw = 1.50)                                                        4.9700       1.4151       7.0330                      (27)
External Wall                                  25.0760       4.9700       20.1060       0.2000       4.0212                      (29a)
Corridor Wall                                  28.0800       1.8900       26.1900       0.2257       5.9120                      (29a)
Total net area of external elements Aum(A, m2)                            53.1560                                                (31)
Fabric heat loss, W/K = Sum (A x U)                                           (26)...(30) + (32) =  18.8562                      (33)
Party Wall                                                                44.0200       0.0000       0.0000                      (32)
Floor                                                                     38.8600                                                (32d)
Ceiling                                                                   38.8600                                                (32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                                                               250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)                                                        7.9734 (36)
Total fabric heat loss                                                                       (33) + (36) =       26.8296 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(38)m         24.2604   23.5375   23.5375   22.2157   21.4262   21.0591   20.7102   20.7102   21.6167   22.2157   22.8559   23.5375 (38)
(39)m         51.0900   50.3671   50.3671   49.0453   48.2558   47.8886   47.5398   47.5398   48.4463   49.0453   49.6855   50.3671 (39)
(40)m          1.3147    1.2961    1.2961    1.2621    1.2418    1.2323    1.2234    1.2234    1.2467    1.2621    1.2786    1.2961 (40)
                                                                                  Average = Sum(40)m / 12 =      1.2644 (40)
(41)m              31        28        31        30        31        30        31        31        30        31        30        31 (41)

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4. Water heating energy requirements (kWh/year)
--------------------------------------------------------------------------------------------------------

Assumed occupancy, N                                                                                       1.3764 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36                               66.8889 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of
not more that 125 litres per person per day (all water use, hot and cold)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(44)m         73.5778   70.9023   68.2267   65.5512   62.8756   60.2001   60.2001   62.8756   65.5512   68.2267   70.9023   73.5778 (44)
(45)m        109.3749   95.6599   98.7125   86.0599   82.5766   71.2573   66.0304   75.7708   76.6758   89.3582   97.5415  105.9237 (45)
Energy content (annual)                                                                      Total = Sum(45)m =  1054.9414 (45)
(46)m          0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 (46)
Water storage loss:
(57)m          0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 (57)
Primary circuit loss (annual) from Table 3                                                                            0.0000 (58)
(59)m          0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 (59)
(65)m         23.2422   20.3277   20.9764   18.2877   17.5475   15.1422   14.0315   16.1013   16.2936   18.9886   20.7276   22.5088 (65)

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5. Internal gains (see Table 5 and 5a)
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Metabolic gains (Table 5), Watts
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(66)m         68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188 (66)
(67)m         11.5788   10.2842    8.3637    6.3319    4.7331    3.9959    4.3177    5.6123    7.5329    9.5647   11.1634   11.9007 (67)
(68)m        118.6774  119.9089  116.8055  110.1989  101.8592   94.0210   88.7847   87.5532   90.6565   97.2632  105.6029  113.4410 (68)
(69)m         29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819 (69)
(70)m          0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 (70)
(71)m        -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551 (71)
(72)m         31.2395   30.2496   28.1941   25.3996   23.5854   21.0308   18.8595   21.6415   22.6300   25.5223   28.7883   30.2537 (72)
(73)m        205.1413  204.0883  197.0090  185.5760  173.8233  162.6934  155.6075  158.4527  164.4650  175.9959  189.2002  199.2411 (73)

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6. Solar gains
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CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF FABRIC ENERGY EFFICIENCY
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[Jan]                              Area      Solar flux            g              FF          Access         Gains
                                    m2        Table 6a      Specific data   Specific data     factor            W
                                                W/m2         or Table 6b     or Table 6c     Table 6d
--------------------------------------------------------------------------------------------------------
Southeast                         3.4200       37.3877         0.7600          0.7000         0.7700        47.1411 (77)
Northwest                         1.5500       11.5098         0.7600          0.7000         0.7700         6.5772 (81)
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(83)m          53.7183   93.8221  129.6873  169.2292  194.1996  200.7729  195.3476  175.9184  146.4152  108.1544   64.8194   45.6337 (83)
(84)m         258.8596  297.9105  326.6962  354.8052  368.0229  363.4663  350.9552  334.3711  310.8802  284.1503  254.0196  244.8747 (84)

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7. Mean internal temperature (heating season)
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Temperature during heating periods in the living area from Table 9, Th1 (C)                               21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
tau           52.8208   53.5789   53.5789   55.0229   55.9230   56.3518   56.7653   56.7653   55.7031   55.0229   54.3138   53.5789
alpha          4.5214    4.5719    4.5719    4.6682    4.7282    4.7568    4.7844    4.7844    4.7135    4.6682    4.6209    4.5719
(86)m          0.9967    0.9933    0.9847    0.9636    0.8963    0.7493    0.5401    0.5637    0.8423    0.9679    0.9939    0.9971 (86)

(87)m         19.6274   19.7995   20.0736   20.3810   20.7173   20.9187   20.9872   20.9847   20.8510   20.4665   19.9536   19.6658 (87)
(88)m         19.8322   19.8467   19.8467   19.8733   19.8893   19.8967   19.9039   19.9039   19.8854   19.8733   19.8604   19.8467 (88)
(89)m          0.9955    0.9910    0.9790    0.9494    0.8535    0.6543    0.4036    0.4229    0.7633    0.9517    0.9915    0.9960 (89)
(90)m         18.5989   18.7813   19.0526   19.3732   19.6965   19.8590   19.9011   19.9005   19.8063   19.4598   18.9462   18.6486 (90)
Living area fraction                                                               fLA = Living area / (4) =   0.5373 (91)
(92)m         19.1515   19.3284   19.6012   19.9147   20.2450   20.4284   20.4847   20.4830   20.3677   20.0007   19.4875   19.1952 (92)
Temperature adjustment                                                                                         0.0000
(93)m         19.1515   19.3284   19.6012   19.9147   20.2450   20.4284   20.4847   20.4830   20.3677   20.0007   19.4875   19.1952 (93)

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8. Space heating requirement
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                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(94)m          0.9946    0.9896    0.9774    0.9500    0.8688    0.7030    0.4776    0.4993    0.8011    0.9539    0.9904    0.9952 (94)
(95)m        257.4634  294.8257  319.3286  337.0582  319.7523  255.5060  167.6058  166.9527  249.0512  271.0532  251.5826  243.7051 (95)
(96)m          4.5000    5.0000    6.8000    8.7000   11.7000   14.6000   16.9000   16.9000   14.3000   10.8000    7.0000    4.9000 (96)
(97)m        748.5454  721.6793  644.7602  550.0277  412.3463  279.1142  170.4143  170.3368  293.9553  451.2526  620.4470  720.0053 (97)
(98)m        365.3650  286.8456  242.1211  153.3380   68.8899    0.0000    0.0000    0.0000    0.0000  134.0684  265.5824  354.3674 (98)
Space heating (October to May) (kWh/year)                                                                  1870.5777 (98)
Space heating requirement in kWh/m2/year                                                       (98) / (4) =   48.1363 (99)

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8c. Space cooling requirement
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Calculated for June, July and August. See Table 10b
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Ext. temp.     0.0000    0.0000    0.0000    0.0000    0.0000   15.4000   17.8000   17.8000    0.0000    0.0000    0.0000    0.0000
(100)m         0.0000    0.0000    0.0000    0.0000    0.0000  411.8424  294.7470  294.7470    0.0000    0.0000    0.0000    0.0000 (100)
(101)m         0.0000    0.0000    0.0000    0.0000    0.0000    0.8910    0.9579    0.9523    0.0000    0.0000    0.0000    0.0000 (101)
(102)m         0.0000    0.0000    0.0000    0.0000    0.0000  366.9567  282.3422  280.6931    0.0000    0.0000    0.0000    0.0000 (102)
(103)m         0.0000    0.0000    0.0000    0.0000    0.0000  492.2066  472.5025  455.9274    0.0000    0.0000    0.0000    0.0000 (103)
(98)m          0.0000    0.0000    0.0000    0.0000    0.0000    3.1497    0.1342    0.1571    0.0000    0.0000    0.0000    0.0000 (98)
(104)m         0.0000    0.0000    0.0000    0.0000    0.0000   90.1799  141.4793  130.3743    0.0000    0.0000    0.0000    0.0000 (104)
Cooled fraction                                                                    fC = cooled area / (4) =      1.000 (105)
(106)m         0.0000    0.0000    0.0000    0.0000    0.0000    0.2500    0.2500    0.2500    0.0000    0.0000    0.0000    0.0000 (106)
(107)m         0.0000    0.0000    0.0000    0.0000    0.0000   22.5450   35.3698   32.5936    0.0000    0.0000    0.0000    0.0000 (107)
                                                                                  Total = Sum(107)6..8 =    90.5084 (107)
Space cooling requirement in kWh/m2/year                                                      (107) / (4) =    2.3291 (108)

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8f.  Fabric Energy Efficiency
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Fabric Energy Efficiency                                                                  (99) + (108) =    50.4654
Fabric Energy Efficiency rounded                                                                               50.5 (109)


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CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF DATA FOR RENEWABLE HEAT INCENTIVE (RHI) Page: 5 of 22

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF DATA FOR RENEWABLE HEAT INCENTIVE (RHI)
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.8600 (1b)	x	2.7400 (2b)	=	106.4764	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.4764	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)
							Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =							20.0000 / (5) =	0.1878	(8)
Pressure test								Yes	
Measured/design q50								7.0000	
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)								0.5378	(18)
Number of sides on which dwelling is sheltered								2	(19)
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.4572	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000	(22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750	(22a)
(22b)m	0.6172	0.5829	0.5829	0.5143	0.4686	0.4457	0.4229	0.4229	0.4800	0.5143	0.5486	0.5829	(22b)
Effective ach	0.6904	0.6699	0.6699	0.6323	0.6098	0.5993	0.5894	0.5894	0.6152	0.6323	0.6505	0.6699	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900			(26)
Windows (Uw = 1.50)			4.9700	1.4151	7.0330			(27)
External Wall	25.0760	4.9700	20.1060	0.2000	4.0212			(29a)
Corridor Wall	28.0800	1.8900	26.1900	0.2257	5.9120			(29a)
Total net area of external elements Aum(A, m2)			53.1560					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.8562			(33)
Party Wall			44.0200	0.0000	0.0000			(32)
Floor			38.8600					(32d)
Ceiling			38.8600					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	7.9734	(36)
Total fabric heat loss (33) + (36) =	26.8296	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.2604	23.5375	23.5375	22.2157	21.4262	21.0591	20.7102	20.7102	21.6167	22.2157	22.8559	23.5375	(38)
(39)m	51.0900	50.3671	50.3671	49.0453	48.2558	47.8886	47.5398	47.5398	48.4463	49.0453	49.6855	50.3671	(39)
(40)m	1.3147	1.2961	1.2961	1.2621	1.2418	1.2323	1.2234	1.2234	1.2467	1.2621	1.2786	1.2961	(40)
									Average = Sum(40)m / 12 =			1.2644	(40)
(41)m	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N	1.3764	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	66.8889	(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m	73.5778	70.9023	68.2267	65.5512	62.8756	60.2001	60.2001	62.8756	65.5512	68.2267	70.9023	73.5778	(44)
(45)m	109.3749	95.6599	98.7125	86.0599	82.5766	71.2573	66.0304	75.7708	76.6758	89.3582	97.5415	105.9237	(45)
Energy content (annual)											Total = Sum(45)m =	1054.9414	(45)
(46)m	16.4062	14.3490	14.8069	12.9090	12.3865	10.6886	9.9046	11.3656	11.5014	13.4037	14.6312	15.8886	(46)
Water storage loss:													
(57)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
(61)m	37.4945	32.6345	34.7676	32.3266	32.0407	29.6877	30.6773	32.0407	32.3266	34.7676	34.9655	37.4945	(61)
(62)m	146.8693	128.2944	133.4801	118.3866	114.6173	100.9450	96.7077	107.8115	109.0024	124.1258	132.5070	143.4182	(62)
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Water heat.	146.8693	128.2944	133.4801	118.3866	114.6173	100.9450	96.7077	107.8115	109.0024	124.1258	132.5070	143.4182	(64)
								Total per year (kWh/year) = Sum(64)m =				1456.1651	(64)
RHI water heating demand												1456	(64)
(65)m	45.7408	39.9656	41.5138	36.6966	35.4669	31.1150	29.6244	33.2040	33.5763	38.4035	41.1739	44.5932	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	(66)
(67)m	28.9471	25.7106	20.9092	15.8296	11.8328	9.9898	10.7943	14.0309	18.8322	23.9118	27.9086	29.7516	(67)
(68)m	177.1304	178.9684	174.3366	164.4759	152.0286	140.3299	132.5144	130.6764	135.3082	145.1689	157.6162	169.3149	(68)
(69)m	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	(69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	(70)
(71)m	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	(71)

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF DATA FOR RENEWABLE HEAT INCENTIVE (RHI) Page: 6 of 22

(72)m	61.4795	59.4725	55.7981	50.9675	47.6706	43.2152	39.8178	44.6290	46.6338	51.6176	57.1860	59.9372	(72)
(73)m	349.7192	346.3137	333.2061	313.4352	293.6942	275.6971	265.2887	271.4984	282.9364	302.8605	324.8729	341.1659	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.4200	39.7858	0.7600	0.7000	0.7700	50.1648	(77)
Northwest	1.5500	12.7761	0.7600	0.7000	0.7700	7.3008	(81)

(83)m	57.4657	91.7040	131.6321	168.1962	193.8524	212.7715	203.7695	186.0119	151.3716	111.5355	73.4724	47.9394	(83)
(84)m	407.1849	438.0177	464.8382	481.6314	487.5466	488.4686	469.0582	457.5103	434.3080	414.3960	398.3453	389.1053	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.8208	53.5789	53.5789	55.0229	55.9230	56.3518	56.7653	56.7653	55.7031	55.0229	54.3138	53.5789	
alpha	4.5214	4.5719	4.5719	4.6682	4.7282	4.7568	4.7844	4.7844	4.7135	4.6682	4.6209	4.5719	
(86)m	0.9775	0.9674	0.9383	0.8873	0.7417	0.5343	0.3233	0.3314	0.6237	0.8645	0.9604	0.9788	(86)
(87)m	20.0279	20.1597	20.4142	20.6531	20.8960	20.9828	20.9989	20.9987	20.9644	20.7565	20.3312	20.0587	(87)
(88)m	19.8322	19.8467	19.8467	19.8733	19.8893	19.8967	19.9039	19.9039	19.8854	19.8733	19.8604	19.8467	(88)
(89)m	0.9705	0.9575	0.9188	0.8526	0.6707	0.4358	0.2131	0.2185	0.5205	0.8148	0.9465	0.9719	(89)
(90)m	18.6036	18.8012	19.1578	19.4988	19.8031	19.8881	19.9037	19.9037	19.8654	19.6370	19.0575	18.6591	(90)
Living area fraction										fLA = Living area / (4) =		0.5373	(91)
(92)m	19.3689	19.5312	19.8329	20.1190	20.3904	20.4763	20.4921	20.4921	20.4559	20.2385	19.7418	19.4111	(92)
Temperature adjustment												0.0000	
(93)m	19.3689	19.5312	19.8329	20.1190	20.3904	20.4763	20.4921	20.4921	20.4559	20.2385	19.7418	19.4111	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m	0.9670	0.9541	0.9185	0.8610	0.7044	0.4885	0.2725	0.2793	0.5750	0.8326	0.9447	0.9686	(94)
(95)m	393.7311	417.9263	426.9701	414.6737	343.4245	238.6000	127.7978	127.7725	249.7466	345.0157	376.3303	376.8890	(95)
(96)m	5.1000	5.5000	7.4000	9.3000	12.6000	15.4000	17.8000	17.8000	15.1000	11.6000	7.6000	5.5000	(96)
(97)m	728.9972	706.7083	626.2066	530.6226	375.9311	243.0988	127.9841	127.9804	259.4740	423.6795	603.2738	700.6623	(97)
(98)m	249.4380	194.0615	148.2320	83.4832	24.1849	0.0000	0.0000	0.0000	0.0000	58.5259	163.3993	240.8874	(98)
Space heating (October to May) (kWh/year)												1162.2120	(98)
RHI space heating demand												1162	(98)

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF ENERGY RATINGS Page: 7 of 22

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF ENERGY RATINGS
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	38.8600 (1b)	x	2.7400 (2b)	=	106.4764	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.8600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	106.4764	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							2 * 10 =	20.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)
							Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =							20.0000 / (5) =	0.1878	(8)
Pressure test								Yes	
Measured/design q50								7.0000	
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)								0.5378	(18)
Number of sides on which dwelling is sheltered								2	(19)
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.4572	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000	(22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	1.0500	1.1250	1.2000	1.2750	(22a)	
(22b)m	0.6172	0.5829	0.5829	0.5143	0.4686	0.4457	0.4229	0.4229	0.4800	0.5143	0.5486	0.5829	(22b)
Effective ach	0.6904	0.6699	0.6699	0.6323	0.6098	0.5993	0.5894	0.5894	0.6152	0.6323	0.6505	0.6699	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900			(26)
Windows (Uw = 1.50)			4.9700	1.4151	7.0330			(27)
External Wall	25.0760	4.9700	20.1060	0.2000	4.0212			(29a)
Corridor Wall	28.0800	1.8900	26.1900	0.2257	5.9120			(29a)
Total net area of external elements Aum(A, m2)			53.1560					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.8562			(33)
Party Wall			44.0200	0.0000	0.0000			(32)
Floor			38.8600					(32d)
Ceiling			38.8600					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)	7.9734	(36)
Total fabric heat loss (33) + (36) =	26.8296	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.2604	23.5375	23.5375	22.2157	21.4262	21.0591	20.7102	20.7102	21.6167	22.2157	22.8559	23.5375	(38)
(39)m	51.0900	50.3671	50.3671	49.0453	48.2558	47.8886	47.5398	47.5398	48.4463	49.0453	49.6855	50.3671	(39)
(40)m	1.3147	1.2961	1.2961	1.2621	1.2418	1.2323	1.2234	1.2234	1.2467	1.2621	1.2786	1.2961	(40)
									Average = Sum(40)m / 12 =			1.2644	(40)
(41)m	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N	1.3764	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	66.8889	(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m	73.5778	70.9023	68.2267	65.5512	62.8756	60.2001	60.2001	62.8756	65.5512	68.2267	70.9023	73.5778	(44)
(45)m	109.3749	95.6599	98.7125	86.0599	82.5766	71.2573	66.0304	75.7708	76.6758	89.3582	97.5415	105.9237	(45)
Energy content (annual)											Total = Sum(45)m =	1054.9414	(45)
(46)m	16.4062	14.3490	14.8069	12.9090	12.3865	10.6886	9.9046	11.3656	11.5014	13.4037	14.6312	15.8886	(46)
Water storage loss:													
(57)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
(61)m	37.4945	32.6345	34.7676	32.3266	32.0407	29.6877	30.6773	32.0407	32.3266	34.7676	34.9655	37.4945	(61)
(62)m	146.8693	128.2944	133.4801	118.3866	114.6173	100.9450	96.7077	107.8115	109.0024	124.1258	132.5070	143.4182	(62)
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Water heat.	146.8693	128.2944	133.4801	118.3866	114.6173	100.9450	96.7077	107.8115	109.0024	124.1258	132.5070	143.4182	(64)
								Total per year (kWh/year) = Sum(64)m =				1456.1651	(64)
(65)m	45.7408	39.9656	41.5138	36.6966	35.4669	31.1150	29.6244	33.2040	33.5763	38.4035	41.1739	44.5932	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	82.5826	(66)
(67)m	28.9471	25.7106	20.9092	15.8296	11.8328	9.9898	10.7943	14.0309	18.8322	23.9118	27.9086	29.7516	(67)
(68)m	177.1304	178.9684	174.3366	164.4759	152.0286	140.3299	132.5144	130.6764	135.3082	145.1689	157.6162	169.3149	(68)
(69)m	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	44.6346	(69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	(70)
(71)m	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	(71)
(72)m	61.4795	59.4725	55.7981	50.9675	47.6706	43.2152	39.8178	44.6290	46.6338	51.6176	57.1860	59.9372	(72)

8.2: Appendixes :
Energy / Renewable Energy Statement


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(73)m          349.7192  346.3137  333.2061  313.4352  293.6942  275.6971  265.2887  271.4984  282.9364  302.8605  324.8729  341.1659 (73)
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6. Solar gains
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[Jan]                                    Area        Solar flux          g              FF          Access          Gains
                                         m2          Table 6a          Specific data  Specific data  factor          W
                                                     W/m2              or Table 6b    or Table 6c    Table 6d
----------------------------------------------------------------------------------------------------------------------------------------
Southeast                                3.4200      37.3877           0.7600         0.7000         0.7700          47.1411 (77)
Northwest                                1.5500      11.5098           0.7600         0.7000         0.7700          6.5772 (81)
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(83)m          53.7183   93.8221  129.6873  169.2292  194.1996  200.7729  195.3476  175.9184  146.4152  108.1544   64.8194   45.6337 (83)
(84)m          403.4375  440.1359  462.8934  482.6644  487.8938  476.4700  460.6363  447.4168  429.3516  411.0149  389.6924  386.7995 (84)
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7. Mean internal temperature (heating season)
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Temperature during heating periods in the living area from Table 9, Th1 (C)                                                    21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
tau             52.8208   53.5789   53.5789   55.0229   55.9230   56.3518   56.7653   56.7653   55.7031   55.0229   54.3138   53.5789
alpha           4.5214    4.5719    4.5719    4.6682    4.7282    4.7568    4.7844    4.7844    4.7135    4.6682    4.6209    4.5719
(86)m           0.9810    0.9704    0.9470    0.9016    0.7892    0.6127    0.4191    0.4310    0.6941    0.8939    0.9686    0.9820 (86)

(87)m           19.9507   20.1083   20.3483   20.6019   20.8486   20.9653   20.9956   20.9950   20.9369   20.6853   20.2487   19.9852 (87)
(88)m           19.8322   19.8467   19.8467   19.8733   19.8893   19.8967   19.9039   19.9039   19.8854   19.8733   19.8604   19.8467 (88)
(89)m           0.9752    0.9615    0.9306    0.8715    0.7289    0.5196    0.3092    0.3182    0.6018    0.8546    0.9577    0.9763 (89)
(90)m           18.4923   18.7275   19.0662   19.4315   19.7516   19.8756   19.9026   19.9024   19.8429   19.5481   18.9411   18.5530 (90)
Living area fraction                                                                    fLA = Living area / (4) =                  0.5373 (91)
(92)m           19.2759   19.4695   19.7551   20.0604   20.3410   20.4611   20.4899   20.4895   20.4307   20.1592   19.6437   19.3225 (92)
Temperature adjustment                                                                                                             0.0000
(93)m           19.2759   19.4695   19.7551   20.0604   20.3410   20.4611   20.4899   20.4895   20.4307   20.1592   19.6437   19.3225 (93)
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8. Space heating requirement
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                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(94)m           0.9717    0.9580    0.9290    0.8771    0.7550    0.5686    0.3685    0.3790    0.6490    0.8658    0.9551    0.9730 (94)
(95)m           392.0269  421.6424  430.0504  423.3533  368.3680  270.9111  169.7298  169.5911  278.6583  355.8603  372.2117  376.3498 (95)
(96)m           4.5000    5.0000    6.8000    8.7000    11.7000   14.6000   16.9000   16.9000   14.3000   10.8000   7.0000    4.9000 (96)
(97)m           754.9021  728.7847  652.5099  557.1745  416.9790  280.6812  170.6618  170.6438  297.0106  459.0222  628.2083  726.4207 (97)
(98)m           269.9792  206.3996  165.5099  96.3512   36.1666   0.0000    0.0000    0.0000    0.0000    76.7524   184.3176  260.4528 (98)
Space heating (October to May) (kWh/year)                                                                                          1295.9293 (98)
Space heating requirement in kWh/m2/year                                                                                (98) / (4) =  33.3487 (99)
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8c. Space cooling requirement
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Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP
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Fraction of space heat from secondary/supplementary system (Table 11)                                                          0.0000 (201)
Fraction of space heat from main system(s)                                                                                     1.0000 (202)
Efficiency of main space heating system 1 (in %)                                                                               90.8000 (206)
Efficiency of secondary/supplementary heating system, %                                                                        0.0000 (208)
Space heating:
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(98)m           269.9792  206.3996  165.5099  96.3512   36.1666   0.0000    0.0000    0.0000    0.0000    76.7524   184.3176  260.4528 (98)
(211)m          297.3339  227.3124  182.2796  106.1137  39.8311   0.0000    0.0000    0.0000    0.0000    84.5291   202.9929  286.8423 (211)
(215)m          0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 (215)
Annual totals kWh/year
Space heating fuel used, main system 1                                                                                         1427.2349 (211)
Space heating fuel used, secondary                                                                                             0.0000 (215)

Water heating
(64)m           146.8693  128.2944  133.4801  118.3866  114.6173  100.9450  96.7077   107.8115  109.0024  124.1258  132.5070  143.4182 (64)
Efficiency of water heater                                                                                                     81.5000 (216)
(217)m          87.2905   86.9948   86.3986   85.4259   83.5526   81.5000   81.5000   81.5000   81.5000   84.8193   86.6640   87.2639 (217)
(219)m          168.2535  147.4737  154.4934  138.5840  137.1798  123.8589  118.6597  132.2841  133.7452  146.3414  152.8974  164.3499 (219)

Water heating fuel used                                                                                                        1718.1209 (219)

Electricity for pumps, fans and electric keep-hot (Table 4f):
  central heating pump                                                                                                         130.0000 (230c)
  boiler with a fan-assisted flue                                                                                              45.0000 (230e)
Total electricity for the above, kWh/year                                                                                      175.0000 (231)
Electricity for lighting (calculated in Appendix L)                                                                            204.4860 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV Unit 0 (0.80 * 0.28 * 961 * 1.00)                                                                    -215.2640              (233)
----------------------------------------------------------------------------------------------------------------------------------------
10a. Fuel costs - using Table 12 prices
----------------------------------------------------------------------------------------------------------------------------------------

                                                                                Fuel          Fuel price          Fuel cost
                                                                                kWh/year      p/kWh               £/year
Space heating - main system 1                                                   1427.2349     3.1000              44.2443 (240)
Space heating - secondary                                                       0.0000        0.0000              0.0000 (242)
Water heating cost (other fuel)                                                 1718.1209     3.1000              53.2617 (247)
Pumps and fans for heating                                                      175.0000      11.4600             20.0550 (249)
Energy for lighting                                                             204.4860      11.4600             23.4341 (250)
Additional standing charges                                                                                       106.0000 (251)

Energy saving/generation technologies
PV Unit                                                                         -215.2640     11.4600             -24.6693 (252)
Total energy cost                                                                                                 222.3259 (255)

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11a. SAP rating - Individual heating systems
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Energy cost deflator (Table 12):                                                                                               0.4700 (256)
Energy cost factor (ECF)                                        [(255) x (256)] / [(4) + 45.0] =                               1.2460 (257)
SAP value                                                                                                                      82.6177
SAP rating (Section 12)                                                                                                        83 (258)
SAP band                                                                                                                       B

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10a. Fuel costs - using BEDF prices (327)
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                                                                                Fuel          Fuel price          Fuel cost
                                                                                kWh/year      p/kWh               £/year
Space heating - main system 1                                                   1427.2349     3.4100              48.6687 (240)
Space heating - secondary                                                       0.0000        0.0000              0.0000 (242)
Water heating cost (other fuel)                                                 1718.1209     3.4100              58.5879 (247)
Pumps and fans for heating                                                      175.0000      12.9300             22.6275 (249)
Energy for lighting                                                             204.4860      12.9300             26.4400 (250)
Additional standing charges                                                                                       119.0000 (251)

Energy saving/generation technologies
PV Unit                                                                         -215.2640     12.9300             -27.8336 (252)
Total energy cost                                                                                                 247.4905 (255)

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12a. CO2 emissions - Individual heating systems including micro-CHP
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                                                                                Energy        Emission factor     Emissions
                                                                                kWh/year      kg CO2/kWh          kg CO2/year
Space heating - main system 1                                                   1427.2349     0.1980              282.5925 (261)
Space heating - secondary                                                       0.0000        0.0000              0.0000 (263)
Water heating cost (other fuel)                                                 1718.1209     0.1980              340.1879 (264)
Space and water heating                                                                                           622.7804 (265)
Pumps and fans                                                                  175.0000      0.5170              90.4750 (267)
Energy for lighting                                                             204.4860      0.5170              105.7192 (268)

Energy saving/generation technologies
PV Unit                                                                         -215.2640     0.5290              -113.8747 (269)
Total CO2, kg/year                                                                                                705.1000 (272)
CO2 emissions per m2                                                                                              18.1400 (273)
EI value                                                                                                          88.7332
EI rating                                                                                                         89 (274)
EI band                                                                                                           B

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13a. Primary energy - Individual heating systems including micro-CHP
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                                                                                Energy        Primary energy factor Primary energy
                                                                                kWh/year      kg CO2/kWh          kWh/year
Space heating - main system 1                                                   1427.2349     1.0200              1455.7796 (261)
Space heating - secondary                                                       0.0000        0.0000              0.0000 (263)
Water heating cost (other fuel)                                                 1718.1209     1.0200              1752.4833 (264)
Space and water heating                                                                                           3208.2629 (265)
Pumps and fans                                                                  175.0000      2.9200              511.0000 (267)
Energy for lighting                                                             204.4860      2.9200              597.0990 (268)

Energy saving/generation technologies
PV Unit                                                                         -215.2640     2.9200              -628.5709 (269)
Primary energy kWh/year                                                                                           3687.7910 (272)
Primary energy kWh/m2/year                                                                                        94.8994 (273)

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SAP 2009 WORKSHEET FOR New Build (As Designed)   BRE SAP Worksheet 9.90
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18
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1. Overall dwelling dimensions
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                                                                                Area          Storey height       Volume
                                                                                (m2)          (m)                 (m3)
Ground floor                                                                    38.8600 (1b)  x  2.7400 (2b)  =  106.4764 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)                          38.8600                           (4)
Dwelling volume                                                                               (3a)+(3b)+(3c)+(3d)+(3e)...(3n) =  106.4764 (5)

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2. Ventilation rate
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                                                main          secondary     other         total         m3 per hour
                                                heating       heating
Number of chimneys                              0       +     0       +     0       =     0 * 40 =      0.0000 (6a)
Number of open flues                            0       +     0       +     0       =     0 * 20 =      0.0000 (6b)
Number of intermittent fans                                                             2 * 10 =      20.0000 (7a)
Number of passive vents                                                                 0 * 10 =      0.0000 (7b)
Number of flueless gas fires                                                            0 * 40 =      0.0000 (7c)

                                                                                                      Air changes per hour
Infiltration due to chimneys, flues and fans  = (6a)+(6b)+(7a)+(7b)+(7c) =                            20.0000 / (5) =       0.1878 (8)
Pressure test                                                                                                               Yes
Measured/design q50                                                                                                         7.0000
If based on air permeability value, then (18) = [(17)/20]+(8),  otherwise (18) = (16)                                       0.5378 (18)
Number of sides on which dwelling is sheltered                                                                              2 (19)

Shelter factor                                                                          (20) = 1 - [0.075 x (19)] =           0.8500 (20)
Infiltration rate adjusted to include shelter factor                                            (21) = (18) x (20) =          0.4572 (21)

                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Wind speed      5.4000    5.1000    5.1000    4.5000    4.1000    3.9000    3.7000    3.7000    4.2000    4.5000    4.8000    5.1000 (22)
Wind factor     1.3500    1.2750    1.2750    1.1250    1.0250    0.9750    0.9250    0.9250    1.0500    1.1250    1.2000    1.2750 (22a)
(22b)m          0.6172    0.5829    0.5829    0.5143    0.4686    0.4457    0.4229    0.4229    0.4800    0.5143    0.5486    0.5829 (22b)
Effective ach   0.6904    0.6699    0.6699    0.6323    0.6098    0.5993    0.5894    0.5894    0.6152    0.6323    0.6505    0.6699 (25)

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3. Heat losses and heat loss parameter
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Element                                         Gross         Openings      NetArea       U-value       A x U         K-value       A x K
                                                m2            m2            m2            W/m2K         W/K           kJ/m2K        kJ/K
Door                                                                        1.8900        1.0000        1.8900                      (26)
Windows (Uw = 1.50)                                                         4.9700        1.4151        7.0330                      (27)
External Wall                                   25.0760       4.9700        20.1060       0.2000        4.0212                      (29a)
Corridor Wall                                   28.0800       1.8900        26.1900       0.2257        5.9120                      (29a)
Total net area of external elements Aum(A, m2)                              53.1560                                             (31)
Fabric heat loss, W/K = Sum (A x U)                                                       (26)...(30) + (32) =  18.8562             (33)
Party Wall                                                                  44.0200       0.0000        0.0000                      (32)
Floor                                                                       38.8600                                             (32d)
Ceiling                                                                     38.8600                                             (32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                                                                               250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)                                                                      7.9734 (36)
Total fabric heat loss                                                                                        (33) + (36) =     26.8296 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(38)m           24.2604   23.5375   23.5375   22.2157   21.4262   21.0591   20.7102   20.7102   21.6167   22.2157   22.8559   23.5375 (38)
(39)m           51.0900   50.3671   50.3671   49.0453   48.2558   47.8886   47.5398   47.5398   48.4463   49.0453   49.6855   50.3671 (39)
(40)m           1.3147    1.2961    1.2961    1.2621    1.2418    1.2323    1.2234    1.2234    1.2467    1.2621    1.2786    1.2961 (40)
                                                                                                Average = Sum(40)m / 12 =     1.2644 (40)
(41)m           31        28        31        30        31        30        31        31        30        31        30        31 (41)

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4. Water heating energy requirements (kWh/year)
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Assumed occupancy, N                                                                                                            1.3764 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36                                                     66.8889 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of
not more that 125 litres per person per day (all water use, hot and cold)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(44)m           73.5778   70.9023   68.2267   65.5512   62.8756   60.2001   60.2001   62.8756   65.5512   68.2267   70.9023   73.5778 (44)
(45)m           109.3749  95.6599   98.7125   86.0599   82.5766   71.2573   66.0304   75.7708   76.6758   89.3582   97.5415   105.9237 (45)
Energy content (annual)                                                                                 Total = Sum(45)m =    1054.9414 (45)
(46)m           16.4062   14.3490   14.8069   12.9090   12.3865   10.6886   9.9046    11.3656   11.5014   13.4037   14.6312   15.8886 (46)
Water storage loss:
(57)m           0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 (57)
(61)m           37.4945   32.6345   34.7676   32.3266   32.0407   29.6877   30.6773   32.0407   32.3266   34.7676   34.9655   37.4945 (61)
(62)m           146.8693  128.2944  133.4801  118.3866  114.6173  100.9450  96.7077   107.8115  109.0024  124.1258  132.5070  143.4182 (62)
(63)m           0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 (63)
                                                                                                Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Water heat.     146.8693  128.2944  133.4801  118.3866  114.6173  100.9450  96.7077   107.8115  109.0024  124.1258  132.5070  143.4182 (64)
                                                                                                Total per year (kWh/year) = Sum(64)m =  1456.1651 (64)
(65)m           45.7408   39.9656   41.5138   36.6966   35.4669   31.1150   29.6244   33.2040   33.5763   38.4035   41.1739   44.5932 (65)

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5. Internal gains (see Table 5 and 5a)
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Metabolic gains (Table 5), Watts
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(66)m           68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188   68.8188 (66)
(67)m           11.5788   10.2842   8.3637    6.3319    4.7331    3.9959    4.3177    5.6123    7.5329    9.5647    11.1634   11.9007 (67)
(68)m           118.6774  119.9089  116.8055  110.1989  101.8592  94.0210   88.7847   87.5532   90.6565   97.2632   105.6029  113.4410 (68)
(69)m           29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819 (69)
(70)m           10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000 (70)
(71)m           -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551 (71)
(72)m           61.4795   59.4725   55.7981   50.9675   47.6706   43.2152   39.8178   44.6290   46.6338   51.6176   57.1860   59.9372 (72)
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CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE Page: 11 of 22

(73)m	245.3814	243.3113	234.6130	221.1439	207.9085	194.8778	186.5658	191.4402	198.4688	212.0911	227.5979	238.9245 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast			3.4200	37.3877	0.7600	0.7000	0.7700	47.1411 (77)
Northwest			1.5500	11.5098	0.7600	0.7000	0.7700	6.5772 (81)

(83)m	53.7183	93.8221	129.6873	169.2292	194.1996	200.7729	195.3476	175.9184	146.4152	108.1544	64.8194	45.6337 (83)
(84)m	299.0997	337.1334	364.3002	390.3730	402.1081	395.6507	381.9135	367.3585	344.8840	320.2455	292.4173	284.5581 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.8208	53.5789	53.5789	55.0229	55.9230	56.3518	56.7653	56.7653	55.7031	55.0229	54.3138	53.5789	
alpha	4.5214	4.5719	4.5719	4.6682	4.7282	4.7568	4.7844	4.7844	4.7135	4.6682	4.6209	4.5719	
(86)m	0.9940	0.9891	0.9770	0.9494	0.8675	0.7074	0.5001	0.5183	0.7991	0.9513	0.9893	0.9946	(86)
(87)m	19.7196	19.8879	20.1542	20.4491	20.7624	20.9366	20.9907	20.9892	20.8836	20.5367	20.0405	19.7573	(87)
(88)m	19.8322	19.8467	19.8467	19.8733	19.8893	19.8967	19.9039	19.9039	19.8854	19.8733	19.8604	19.8467	(88)
(89)m	0.9920	0.9854	0.9688	0.9308	0.8182	0.6110	0.3718	0.3861	0.7128	0.9286	0.9852	0.9927	(89)
(90)m	18.1599	18.4138	18.7978	19.2329	19.6589	19.8552	19.9010	19.9005	19.7993	19.3612	18.6467	18.2250	(90)
Living area fraction								fLA = Living area / (4) =				0.5373	(91)
(92)m	18.9980	19.2059	19.5266	19.8863	20.2518	20.4363	20.4865	20.4855	20.3819	19.9928	19.3956	19.0483	(92)
Temperature adjustment												0.0000	
(93)m	18.9980	19.2059	19.5266	19.8863	20.2518	20.4363	20.4865	20.4855	20.3819	19.9928	19.3956	19.0483	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m	0.9901	0.9828	0.9659	0.9311	0.8360	0.6605	0.4412	0.4576	0.7545	0.9315	0.9829	0.9909	(94)
(95)m	296.1247	331.3317	351.8920	363.4719	336.1440	261.3276	168.4917	168.1069	260.1978	298.2983	287.4270	281.9717	(95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000	(96)
(97)m	740.7007	715.5077	641.0029	548.6367	412.6741	279.4911	170.5025	170.4533	294.6453	450.8628	615.8842	712.6079	(97)
(98)m	330.7645	258.1662	215.0985	133.3187	56.9383	0.0000	0.0000	0.0000	0.0000	113.5080	236.4892	320.3933	(98)
Space heating (October to May) (kWh/year)												1664.6768	(98)
Space heating requirement in kWh/m2/year											(98) / (4) =	42.8378	(99)

9c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)
Fraction of space heat from main system(s)	1.0000 (202)
Efficiency of main space heating system 1 (in %)	90.8000 (206)
Efficiency of secondary/supplementary heating system, %	0.0000 (208)

Space heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m	330.7645	258.1662	215.0985	133.3187	56.9383	0.0000	0.0000	0.0000	0.0000	113.5080	236.4892	320.3933	(98)
(211)m	364.2781	284.3240	236.8927	146.8268	62.7074	0.0000	0.0000	0.0000	0.0000	125.0088	260.4507	352.8561	(211)
(215)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Annual totals kWh/year	
Space heating fuel used, main system 1	1833.3445 (211)
Space heating fuel used, secondary	0.0000 (215)
Water heating	
(64)m 146.8693 128.2944 133.4801 118.3866 114.6173 100.9450 96.7077 107.8115 109.0024 124.1258 132.5070	143.4182 (64)
Efficiency of water heater	81.5000 (216)
(217)m 87.7220 87.4859 86.9985 86.1749 84.3680 81.5000 81.5000 81.5000 81.5000 85.6923 87.2257	87.7053 (217)
(219)m 167.4259 146.6458 153.4280 137.3793 135.8540 123.8589 118.6597 132.2841 133.7452 144.8505 151.9127	163.5228 (219)
Water heating fuel used	1709.5669 (219)
Electricity for pumps, fans and electric keep-hot (Table 4f):	
central heating pump	130.0000 (230c)
boiler with a fan-assisted flue	45.0000 (230e)
Total electricity for the above, kWh/year	175.0000 (231)
Electricity for lighting (calculated in Appendix L)	204.4860 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.28 * 961 * 1.00) -215.2640	(233)

12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1833.3445	0.1980	363.0022	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating cost (other fuel)	1709.5669	0.1980	338.4942	(264)
Space and water heating			701.4965	(265)
Pumps and fans	175.0000	0.5170	90.4750	(267)
Energy for lighting	204.4860	0.5170	105.7192	(268)
Energy saving/generation technologies				
PV Unit	-215.2640	0.5290	-113.8747	(269)
Total CO2, kg/year			783.8160	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.1700	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE Page: 12 of 22

DER		20.1700 2C1
Total Floor Area	TFA	38.8600
Assumed number of occupants	N	1.3764
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5290
CO2 emissions from appliances, equation (L14)		18.4459 2C2
CO2 emissions from cooking, equation (L16)		3.9123 2C3
Total CO2 emissions		42.5282 2C4
Residual CO2 emissions offset from biofuel CHP		0.0000 2C5
Additional allowable electricity generation, kWh/m2/year		0.0000 2C6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 2C7
Net CO2 emissions		42.5282 2C8

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF TARGET EMISSIONS Page: 13 of 22

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF TARGET EMISSIONS
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	38.8600 (1b)	x 2.7400 (2b)	= 106.4764 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.8600		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	106.4764 (5)	

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour	
Number of chimneys	0 +	0 +	0 =	0 * 40 =	0.0000	(6a)
Number of open flues	0 +	0 +	0 =	0 * 20 =	0.0000	(6b)
Number of intermittent fans				2 * 10 =	20.0000	(7a)
Number of passive vents				0 * 10 =	0.0000	(7b)
Number of flueless gas fires				0 * 40 =	0.0000	(7c)
				Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1878	(8)
Pressure test					Yes	
Measured/design q50					10.0000	
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)					0.6878	(18)
Number of sides on which dwelling is sheltered					2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.5847	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000	(22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750	(22a)
(22b)m	0.7893	0.7454	0.7454	0.6577	0.5993	0.5700	0.5408	0.5408	0.6139	0.6577	0.7016	0.7454	(22b)
Effective ach	0.8115	0.7778	0.7778	0.7163	0.6796	0.6625	0.6462	0.6462	0.6884	0.7163	0.7461	0.7778	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Doors			1.8500	2.0000	3.7000			(26)
Windows (Uw = 2.00)			7.8650	1.8519	14.5648			(27)
External Wall	53.1560	9.7150	43.4410	0.3500	15.2044			(29a)
Total net area of external elements Aum(A, m2)			53.1560					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.4692			(33)
Party Wall			44.0200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (User defined value 0.110 * total exposed area)	5.8472 (36)
Total fabric heat loss (33) + (36) =	39.3163 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.5135	27.3312	27.3312	25.1692	23.8781	23.2775	22.7070	22.7070	24.1896	25.1692	26.2164	27.3312	(38)
(39)m	67.8298	66.6475	66.6475	64.4855	63.1944	62.5938	62.0233	62.0233	63.5059	64.4855	65.5327	66.6475	(39)
(40)m	1.7455	1.7151	1.7151	1.6594	1.6262	1.6108	1.5961	1.5961	1.6342	1.6594	1.6864	1.7151	(40)
										Average = Sum(40)m / 12 =		1.6633	(40)
(41)m	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N		1.3764 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36		70.4094 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m	77.4504	74.6340	71.8176	69.0012	66.1849	63.3685	63.3685	66.1849	69.0012	71.8176	74.6340	77.4504	(44)
(45)m	115.1314	100.6947	103.9079	90.5894	86.9227	75.0077	69.5056	79.7587	80.7113	94.0613	102.6752	111.4986	(45)
Energy content (annual)										Total = Sum(45)m =		1110.4646	(45)
(46)m	17.2697	15.1042	15.5862	13.5884	13.0384	11.2512	10.4258	11.9638	12.1067	14.1092	15.4013	16.7248	(46)

Water storage loss:	
b) If manufacturer declared cylinder loss factor is not known :	
Cylinder volume (litres) including any solar storage within same cylinder	150.0000 (50)
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0191 (51)
Volume factor from Table 2a	0.9283 (52)
Temperature factor from Table 2b	0.5400 (53)
Enter (49) or (54) in (55)	1.4364 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(57)m	44.5282	40.2190	44.5282	43.0918	44.5282	43.0918	44.5282	44.5282	43.0918	44.5282	43.0918	44.5282	(57)
Primary circuit loss (annual) from Table 3												610.0000	(58)
(59)m	51.8082	46.7945	51.8082	50.1370	51.8082	50.1370	51.8082	51.8082	50.1370	51.8082	50.1370	51.8082	(59)
(62)m	211.4678	187.7082	200.2443	183.8182	183.2591	168.2365	165.8421	176.0952	173.9401	190.3977	195.9040	207.8350	(62)
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
										Solar input (sum of months) = Sum(63)m =		0.0000	(63)
Water heat.	211.4678	187.7082	200.2443	183.8182	183.2591	168.2365	165.8421	176.0952	173.9401	190.3977	195.9040	207.8350	(64)
										Total per year (kWh/year) = Sum(64)m =		2244.7482	(64)
(65)m	115.3503	103.0918	111.6185	104.7040	105.9709	99.5231	100.1798	103.5889	101.4195	108.3445	108.7225	114.1424	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	(66)
(67)m	18.0914	16.0686	13.0679	9.8932	7.3953	6.2434	6.7462	8.7690	11.7697	14.9444	17.4423	18.5942	(67)
(68)m	118.6774	119.9089	116.8055	110.1989	101.8592	94.0210	88.7847	87.5532	90.6565	97.2632	105.6029	113.4410	(68)

8.2: Appendixes :
Energy / Renewable Energy Statement

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF TARGET EMISSIONS Page: 14 of 22

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(69)m          29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819   29.8819 (69)
(70)m          10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000   10.0000 (70)
(71)m         -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551  -55.0551 (71)
(72)m         155.0408  153.4104  150.0249  145.4222  142.4340  138.2265  134.6502  139.2324  140.8605  145.6243  151.0035  153.4172 (72)
(73)m         345.4551  343.0335  333.5439  319.1600  305.3342  292.1366  283.8268  289.2002  296.9324  311.4775  327.6943  339.0981 (73)

6. Solar gains

[Jan]                                  Area        Solar flux          g          FF          Access          Gains
                                       m2          Table 6a      Specific data  Specific data  factor          W
                                                   W/m2          or Table 6b    or Table 6c    Table 6d
East                                              7.8650          19.8726        0.7200         0.7000          0.7700          54.5904 (76)

(83)m          54.5904  105.8117  169.1212  251.1049  305.5232  318.7979  309.4294  269.3032  202.1913  128.8588   67.8701   45.0317 (83)
(84)m         400.0456  448.8453  502.6651  570.2649  610.8573  610.9345  593.2562  558.5035  499.1237  440.3363  395.5644  384.1298 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)                                                  21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
tau           39.7850   40.4908   40.4908   41.8483   42.7033   43.1130   43.5096   43.5096   42.4939   41.8483   41.1796   40.4908
alpha          3.6523    3.6994    3.6994    3.7899    3.8469    3.8742    3.9006    3.9006    3.8329    3.7899    3.7453    3.6994
(86)m          0.9849    0.9760    0.9524    0.8986    0.7781    0.6053    0.4195    0.4435    0.7256    0.9154    0.9752    0.9855 (86)

(87)m          19.4189   19.6233   19.9753   20.3792   20.7500   20.9313   20.9879   20.9853   20.8594   20.4368   19.8293   19.4783 (87)
(88)m          19.5135   19.5350   19.5350   19.5746   19.5986   19.6098   19.6205   19.6205   19.5928   19.5746   19.5553   19.5350 (88)
(89)m           0.9797    0.9680    0.9358    0.8643    0.7071    0.4937    0.2829    0.3001    0.6167    0.8774    0.9655    0.9805 (89)
(90)m          18.1477   18.3643   18.7059   19.1138   19.4491   19.5831   19.6185   19.6180   19.5299   19.1776   18.5847   18.2229 (90)
Living area fraction                                                    fLA = Living area / (4) =                          0.5373 (91)
(92)m          18.8307   19.0408   19.3880   19.7937   20.1481   20.3075   20.3543   20.3527   20.2442   19.8542   19.2535   18.8974 (92)
Temperature adjustment                                                                                                     0.0000
(93)m          18.8307   19.0408   19.3880   19.7937   20.1481   20.3075   20.3543   20.3527   20.2442   19.8542   19.2535   18.8974 (93)

8. Space heating requirement

                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(94)m          0.9766    0.9645    0.9338    0.8703    0.7372    0.5520    0.3568    0.3778    0.6710    0.8861    0.9629    0.9776 (94)
(95)m        390.7002  432.9241  469.3778  496.3100  450.2940  337.2308  211.6515  210.9777  334.9187  390.1993  380.9010  375.5155 (95)
(96)m          4.5000    5.0000    6.8000    8.7000   11.7000   14.6000   16.9000   16.9000   14.3000   10.8000    7.0000    4.9000 (96)
(97)m        972.0490  935.7813  838.9555  715.3832  533.8709  357.2523  214.2452  214.1456  377.4948  583.8645  803.0032  932.8944 (97)
(98)m        432.5235  337.9200  274.9658  157.7327   62.1812    0.0000    0.0000    0.0000    0.0000  144.0869  303.9136  414.6899 (98)
Space heating (October to May) (kWh/year)                                                                              2128.0136 (98)
Space heating requirement in kWh/m2/year                                                                (98) / (4) =    54.7610 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)                                                      0.1000 (201)
Fraction of space heat from main system(s)                                                                                 0.9000 (202)
Efficiency of main space heating system 1 (in %)                                                                          78.9000 (206)
Efficiency of secondary/supplementary heating system, %                                                                  100.0000 (208)
Space heating:
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(98)m        432.5235  337.9200  274.9658  157.7327   62.1812    0.0000    0.0000    0.0000    0.0000  144.0869  303.9136  414.6899 (98)
(211)m       493.3728  385.4601  313.6492  179.9232   70.9291    0.0000    0.0000    0.0000    0.0000  164.3576  346.6695  473.0303 (211)
(215)m        43.2523   33.7920   27.4966   15.7733    6.2181    0.0000    0.0000    0.0000    0.0000   14.4087   30.3914   41.4690 (215)
Annual totals kWh/year
Space heating fuel used, main system 1                                                                                  2427.3919 (211)
Space heating fuel used, secondary                                                                                       212.8014 (215)

Water heating
(64)m          211.4678  187.7082  200.2443  183.8182  183.2591  168.2365  165.8421  176.0952  173.9401  190.3977  195.9040  207.8350 (64)
Efficiency of water heater                                                                                                68.8000 (216)
(217)m          75.0231   74.7140   74.0387   72.8645   70.9239   68.8000   68.8000   68.8000   68.8000   72.5634   74.3453   74.9637 (217)
(219)m         281.8704  251.2356  270.4589  252.2741  258.3883  244.5297  241.0495  255.9523  252.8199  262.3882  263.5057  277.2475 (219)

Water heating fuel used                                                                                                 3111.7201 (219)

Electricity for pumps, fans and electric keep-hot (Table 4f):
  central heating pump                                                                                                   130.0000 (230c)
  boiler with a fan-assisted flue                                                                                         45.0000 (230e)
Total electricity for the above, kWh/year                                                                                175.0000 (231)
Electricity for lighting (calculated in Appendix L)                                                                      319.4991 (232)

12a. CO2 emissions - Individual heating systems including micro-CHP

                                                Energy          Emission factor          Emissions
                                                kWh/year        kg CO2/kWh               kg CO2/year
Space heating - main system 1                   2427.3919             0.1940             470.9140 (261)
Space heating - secondary                        212.8014             0.4220              89.8022 (263)
Water heating cost (other fuel)                 3111.7201             0.1940             603.6737 (264)
Space and water heating                                                                 1164.3899 (265)
Pumps and fans                                   175.0000             0.4220              73.8500 (267)
Energy for lighting                              319.4991             0.4220             134.8286 (268)
Total CO2, kg/year                                                                      1373.0685 (272)
Emissions per m2 for space and water heating                                              31.8641 (272a)
Emissions per m2 for lighting                                                              3.4696 (272b)
Target Carbon Dioxide Emission Rate (TER)                                                 22.0600 (273)
 = [(31.8641 * 1.00 * 1.0206) + (3.4696 * 1.2251)] * 0.60
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CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF TARGET EMISSIONS Page: 15 of 22

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF STANDARD ENE7 CO2 Page: 16 of 22

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SAP 2009 WORKSHEET FOR New Build (As Designed)   BRE SAP Worksheet 9.90
CALCULATION OF STANDARD ENE7 CO2
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

                                                                  Area          Storey height                Volume
                                                                  (m2)               (m)                     (m3)
Ground floor                                                   38.8600 (1b)    x     2.7400 (2b)    =    106.4764 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)         38.8600                                          (4)
Dwelling volume                                                                (3a)+(3b)+(3c)+(3d)+(3e)...(3n) =    106.4764 (5)

2. Ventilation rate

                                                        main          secondary          other             total        m3 per hour
                                                      heating         heating
Number of chimneys                                          0   +           0   +           0   =             0 * 40 =       0.0000 (6a)
Number of open flues                                        0   +           0   +           0   =             0 * 20 =       0.0000 (6b)
Number of intermittent fans                                                                          2 * 10 =      20.0000 (7a)
Number of passive vents                                                                              0 * 10 =       0.0000 (7b)
Number of flueless gas fires                                                                         0 * 40 =       0.0000 (7c)

                                                                                                                Air changes per hour
Infiltration due to chimneys, flues and fans  = (6a)+(6b)+(7a)+(7b)+(7c) =                                  20.0000 / (5) =       0.1878 (8)
Pressure test                                                                                                                 Yes
Measured/design q50                                                                                                         7.0000
If based on air permeability value, then (18) = [(17)/20]+(8),  otherwise (18) = (16)                                       0.5378 (18)
Number of sides on which dwelling is sheltered                                                                              2      (19)

Shelter factor                                                                          (20) =  1  -  [0.075 x (19)]  =       0.8500 (20)
Infiltration rate adjusted to include shelter factor                                            (21) = (18) x (20)  =       0.4572 (21)

                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Wind speed    5.4000    5.1000    5.1000    4.5000    4.1000    3.9000    3.7000    3.7000    4.2000    4.5000    4.8000    5.1000 (22)
Wind factor   1.3500    1.2750    1.2750    1.1250    1.0250    0.9750    0.9250    0.9250    1.0500    1.1250    1.2000    1.2750 (22a)
(22b)m        0.6172    0.5829    0.5829    0.5143    0.4686    0.4457    0.4229    0.4229    0.4800    0.5143    0.5486    0.5829 (22b)
Effective ach   0.6904    0.6699    0.6699    0.6323    0.6098    0.5993    0.5894    0.5894    0.6152    0.6323    0.6505    0.6699 (25)

3. Heat losses and heat loss parameter

Element                                  Gross      Openings       NetArea       U-value        A x U          K-value        A x K
                                         m2         m2             m2            W/m2K          W/K            kJ/m2K         kJ/K
Door                                                                1.8900        1.0000         1.8900                                (26)
Windows (Uw = 1.50)                                                 4.9700        1.4151         7.0330                                (27)
External Wall                           25.0760    4.9700       20.1060        0.2000         4.0212                                (29a)
Corridor Wall                           28.0800    1.8900       26.1900        0.2257         5.9120                                (29a)
Total net area of external elements Aum(A, m2)                  53.1560                                                              (31)
Fabric heat loss, W/K = Sum (A x U)                                    (26)...(30) + (32) =    18.8562                               (33)
Party Wall                                                      44.0200        0.0000         0.0000                                (32)
Floor                                                           38.8600                                                              (32d)
Ceiling                                                         38.8600                                                              (32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                                                                          250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)                                                                   7.9734 (36)
Total fabric heat loss                                                                                  (33) + (36) =     26.8296 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(38)m         24.2604   23.5375   23.5375   22.2157   21.4262   21.0591   20.7102   20.7102   21.6167   22.2157   22.8559   23.5375 (38)
(39)m         51.0900   50.3671   50.3671   49.0453   48.2558   47.8886   47.5398   47.5398   48.4463   49.0453   49.6855   50.3671 (39)
(40)m          1.3147    1.2961    1.2961    1.2621    1.2418    1.2323    1.2234    1.2234    1.2467    1.2621    1.2786    1.2961 (40)
                                                                                                Average = Sum(40)m / 12 =     1.2644 (40)
(41)m             31        28        31        30        31        30        31        31        30        31        30        31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N                                                                                                         1.3764 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36                                                 66.8889 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of
not more that 125 litres per person per day (all water use, hot and cold)
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(44)m         73.5778   70.9023   68.2267   65.5512   62.8756   60.2001   60.2001   62.8756   65.5512   68.2267   70.9023   73.5778 (44)
(45)m        109.3749   95.6599   98.7125   86.0599   82.5766   71.2573   66.0304   75.7708   76.6758   89.3582   97.5415  105.9237 (45)
Energy content (annual)                                                                                 Total = Sum(45)m =  1054.9414 (45)
(46)m         16.4062   14.3490   14.8069   12.9090   12.3865   10.6886    9.9046   11.3656   11.5014   13.4037   14.6312   15.8886 (46)
Water storage loss:
b) If manufacturer declared cylinder loss factor is not known :
 Cylinder volume (litres) including any solar storage within same cylinder                                                 150.0000 (50)
 Hot water storage loss factor from Table 2 (kWh/litre/day)                                                                  0.0191 (51)
 Volume factor from Table 2a                                                                                                 0.9283 (52)
 Temperature factor from Table 2b                                                                                            0.5400 (53)
Enter (49) or (54) in (55)                                                                                                   1.4364 (55)
(57)m         44.5282   40.2190   44.5282   43.0918   44.5282   43.0918   44.5282   44.5282   43.0918   44.5282   43.0918   44.5282 (57)
Primary circuit loss (annual) from Table 3                                                                                 360.0000 (58)
(59)m         30.5753   27.6164   30.5753   29.5890   30.5753   29.5890   30.5753   30.5753   29.5890   30.5753   29.5890   30.5753 (59)
(62)m        184.4784  163.4954  173.8160  158.7408  157.6801  143.9381  141.1339  150.8743  149.3566  164.4617  170.2223  181.0272 (62)
(63)m          0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 (63)
                                                                                    Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Water heat.  184.4784  163.4954  173.8160  158.7408  157.6801  143.9381  141.1339  150.8743  149.3566  164.4617  170.2223  181.0272 (64)
                                                                                    Total per year (kWh/year) = Sum(64)m =   1939.2249 (64)
(65)m         96.4500   86.0753   92.9047   86.7596   87.5395   81.8377   82.0379   85.2766   83.6394   89.7944   90.5772   95.3025 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
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8.2: Appendixes :
Energy / Renewable Energy Statement

(66)m	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188	68.8188 (66)
(67)m	11.5788	10.2842	8.3637	6.3319	4.7331	3.9959	4.3177	5.6123	7.5329	9.5647	11.1634	11.9007 (67)
(68)m	118.6774	119.9089	116.8055	110.1989	101.8592	94.0210	88.7847	87.5532	90.6565	97.2632	105.6029	113.4410 (68)
(69)m	29.8819	29.8819	29.8819	29.8819	29.8819	29.8819	29.8819	29.8819	29.8819	29.8819	29.8819	29.8819 (69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000 (70)
(71)m	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551	-55.0551 (71)
(72)m	129.6371	128.0882	124.8720	120.4994	117.6607	113.6635	110.2660	114.6191	116.1658	120.6914	125.8017	128.0947 (72)
(73)m	313.5389	311.9270	303.6868	290.6758	277.8986	265.3261	257.0141	261.4303	268.0008	281.1650	296.2136	307.0820 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	3.4200	37.3877	0.7600	0.7000	0.7700	47.1411 (77)
Northwest	1.5500	11.5098	0.7600	0.7000	0.7700	6.5772 (81)

(83)m	53.7183	93.8221	129.6873	169.2292	194.1996	200.7729	195.3476	175.9184	146.4152	108.1544	64.8194	45.6337 (83)
(84)m	367.2572	405.7491	433.3741	459.9050	472.0982	466.0990	452.3617	437.3487	414.4160	389.3194	361.0330	352.7157 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.8208	53.5789	53.5789	55.0229	55.9230	56.3518	56.7653	56.7653	55.7031	55.0229	54.3138	53.5789	
alpha	4.5214	4.5719	4.5719	4.6682	4.7282	4.7568	4.7844	4.7844	4.7135	4.6682	4.6209	4.5719	
(86)m	0.9867	0.9780	0.9575	0.9147	0.8039	0.6239	0.4265	0.4405	0.7119	0.9093	0.9762	0.9873	(86)
(87)m	19.8723	20.0370	20.2932	20.5676	20.8353	20.9626	20.9953	20.9946	20.9298	20.6536	20.1896	19.9108	(87)
(88)m	19.8322	19.8467	19.8467	19.8733	19.8893	19.8967	19.9039	19.9039	19.8854	19.8733	19.8604	19.8467	(88)
(89)m	0.9824	0.9711	0.9437	0.8873	0.7450	0.5301	0.3148	0.3255	0.6196	0.8738	0.9676	0.9832	(89)
(90)m	18.8408	19.0139	19.2625	19.5419	19.7860	19.8810	19.9029	19.9028	19.8526	19.6251	19.1764	18.8908	(90)
Living area fraction									fLA = Living area / (4) =			0.5373	(91)
(92)m	19.3950	19.5636	19.8163	20.0930	20.3498	20.4622	20.4898	20.4894	20.4314	20.1777	19.7208	19.4389	(92)
Temperature adjustment												0.0000	
(93)m	19.3950	19.5636	19.8163	20.0930	20.3498	20.4622	20.4898	20.4894	20.4314	20.1777	19.7208	19.4389	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m	0.9805	0.9690	0.9433	0.8933	0.7711	0.5796	0.3750	0.3875	0.6671	0.8846	0.9663	0.9813	(94)
(95)m	360.0786	393.1875	408.7884	410.8489	364.0182	270.1503	169.6546	169.4818	276.4632	344.4066	348.8697	346.1231	(95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000	(96)
(97)m	760.9871	733.5270	655.5925	558.7744	417.4039	280.7326	170.6604	170.6394	297.0440	459.9324	632.0402	732.2802	(97)
(98)m	298.2759	228.7081	183.6222	106.5064	39.7190	0.0000	0.0000	0.0000	0.0000	85.9512	203.8827	287.3009	(98)
Space heating (October to May) (kWh/year)												1433.9665	(98)
Space heating requirement in kWh/m2/year											(98) / (4) =	36.9008	(99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)	0.1000	(201)
Fraction of space heat from main system(s)	0.9000	(202)
Efficiency of main space heating system 1 (in %)	88.9000	(206)
Efficiency of secondary/supplementary heating system, %	100.0000	(208)

Space heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m	298.2759	228.7081	183.6222	106.5064	39.7190	0.0000	0.0000	0.0000	0.0000	85.9512	203.8827	287.3009	(98)
(211)m	301.9666	231.5380	185.8943	107.8242	40.2104	0.0000	0.0000	0.0000	0.0000	87.0147	206.4055	290.8558	(211)
(215)m	29.8276	22.8708	18.3622	10.6506	3.9719	0.0000	0.0000	0.0000	0.0000	8.5951	20.3883	28.7301	(215)

Annual totals kWh/year		
Space heating fuel used, main system 1	1451.7097	(211)
Space heating fuel used, secondary	143.3967	(215)
Water heating		
(64)m 184.4784 163.4954 173.8160 158.7408 157.6801 143.9381 141.1339 150.8743 149.3566 164.4617 170.2223 181.0272		(64)
Efficiency of water heater	78.8000	(216)
(217)m 84.4892 84.1267 83.4191 82.3213 80.4900 78.8000 78.8000 78.8000 78.8000 81.7719 83.7351 84.4430		(217)
(219)m 218.3454 194.3442 208.3648 192.8309 195.9003 182.6626 179.1039 191.4649 189.5388 201.1226 203.2867 214.3781		(219)
Water heating fuel used	2371.3433	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):		
central heating pump	130.0000	(230c)
boiler with a fan-assisted flue	45.0000	(230e)
Total electricity for the above, kWh/year	175.0000	(231)
Electricity for lighting (calculated in Appendix L)	204.4860	(232)

12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1451.7097	0.1980	287.4385	(261)
Space heating - secondary	143.3967	0.5170	74.1361	(263)
Water heating cost (other fuel)	2371.3433	0.1980	469.5260	(264)
Space and water heating			831.1006	(265)
Pumps and fans	175.0000	0.5170	90.4750	(267)
Energy for lighting	204.4860	0.5170	105.7192	(268)
Total CO2, kg/year			1027.2948	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			26.4400	(273)

SAP 2009 WORKSHEET FOR New Build (As Designed) - BRE SAP Worksheet 9.90
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

No improvements selected

Energy / Renewable Energy Statement

CALCULATION DETAILS for survey reference no 'PVs'
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.06 kg/m^2
Dwelling Carbon Dioxide Emission Rate (DER) 20.17 kg/m^2OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.36 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15

3 Design air permeability
Design air permeability at 50 pascals: 7.00
Maximum 10.0 OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 90.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation
Not applicable

9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing South East: 3.42 m^2, No overhang
Windows facing North West: 1.55 m^2, No overhang
Ventilation rate: 6.00
Blinds/curtains: None

10 Key features
Door U-value 1.00 W/m^2K
Party wall U-value 0.00 W/m^2K
Photovoltaic array

CALCULATION DETAILS for survey reference no 'PVs'
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SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	South East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	210.82 (P1)
Transmission heat loss coefficient	26.83 (37)
Summer heat loss coefficient	237.65 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South East	0.000	1.000	None
North West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South East	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South East	3.4200	116.7611	0.7600	0.7000	0.9000	172.0763
North West	1.5500	98.9568	0.7600	0.7000	0.9000	66.0958
					total:	238.1721

	Jun	Jul	Aug	
Solar gains	249	238	217	(P3)
Internal gains	266	255	261	
Total summer gains	514	493	479	(P5)
Summer gain/loss ratio	2.16	2.08	2.02	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.00	0.00	0.00	
Threshold temperature	17.81	20.13	20.07	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant

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CALCULATION DETAILS for survey reference no 'PVs'
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SAP 2009 IMPROVEMENTS
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

21686_New Ofxord Street_03Flat

Current energy efficiency rating: B 83
Current environmental impact rating: B 89

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
L	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
Q	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic (PV) panels	Not applicable
V Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Typical annual savings / Energy efficiency / Environmental impact

Lower cost measures
(none)
Sub Total £0 0.0000 kg/m^2

Higher cost measures
(none)
Sub Total £0 0.0000 kg/m^2

Potential energy efficiency rating: B 83
Potential environmental impact rating: B 89

Further improvements to achieve even higher standards
(none)
Total Savings £0 0.0000 kg/m^2

Enhanced energy efficiency rating: B 83
Enhanced environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 327 TEST (31 Aug 2012)
Recommendation texts revision number 3.9c (09 Jan 2012)

Typical heating and lighting costs of this home (per year):

	Current	Potential	Enhanced
Electricity	£49	£49	£49
Mains gas	£226	£226	£226
Space heating	£190	£190	£190
Water heating	£59	£59	£59
Lighting	£26	£26	£26
Generated (PV)	-£28	-£28	-£28
Total cost	£247	£247	£247
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.7 tonnes
Primary energy	95 kWh/m^2	95 kWh/m^2	95 kWh/m^2

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Full SAP Calculation Printout

Property Reference: 21686_New Ofxord Street_08Flat **Issued on Date:** 17.Dec.2012
Survey Reference: PVs **Prop Type Ref:**
Property: 112-116, New Oxford Street, LONDON, WC1A 1HH,

SAP Rating:	83 B	**CO2 Emissions (t/year):**	1.57	**DER:** 18.77 Pass	**Reduction:** 14.1%	**FEE:** 72.5	**ZC8:**	0.00
Environmental:	84 B	**General Requirements Compliance:**	Pass	**TER:** 21.84		**HLP:** 2.04	**Energy cost:**	£ 393
CfSH Results		**Version:** CfSH November 2010	**ENE1 Credits:** 1.7	**ENE2 Credits:** 0.0	**ENE7 Credits:** 0		**CfSH Level:**	3

Surveyor: admin admin, Tel: unknown
Address:
Client:

Software Version: Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18
SAP version: SAP 2009, Regs Region: England and Wales (Part L1A 2010), Calculation Type: New Dwelling As Designed

CALCULATION DETAILS for survey reference no 'PVs'
SAP2009 - 9.81 input data (DesignData) - Page: 1 of 22

SAP2009 Input Data

FullRefNo:	PVs
Sap Version:	SAP 2009
Regs Region:	England & Wales
Region:	Thames Valley
Calculation Type:	New Build (As Designed)
DwellingOrientation:	South East
Property Type:	Flat, End-Terrace
Storeys:	1
Date Built:	2012
Sheltered Sides:	1
Sunlight Shade:	Average or unknown
Measurements	Perimeter, Floor Area, Storey Height
1st Storey:	42.18, 89.97, 3.55
Living Area:	25.63 m2, fraction: 28.5%
Thermal Mass:	Simple calculation
Thermal Mass Simple:	Medium
Thermal MassValue:	250
External Walls	Nett Area, Gross Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
External Wall	75.45, 115.019, 190, , CavityWallDensePlasterDenseBlock, , Cavity, 0, 0.23, Calculate
Corridor Wall	32.83, 34.72, 190, , CavityWallDensePlasterDenseBlock, , Cavity, 0.43, 0.2257336343115l2, Gross
Party Walls	Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
Party Wall	10.65, 180, , PartyWallDensePlaster, , Solid, 0, 0
External Roofs	Nett Area, Gross Area, Kappa, Construction, Element, UValueFinal
External Roof	89.97, 89.97, 9, PlasterInsulatedFlatRoof, , , 0.13
Heat Loss Floors	Area, Kappa, Construction, Element, Type, UValueFinal, ShelterFactor
Party Floors	Area, Kappa, Construction, Element
Floor	89.97, 100
Description	Data Source, Type, Glazing, Glazing Gap, Argon Filled, Solar Trans, Frame Type, Frame Factor, U Value
Windows	Manufacturer, Window, Double glazed, , , 0.76, , 0.7,
Door	Manufacturer, Solid Door, , , , , , ,
Openings	Opening Type, Location, Orientation, Curtain Type, Overhang Ratio, Wide Overhang, Width, Height, Count, Area, Curtain Closed
Windows SE	Window, External Wall , Southeast, None, 0, , 0, 0, 0, 12.84,
Windows SW	Window, External Wall , Southwest, None, 0, , 0, 0, 0, 18.24,
Door	Solid Door, Corridor Wall, Northeast, , , , 0, 0, 0, 1.89,
Windows NW	Window, External Wall , Northwest, None, 0, , 0, 0, 0, 8.49,
Conservatory:	None
Draught Proofing:	100
Draught Lobby:	No
Thermal Bridges	Default,
Y	0.15
Pressure Test:	True
Designed q50:	5
AsBuilt q50:	4
Property Tested:	False
Mechanical Ventilation	None
Chimneys MHS:	0
Chimneys SHS:	0
Chimneys Other:	0
Chimneys Total:	0
Open Flues MHS:	0
Open Flues SHS:	0
Open Flues Other:	0
Open Flues Total:	0
Intermittent Fans:	3
Passive Vents:	0
Flueless Gas Fires:	0
Cooling System	None
Light Fittings:	5
LEL Fittings:	5
Percentage of LEL Fittings:	100
External Lights Fitted:	No
External LELs Fitted:	No
Electricity Tariff:	Standard
Main Heating 1	
Description	
Percentage	100
MHS	BGW - Mains gas BGW Post 98 Combi condens. with auto ign.
SAP Code	104
Boiler Efficiency Type	Sedbuk 2009
Efficiency	90
Model Name	tbc
Manufacturer	tbc
MHS Controls	CBI
Delayed Start Stat	No
Ctrl SAP Code	2110

CALCULATION DETAILS for survey reference no 'PVs'
SAP2009 - 9.81 input data (DesignData) - Page: 2 of 22

Burner Control	OnOff
Boiler Compensator	None
Flue Type	Balanced
Fan Assisted Flue	Yes
Pumped	Pump in heated space
Heat Emitter	Radiators
Combi boiler type	Standard Combi
Combi keep hot type	None
Main Heating 2	None
Smoke Control Area	Unknown
Community Heating	None
Secondary Heating	None
Water Heating	
Type	MainHeating1
WHS	HWP -
Low Water Usage	Yes
SAP Code	901
Hot Water Cylinder	None
Flue Gas Heat Recovery System	None
Waste Water Heat Recovery	none
PV Unit	
Type	One Dwelling
PVUnit 1	Cells Peak = 0.66, Orientation = South, Elevation = Horizontal, Overshading = NoneOrLittle
Wind Turbine	None
Terrain Type:	Urban
Small Scale Hydro	None
Special Features	None

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF FABRIC ENERGY EFFICIENCY Page: 3 of 22

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF FABRIC ENERGY EFFICIENCY
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	89.9700 (1b)	x	3.5500 (2b)	=	319.3935 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9700					(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 319.3935	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =		0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =		0.0000	(6b)
Number of intermittent fans							3 * 10 =		30.0000	(7a)
Number of passive vents							0 * 10 =		0.0000	(7b)
Number of flueless gas fires							0 * 40 =		0.0000	(7c)
								Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =							30.0000 / (5) =		0.0939	(8)
Pressure test									Yes	
Measured/design q50									5.0000	
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)									0.3439	(18)
Number of sides on which dwelling is sheltered									2	(19)
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.8500	(20)
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.2923	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000	(22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750	(22a)
(22b)m	0.3947	0.3727	0.3727	0.3289	0.2996	0.2850	0.2704	0.2704	0.3070	0.3289	0.3508	0.3727	(22b)
Effective ach	0.5779	0.5695	0.5695	0.5541	0.5449	0.5406	0.5366	0.5366	0.5471	0.5541	0.5615	0.5695	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900			(26)
Windows (Uw = 1.50)			39.5700	1.4151	55.9953			(27)
External Wall	115.0190	39.5700	75.4490	0.1500	11.3174			(29a)
Corridor Wall	34.7200	1.8900	32.8300	0.2257	7.4108			(29a)
External Roof	89.9700		89.9700	0.1300	11.6961			(30)
Total net area of external elements Aum(A, m2)			239.7090					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.3096			(33)
Party Wall			10.6500	0.0000	0.0000			(32)
Floor			89.9700					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area) 35.9564 (36)
Total fabric heat loss (33) + (36) = 124.2659 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	60.9082	60.0215	60.0215	58.4001	57.4318	56.9814	56.5535	56.5535	57.6654	58.4001	59.1855	60.0215	(38)
(39)m	185.1741	184.2874	184.2874	182.6660	181.6977	181.2473	180.8194	180.8194	181.9313	182.6660	183.4514	184.2874	(39)
(40)m	2.0582	2.0483	2.0483	2.0303	2.0195	2.0145	2.0098	2.0098	2.0221	2.0303	2.0390	2.0483	(40)
										Average = Sum(40)m / 12 =		2.0315	(40)
(41)m	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N 2.6253 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 96.5511 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m	106.2062	102.3442	98.4821	94.6201	90.7580	86.8960	86.8960	90.7580	94.6201	98.4821	102.3442	106.2062	(44)
(45)m	157.8775	138.0807	142.4869	124.2236	119.1955	102.8566	95.3118	109.3717	110.6779	128.9844	140.7966	152.8960	(45)
Energy content (annual)										Total = Sum(45)m =		1522.7591	(45)
(46)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
(57)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary circuit loss (annual) from Table 3												0.0000	(58)
(59)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
(65)m	33.5490	29.3422	30.2785	26.3975	25.3290	21.8570	20.2538	23.2415	23.5191	27.4092	29.9193	32.4904	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	(66)
(67)m	21.3090	18.9265	15.3921	11.6528	8.7106	7.3538	7.9461	10.3286	13.8631	17.6023	20.5445	21.9013	(67)
(68)m	239.0225	241.5028	235.2525	221.9464	205.1498	189.3634	178.8171	176.3368	182.5871	195.8932	212.6898	228.4762	(68)
(69)m	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	(69)
(70)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
(71)m	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	(71)
(72)m	45.0927	43.6639	40.6969	36.6632	34.0444	30.3570	27.2228	31.2385	32.6654	36.8403	41.5545	43.6699	(72)
(73)m	367.8039	366.4729	353.7211	332.6420	310.2845	289.4539	276.3656	280.2836	291.4951	312.7155	337.1685	356.4270	(73)

6. Solar gains

8.2: Appendixes :
Energy / Renewable Energy Statement

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF FABRIC ENERGY EFFICIENCY Page: 4 of 22

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	12.8400	37.3877	0.7600	0.7000	0.7700	176.9858 (77)
Southwest	18.2400	37.3877	0.7600	0.7000	0.7700	251.4190 (79)
Northwest	8.4900	11.5098	0.7600	0.7000	0.7700	36.0262 (81)

(83)m	464.4310	804.0344	1093.7130	1398.0337	1579.6352	1623.4121	1583.4393	1443.1030	1224.8573	921.8117	559.0942	395.3940 (83)
(84)m	832.2350	1170.5073	1447.4341	1730.6758	1889.9197	1912.8660	1859.8049	1723.3866	1516.3524	1234.5272	896.2627	751.8210 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.7408	33.9031	33.9031	34.2040	34.3863	34.4718	34.5533	34.5533	34.3422	34.2040	34.0576	33.9031	
alpha	3.2494	3.2602	3.2602	3.2803	3.2924	3.2981	3.3036	3.3036	3.2895	3.2803	3.2705	3.2602	
(86)m	0.9893	0.9697	0.9295	0.8550	0.7224	0.5545	0.3869	0.4147	0.6774	0.8944	0.9790	0.9915	(86)
(87)m	19.0008	19.3731	19.8594	20.3099	20.7076	20.9105	20.9803	20.9759	20.8273	20.3172	19.4809	19.0070	(87)
(88)m	19.3019	19.3083	19.3083	19.3201	19.3271	19.3304	19.3336	19.3336	19.3254	19.3201	19.3144	19.3083	(88)
(89)m	0.9854	0.9593	0.9054	0.8081	0.6376	0.4301	0.2351	0.2532	0.5518	0.8462	0.9701	0.9882	(89)
(90)m	17.5814	17.9502	18.4160	18.8330	19.1642	19.2992	19.3310	19.3303	19.2555	18.8598	18.0659	17.5928	(90)
Living area fraction										fLA = Living area / (4) =		0.2849	(91)
(92)m	17.9858	18.3556	18.8272	19.2537	19.6039	19.7582	19.8008	19.7991	19.7033	19.2750	18.4690	17.9957	(92)
Temperature adjustment												0.0000	
(93)m	17.9858	18.3556	18.8272	19.2537	19.6039	19.7582	19.8008	19.7991	19.7033	19.2750	18.4690	17.9957	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m	0.9811	0.9515	0.8967	0.8059	0.6532	0.4640	0.2789	0.3000	0.5834	0.8446	0.9638	0.9845	(94)
(95)m	816.4714	1113.6973	1297.9126	1394.7310	1234.4259	887.6531	518.7474	517.0132	884.5990	1042.7106	863.8454	740.1876	(95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000	(96)
(97)m	2497.2129	2461.2612	2216.4579	1927.8061	1436.1117	934.9101	524.5255	524.2088	983.0271	1548.0898	2104.0086	2413.3715	(97)
(98)m	1250.4717	905.5629	683.3977	383.8141	150.0542	0.0000	0.0000	0.0000	0.0000	376.0021	892.9175	1244.8488	(98)
Space heating (October to May) (kWh/year)												5887.0690	(98)
Space heating requirement in kWh/m2/year											(98) / (4) =	65.4337	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	0.0000	0.0000	0.0000	0.0000	0.0000	15.4000	17.8000	17.8000	0.0000	0.0000	0.0000	0.0000	
(100)m	0.0000	0.0000	0.0000	0.0000	0.0000	1558.7269	1121.0806	1121.0806	0.0000	0.0000	0.0000	0.0000	(100)
(101)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.9039	0.9525	0.9443	0.0000	0.0000	0.0000	0.0000	(101)
(102)m	0.0000	0.0000	0.0000	0.0000	0.0000	1408.9400	1067.7917	1058.6167	0.0000	0.0000	0.0000	0.0000	(102)
(103)m	0.0000	0.0000	0.0000	0.0000	0.0000	2443.8119	2345.6780	2203.8010	0.0000	0.0000	0.0000	0.0000	(103)
(98)m	0.0000	0.0000	0.0000	0.0000	0.0000	9.6365	0.4798	0.5825	0.0000	0.0000	0.0000	0.0000	(98)
(104)m	0.0000	0.0000	0.0000	0.0000	0.0000	745.1077	950.7474	852.0171	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									EC = cooled area / (4) =			1.000	(105)
(106)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
(107)m	0.0000	0.0000	0.0000	0.0000	0.0000	186.2769	237.6869	213.0043	0.0000	0.0000	0.0000	0.0000	(107)
										Total = Sum(107)6..8 =		636.9681	(107)
Space cooling requirement in kWh/m2/year											(107) / (4) =	7.0798	(108)

8f. Fabric Energy Efficiency

Fabric Energy Efficiency (99) + (108) = 72.5135
Fabric Energy Efficiency rounded 72.5 (109)

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF DATA FOR RENEWABLE HEAT INCENTIVE (RHI) Page: 5 of 22

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF DATA FOR RENEWABLE HEAT INCENTIVE (RHI)
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)		Volume (m3)	
Ground floor	89.9700 (1b)	x	3.5500 (2b)	=	319.3935 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9700				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.3935 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans							3 * 10 =	30.0000 (7a)
Number of passive vents							0 * 10 =	0.0000 (7b)
Number of flueless gas fires							0 * 40 =	0.0000 (7c)

				Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =			30.0000 / (5) =	0.0939 (8)
Pressure test				Yes
Measured/design q50				5.0000
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)				0.3439 (18)
Number of sides on which dwelling is sheltered				1 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =		0.3181 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000	(22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750	(22a)
(22b)m	0.4295	0.4056	0.4056	0.3579	0.3261	0.3102	0.2943	0.2943	0.3340	0.3579	0.3818	0.4056	(22b)
Effective ach	0.5922	0.5823	0.5823	0.5640	0.5532	0.5481	0.5433	0.5433	0.5558	0.5640	0.5729	0.5823	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900			(26)
Windows (Uw = 1.50)			39.5700	1.4151	55.9953			(27)
External Wall	115.0190	39.5700	75.4490	0.1500	11.3174			(29a)
Corridor Wall	34.7200	1.8900	32.8300	0.2257	7.4108			(29a)
External Roof	89.9700		89.9700	0.1300	11.6961			(30)
Total net area of external elements Aum(A, m2)			239.7090					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		88.3096			(33)
Party Wall			10.6500	0.0000	0.0000			(32)
Floor			89.9700					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)	35.9564 (36)
Total fabric heat loss (33) + (36) =	124.2659 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	62.4206	61.3705	61.3705	59.4504	58.3036	57.7703	57.2636	57.2636	58.5803	59.4504	60.3805	61.3705	(38)
(39)m	186.6865	185.6364	185.6364	183.7163	182.5696	182.0362	181.5295	181.5295	182.8463	183.7163	184.6464	185.6364	(39)
(40)m	2.0750	2.0633	2.0633	2.0420	2.0292	2.0233	2.0177	2.0177	2.0323	2.0420	2.0523	2.0633	(40)
									Average = Sum(40)m / 12 =			2.0434	(40)
(41)m	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N	2.6253 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	96.5511 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m	106.2062	102.3442	98.4821	94.6201	90.7580	86.8960	86.8960	90.7580	94.6201	98.4821	102.3442	106.2062	(44)
(45)m	157.8775	138.0807	142.4869	124.2236	119.1955	102.8566	95.3118	109.3717	110.6779	128.9844	140.7966	152.8960	(45)
Energy content (annual)										Total = Sum(45)m =		1522.7591	(45)
(46)m	23.6816	20.7121	21.3730	18.6335	17.8793	15.4285	14.2968	16.4057	16.6017	19.3477	21.1195	22.9344	(46)
Water storage loss:													
(57)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
(61)m	50.9589	46.0274	50.1854	46.6620	46.2493	42.8528	44.2812	46.2493	46.6620	50.1854	49.3151	50.9589	(61)
(62)m	208.8365	184.1081	192.6723	170.8855	165.4448	145.7094	139.5930	155.6210	157.3399	179.1698	190.1117	203.8549	(62)
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Water heat.	208.8365	184.1081	192.6723	170.8855	165.4448	145.7094	139.5930	155.6210	157.3399	179.1698	190.1117	203.8549	(64)
								Total per year (kWh/year) = Sum(64)m =				2093.3468	(64)
RHI water heating demand												2093	(64)
(65)m	65.2340	57.4187	59.9233	52.9698	51.1948	44.9130	42.7615	47.9284	48.4659	55.4337	59.1436	63.5776	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	(66)
(67)m	53.2726	47.3162	38.4802	29.1319	21.7765	18.3846	19.8652	25.8216	34.6577	44.0059	51.3613	54.7532	(67)
(68)m	356.7501	360.4520	351.1232	331.2633	306.1938	282.6319	266.8912	263.1892	272.5180	292.3779	317.4475	341.0093	(68)
(69)m	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	(69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	(70)
(71)m	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	(71)

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF DATA FOR RENEWABLE HEAT INCENTIVE (RHI) Page: 6 of 22

(72)m	87.6801	85.4445	80.5420	73.5692	68.8102	62.3792	57.4751	64.4199	67.3137	74.5076	82.1439	85.4538 (72)
(73)m	613.5861	609.0961	586.0287	549.8478	512.6638	479.2791	460.1149	469.3140	490.3728	526.7748	566.8361	597.0997 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	12.8400	39.7858	0.7600	0.7000	0.7700	188.3381 (77)
Southwest	18.2400	39.7858	0.7600	0.7000	0.7700	267.5458 (79)
Northwest	8.4900	12.7761	0.7600	0.7000	0.7700	39.9898 (81)

(83)m	495.8737	783.9573	1106.5775	1384.6969	1572.4106	1716.7193	1647.6422	1520.8940	1262.0103	948.0267	632.4178	414.6306 (83)
(84)m	1109.4599	1393.0534	1692.6062	1934.5447	2085.0744	2195.9984	2107.7570	1990.2081	1752.3831	1474.8014	1199.2539	1011.7303 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.4674	33.6567	33.6567	34.0085	34.2221	34.3224	34.4182	34.4182	34.1703	34.0085	33.8372	33.6567	
alpha	3.2312	3.2438	3.2438	3.2672	3.2815	3.2882	3.2945	3.2945	3.2780	3.2672	3.2558	3.2438	
(86)m	0.9735	0.9486	0.8897	0.8043	0.6385	0.4435	0.2727	0.2883	0.5604	0.8221	0.9489	0.9779	(86)
(87)m	19.3132	19.6075	20.0882	20.4670	20.8180	20.9590	20.9945	20.9936	20.9131	20.5380	19.8020	19.3103	(87)
(88)m	19.2910	19.2986	19.2986	19.3124	19.3208	19.3247	19.3284	19.3284	19.3188	19.3124	19.3057	19.2986	(88)
(89)m	0.9642	0.9316	0.8544	0.7460	0.5411	0.3198	0.1315	0.1392	0.4229	0.7501	0.9288	0.9697	(89)
(90)m	17.2243	17.6420	18.2988	18.7913	19.1905	19.3087	19.3280	19.3279	19.2790	18.9039	17.9302	17.2269	(90)
Living area fraction										fLA = Living area / (4) =		0.2849	(91)
(92)m	17.8193	18.2019	18.8086	19.2686	19.6541	19.7788	19.8027	19.8024	19.7445	19.3694	18.4634	17.8204	(92)
Temperature adjustment												0.0000	
(93)m	17.8193	18.2019	18.8086	19.2686	19.6541	19.7788	19.8027	19.8024	19.7445	19.3694	18.4634	17.8204	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m	0.9525	0.9169	0.8419	0.7443	0.5620	0.3546	0.1720	0.1821	0.4603	0.7530	0.9152	0.9592	(94)
(95)m	1056.7883	1277.2496	1424.9436	1439.8122	1171.8042	778.7338	362.6341	362.3952	806.5750	1110.5092	1097.5026	970.4019	(95)
(96)m	5.1000	5.5000	7.4000	9.3000	12.6000	15.4000	17.8000	17.8000	15.1000	11.6000	7.6000	5.5000	(96)
(97)m	2374.5278	2357.9358	2117.8506	1831.4007	1287.8693	797.1062	363.5546	363.4929	849.2239	1427.3637	2005.8890	2287.1085	(97)
(98)m	980.3982	726.2212	515.5228	281.9438	86.3525	0.0000	0.0000	0.0000	0.0000	235.7398	654.0382	979.6297	(98)
Space heating (October to May) (kWh/year)												4459.8460	(98)
RHI space heating demand												4460	(98)

8.2: Appendixes :
Energy / Renewable Energy Statement

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF ENERGY RATINGS Page: 7 of 22

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF ENERGY RATINGS
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	89.9700 (1b)	x 3.5500 (2b)	= 319.3935 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9700			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	319.3935	(5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour	
Number of chimneys	0 +	0 +	0 =	0 * 40 =	0.0000	(6a)
Number of open flues	0 +	0 +	0 =	0 * 20 =	0.0000	(6b)
Number of intermittent fans				3 * 10 =	30.0000	(7a)
Number of passive vents				0 * 10 =	0.0000	(7b)
Number of flueless gas fires				0 * 40 =	0.0000	(7c)
					Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.0939	(8)
Pressure test					Yes	
Measured/design q50					5.0000	
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)					0.3439	(18)
Number of sides on which dwelling is sheltered					1	(19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000	(22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750	(22a)
(22b)m	0.4295	0.4056	0.4056	0.3579	0.3261	0.3102	0.2943	0.2943	0.3340	0.3579	0.3818	0.4056	(22b)
Effective ach	0.5922	0.5823	0.5823	0.5640	0.5532	0.5481	0.5433	0.5433	0.5558	0.5640	0.5729	0.5823	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900			(26)
Windows (Uw = 1.50)			39.5700	1.4151	55.9953			(27)
External Wall	115.0190	39.5700	75.4490	0.1500	11.3174			(29a)
Corridor Wall	34.7200	1.8900	32.8300	0.2257	7.4108			(29a)
External Roof	89.9700		89.9700	0.1300	11.6961			(30)
Total net area of external elements Aum(A, m2)			239.7090		(26)...(30) + (32) =	88.3096		(31)
Fabric heat loss, W/K = Sum (A x U)								(33)
Party Wall			10.6500	0.0000	0.0000			(32)
Floor			89.9700					(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Default value 0.150 * total exposed area)							35.9564	(36)
Total fabric heat loss						(33) + (36) =	124.2659	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	62.4206	61.3705	61.3705	59.4504	58.3036	57.7703	57.2636	57.2636	58.5803	59.4504	60.3805	61.3705	(38)
(39)m	186.6865	185.6364	185.6364	183.7163	182.5696	182.0362	181.5295	181.5295	182.8463	183.7163	184.6464	185.6364	(39)
(40)m	2.0750	2.0633	2.0633	2.0420	2.0292	2.0233	2.0177	2.0177	2.0323	2.0420	2.0523	2.0633	(40)
									Average = Sum(40)m / 12 =			2.0434	(40)
(41)m	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N 2.6253 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 96.5511 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m	106.2062	102.3442	98.4821	94.6201	90.7580	86.8960	86.8960	90.7580	94.6201	98.4821	102.3442	106.2062	(44)
(45)m	157.8775	138.0807	142.4869	124.2236	119.1955	102.8566	95.3118	109.3717	110.6779	128.9844	140.7966	152.8960	(45)
Energy content (annual)										Total = Sum(45)m =		1522.7591	(45)
(46)m	23.6816	20.7121	21.3730	18.6335	17.8793	15.4285	14.2968	16.4057	16.6017	19.3477	21.1195	22.9344	(46)
Water storage loss:													
(57)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
(61)m	50.9589	46.0274	50.1854	46.6620	46.2493	42.8528	44.2812	46.2493	46.6620	50.1854	49.3151	50.9589	(61)
(62)m	208.8365	184.1081	192.6723	170.8855	165.4448	145.7094	139.5930	155.6210	157.3399	179.1698	190.1117	203.8549	(62)
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Water heat.	208.8365	184.1081	192.6723	170.8855	165.4448	145.7094	139.5930	155.6210	157.3399	179.1698	190.1117	203.8549	(64)
								Total per year (kWh/year) = Sum(64)m =				2093.3468	(64)
(65)m	65.2340	57.4187	59.9233	52.9698	51.1948	44.9130	42.7615	47.9284	48.4659	55.4337	59.1436	63.5776	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	157.5186	(66)
(67)m	53.2726	47.3162	38.4802	29.1319	21.7765	18.3846	19.8652	25.8216	34.6577	44.0059	51.3613	54.7532	(67)
(68)m	356.7501	360.4520	351.1232	331.2633	306.1938	282.6319	266.8912	263.1892	272.5180	292.3779	317.4475	341.0093	(68)
(69)m	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	53.3772	(69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	(70)
(71)m	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	(71)
(72)m	87.6801	85.4445	80.5420	73.5692	68.8102	62.3792	57.4751	64.4199	67.3137	74.5076	82.1439	85.4538	(72)

CALCULATION DETAILS for survey reference no 'PVs'
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(73)m	613.5861	609.0961	586.0287	549.8478	512.6638	479.2791	460.1149	469.3140	490.3728	526.7748	566.8361	597.0997	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	12.8400	37.3877	0.7600	0.7000	0.7700	176.9858	(77)
Southwest	18.2400	37.3877	0.7600	0.7000	0.7700	251.4190	(79)
Northwest	8.4900	11.5098	0.7600	0.7000	0.7700	36.0262	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m	464.4310	804.0344	1093.7130	1398.0337	1579.6352	1623.4121	1583.4393	1443.1030	1224.8573	921.8117	559.0942	395.3940	(83)
(84)m	1078.0172	1413.1304	1679.7417	1947.8816	2092.2990	2102.6912	2043.5541	1912.4171	1715.2301	1448.5864	1125.9303	992.4937	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.4674	33.6567	33.6567	34.0085	34.2221	34.3224	34.4182	34.4182	34.1703	34.0085	33.8372	33.6567	
alpha	3.2312	3.2438	3.2438	3.2672	3.2815	3.2882	3.2945	3.2945	3.2780	3.2672	3.2558	3.2438	
(86)m	0.9779	0.9508	0.9013	0.8190	0.6811	0.5156	0.3558	0.3784	0.6255	0.8532	0.9612	0.9811	(86)
(87)m	19.1899	19.5442	19.9958	20.4034	20.7545	20.9271	20.9845	20.9814	20.8631	20.4271	19.6527	19.1966	(87)
(88)m	19.2910	19.2986	19.2986	19.3124	19.3208	19.3247	19.3284	19.3284	19.3188	19.3124	19.3057	19.2986	(88)
(89)m	0.9703	0.9350	0.8702	0.7660	0.5942	0.3960	0.2146	0.2291	0.5006	0.7941	0.9460	0.9743	(89)
(90)m	17.0466	17.5512	18.1733	18.7106	19.1238	19.2884	19.3254	19.3248	19.2411	18.7685	17.7207	17.0624	(90)
Living area fraction										fLA = Living area / (4) =		0.2849	(91)
(92)m	17.6572	18.1189	18.6925	19.1929	19.5897	19.7552	19.7981	19.7967	19.7032	19.2410	18.2711	17.6704	(92)
Temperature adjustment												0.0000	
(93)m	17.6572	18.1189	18.6925	19.1929	19.5897	19.7552	19.7981	19.7967	19.7032	19.2410	18.2711	17.6704	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m	0.9595	0.9203	0.8564	0.7617	0.6095	0.4283	0.2552	0.2721	0.5318	0.7910	0.9330	0.9646	(94)
(95)m	1034.4075	1300.4598	1438.6091	1483.6141	1275.1870	900.6392	521.6018	520.3997	912.1219	1145.8928	1050.4731	957.3797	(95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000	(96)
(97)m	2456.2659	2435.3536	2207.6820	1927.7085	1440.4273	938.4384	526.0840	525.8393	987.9458	1550.7472	2081.1618	2370.6553	(97)
(98)m	1057.8627	762.6487	572.1902	319.7480	122.9387	0.0000	0.0000	0.0000	0.0000	301.2117	742.0959	1051.4771	(98)
Space heating (October to May) (kWh/year)												4930.1729	(98)
Space heating requirement in kWh/m2/year											(98) / (4) =	54.7980	(99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (201)
Fraction of space heat from main system(s) 1.0000 (202)
Efficiency of main space heating system 1 (in %) 90.8000 (206)
Efficiency of secondary/supplementary heating system, % 0.0000 (208)
Space heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m	1057.8627	762.6487	572.1902	319.7480	122.9387	0.0000	0.0000	0.0000	0.0000	301.2117	742.0959	1051.4771	(98)
(211)m	1165.0470	839.9214	630.1655	352.1453	135.3951	0.0000	0.0000	0.0000	0.0000	331.7309	817.2862	1158.0144	(211)
(215)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)

Annual totals kWh/year
Space heating fuel used, main system 1 5429.7059 (211)
Space heating fuel used, secondary 0.0000 (215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(64)m	208.8365	184.1081	192.6723	170.8855	165.4448	145.7094	139.5930	155.6210	157.3399	179.1698	190.1117	203.8549	(64)
Efficiency of water heater												81.5000	(216)
(217)m	89.1233	88.8289	88.2629	87.3292	85.2210	81.5000	81.5000	81.5000	81.5000	87.0933	88.7350	89.1480	(217)
(219)m	234.3230	207.2616	218.2937	195.6798	194.1361	178.7846	171.2798	190.9460	193.0550	205.7217	214.2465	228.6701	(219)

Water heating fuel used 2432.3978 (219)

Electricity for pumps, fans and electric keep-hot (Table 4f):
central heating pump 130.0000 (230c)
boiler with a fan-assisted flue 45.0000 (230e)
Total electricity for the above, kWh/year 175.0000 (231)
Electricity for lighting (calculated in Appendix L) 376.3242 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV Unit 0 (0.80 * 0.66 * 961 * 1.00) -507.4080 (233)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5429.7059	3.1000	168.3209	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating cost (other fuel)	2432.3978	3.1000	75.4043	(247)
Pumps and fans for heating	175.0000	11.4600	20.0550	(249)
Energy for lighting	376.3242	11.4600	43.1268	(250)
Additional standing charges			106.0000	(251)
Energy saving/generation technologies				
PV Unit	-507.4080	11.4600	-58.1490	(252)
Total energy cost			354.7580	(255)

CALCULATION DETAILS for survey reference no 'PVs'
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11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4700 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2354 (257)
SAP value		82.7668
SAP rating (Section 12)		83 (258)
SAP band		B

10a. Fuel costs - using BEDF prices (327)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	5429.7059	3.4100	185.1530	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating cost (other fuel)	2432.3978	3.4100	82.9448	(247)
Pumps and fans for heating	175.0000	12.9300	22.6275	(249)
Energy for lighting	376.3242	12.9300	48.6587	(250)
Additional standing charges			119.0000	(251)
Energy saving/generation technologies				
PV Unit	-507.4080	12.9300	-65.6079	(252)
Total energy cost			392.7761	(255)

12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5429.7059	0.1980	1075.0818	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating cost (other fuel)	2432.3978	0.1980	481.6148	(264)
Space and water heating			1556.6965	(265)
Pumps and fans	175.0000	0.5170	90.4750	(267)
Energy for lighting	376.3242	0.5170	194.5596	(268)
Energy saving/generation technologies				
PV Unit	-507.4080	0.5290	-268.4188	(269)
Total CO2, kg/year			1573.3123	(272)
CO2 emissions per m2			17.4900	(273)
EI value			84.3799	
EI rating			84	(274)
EI band			B	

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5429.7059	1.0200	5538.3000	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating cost (other fuel)	2432.3978	1.0200	2481.0457	(264)
Space and water heating			8019.3457	(265)
Pumps and fans	175.0000	2.9200	511.0000	(267)
Energy for lighting	376.3242	2.9200	1098.8666	(268)
Energy saving/generation technologies				
PV Unit	-507.4080	2.9200	-1481.6314	(269)
Primary energy kWh/year			8147.5810	(272)
Primary energy kWh/m2/year			90.5589	(273)

8.2: Appendixes :

Energy / Renewable Energy Statement

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	89.9700 (1b)	x	3.5500 (2b)	=	319.3935 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9700					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	319.3935	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.0939	(8)
Pressure test		Yes	
Measured/design q50		5.0000	
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)		0.3439	(18)
Number of sides on which dwelling is sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3181	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000	(22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750	(22a)
(22b)m	0.4295	0.4056	0.4056	0.3579	0.3261	0.3102	0.2943	0.2943	0.3340	0.3579	0.3818	0.4056	(22b)
Effective ach	0.5922	0.5823	0.5823	0.5640	0.5532	0.5481	0.5433	0.5433	0.5558	0.5640	0.5729	0.5823	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900			(26)
Windows (Uw = 1.50)			39.5700	1.4151	55.9953			(27)
External Wall	115.0190	39.5700	75.4490	0.1500	11.3174			(29a)
Corridor Wall	34.7200	1.8900	32.8300	0.2257	7.4108			(29a)
External Roof	89.9700		89.9700	0.1300	11.6961			(30)
Total net area of external elements Aum(A, m2)			239.7090					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		88.3096			(33)
Party Wall			10.6500	0.0000	0.0000			(32)
Floor			89.9700					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)		35.9564 (36)
Total fabric heat loss	(33) + (36) =	124.2659 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	62.4206	61.3705	61.3705	59.4504	58.3036	57.7703	57.2636	57.2636	58.5803	59.4504	60.3805	61.3705	(38)
(39)m	186.6865	185.6364	185.6364	183.7163	182.5696	182.0362	181.5295	181.5295	182.8463	183.7163	184.6464	185.6364	(39)
(40)m	2.0750	2.0633	2.0633	2.0420	2.0292	2.0233	2.0177	2.0177	2.0323	2.0420	2.0523	2.0633	(40)
									Average = Sum(40)m / 12 =			2.0434	(40)
(41)m	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N		2.6253 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36		96.5511 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m	106.2062	102.3442	98.4821	94.6201	90.7580	86.8960	86.8960	90.7580	94.6201	98.4821	102.3442	106.2062	(44)
(45)m	157.8775	138.0807	142.4869	124.2236	119.1955	102.8566	95.3118	109.3717	110.6779	128.9844	140.7966	152.8960	(45)
Energy content (annual)										Total = Sum(45)m =		1522.7591	(45)
(46)m	23.6816	20.7121	21.3730	18.6335	17.8793	15.4285	14.2968	16.4057	16.6017	19.3477	21.1195	22.9344	(46)
Water storage loss:													
(57)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
(61)m	50.9589	46.0274	50.1854	46.6620	46.2493	42.8528	44.2812	46.2493	46.6620	50.1854	49.3151	50.9589	(61)
(62)m	208.8365	184.1081	192.6723	170.8855	165.4448	145.7094	139.5930	155.6210	157.3399	179.1698	190.1117	203.8549	(62)
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Water heat.	208.8365	184.1081	192.6723	170.8855	165.4448	145.7094	139.5930	155.6210	157.3399	179.1698	190.1117	203.8549	(64)
								Total per year (kWh/year) = Sum(64)m =				2093.3468	(64)
(65)m	65.2340	57.4187	59.9233	52.9698	51.1948	44.9130	42.7615	47.9284	48.4659	55.4337	59.1436	63.5776	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	(66)
(67)m	21.3090	18.9265	15.3921	11.6528	8.7106	7.3538	7.9461	10.3286	13.8631	17.6023	20.5445	21.9013	(67)
(68)m	239.0225	241.5028	235.2525	221.9464	205.1498	189.3634	178.8171	176.3368	182.5871	195.8932	212.6898	228.4762	(68)
(69)m	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	(69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	(70)
(71)m	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	(71)
(72)m	87.6801	85.4445	80.5420	73.5692	68.8102	62.3792	57.4751	64.4199	67.3137	74.5076	82.1439	85.4538	(72)

(73)m	420.3913	418.2535	403.5663	379.5480	355.0503	331.4761	316.6179	323.4649	336.1435	360.3828	387.7579	408.2110	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	12.8400	37.3877	0.7600	0.7000	0.7700	176.9858	(77)
Southwest	18.2400	37.3877	0.7600	0.7000	0.7700	251.4190	(79)
Northwest	8.4900	11.5098	0.7600	0.7000	0.7700	36.0262	(81)

(83)m	464.4310	804.0344	1093.7130	1398.0337	1579.6352	1623.4121	1583.4393	1443.1030	1224.8573	921.8117	559.0942	395.3940	(83)
(84)m	884.8224	1222.2878	1497.2792	1777.5818	1934.6855	1954.8882	1900.0572	1766.5680	1561.0008	1282.1945	946.8521	803.6050	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)
Utilisation factor for gains for living area, n1,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	33.4674	33.6567	33.6567	34.0085	34.2221	34.3224	34.4182	34.4182	34.1703	34.0085	33.8372	33.6567	
alpha	3.2312	3.2438	3.2438	3.2672	3.2815	3.2882	3.2945	3.2945	3.2780	3.2672	3.2558	3.2438	
(86)m	0.9873	0.9662	0.9242	0.8480	0.7142	0.5467	0.3806	0.4068	0.6665	0.8860	0.9756	0.9896	(86)
(87)m	19.0286	19.3987	19.8792	20.3245	20.7155	20.9133	20.9811	20.9769	20.8340	20.3374	19.5106	19.0369	(87)
(88)m	19.2910	19.2986	19.2986	19.3124	19.3208	19.3247	19.3284	19.3284	19.3188	19.3124	19.3057	19.2986	(88)
(89)m	0.9827	0.9547	0.8985	0.7997	0.6286	0.4229	0.2306	0.2476	0.5405	0.8353	0.9654	0.9857	(89)
(90)m	16.8157	17.3488	18.0207	18.6179	19.0900	19.2807	19.3247	19.3238	19.2214	18.6642	17.5224	16.8332	(90)
Living area fraction										fLA = Living area / (4) =		0.2849	(91)
(92)m	17.4461	17.9328	18.5501	19.1040	19.5530	19.7457	19.7966	19.7948	19.6808	19.1409	18.0888	17.4610	(92)
Temperature adjustment												0.0000	
(93)m	17.4461	17.9328	18.5501	19.1040	19.5530	19.7457	19.7966	19.7948	19.6808	19.1409	18.0888	17.4610	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m	0.9750	0.9417	0.8840	0.7926	0.6418	0.4560	0.2738	0.2936	0.5707	0.8288	0.9547	0.9791	(94)
(95)m	862.6894	1151.0652	1323.5417	1408.9837	1241.6048	891.3586	520.2701	518.6490	890.8428	1062.6535	903.9168	786.7952	(95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000	(96)
(97)m	2416.8595	2400.7939	2181.2521	1911.3900	1433.7254	936.7127	525.8130	525.4851	983.8598	1532.3516	2047.5067	2331.7755	(97)
(98)m	1156.3026	839.8176	638.1365	361.7325	142.9377	0.0000	0.0000	0.0000	0.0000	349.4554	823.3847	1149.4653	(98)
Space heating (October to May) (kWh/year)												5461.2325	(98)
Space heating requirement in kWh/m2/year											(98) / (4) =	60.7006	(99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (201)
Fraction of space heat from main system(s)		1.0000 (202)
Efficiency of main space heating system 1 (in %)		90.8000 (206)
Efficiency of secondary/supplementary heating system, %		0.0000 (208)
Space heating:		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m	1156.3026	839.8176	638.1365	361.7325	142.9377	0.0000	0.0000	0.0000	0.0000	349.4554	823.3847	1149.4653	(98)
(211)m	1273.4610	924.9093	702.7936	398.3838	157.4204	0.0000	0.0000	0.0000	0.0000	384.8628	906.8114	1265.9310	(211)
(215)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Annual totals kWh/year													
Space heating fuel used, main system 1												6014.5732	(211)
Space heating fuel used, secondary												0.0000	(215)
Water heating													
(64)m	208.8365	184.1081	192.6723	170.8855	165.4448	145.7094	139.5930	155.6210	157.3399	179.1698	190.1117	203.8549	(64)
Efficiency of water heater												81.5000	(216)
(217)m	89.2422	88.9744	88.4591	87.5931	85.5620	81.5000	81.5000	81.5000	81.5000	87.4190	88.8972	89.2656	(217)
(219)m	234.0110	206.9225	217.8096	195.0901	193.3625	178.7846	171.2798	190.9460	193.0550	204.9553	213.8557	228.3688	(219)
Water heating fuel used												2428.4409	(219)
Electricity for pumps, fans and electric keep-hot (Table 4f):													
central heating pump												130.0000	(230c)
boiler with a fan-assisted flue												45.0000	(230e)
Total electricity for the above, kWh/year												175.0000	(231)
Electricity for lighting (calculated in Appendix L)												376.3242	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.66 * 961 * 1.00)											-507.4080		(233)

12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6014.5732	0.1980	1190.8855	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating cost (other fuel)	2428.4409	0.1980	480.8313	(264)
Space and water heating			1671.7168	(265)
Pumps and fans	175.0000	0.5170	90.4750	(267)
Energy for lighting	376.3242	0.5170	194.5596	(268)
Energy saving/generation technologies				
PV Unit	-507.4080	0.5290	-268.4188	(269)
Total CO2, kg/year			1688.3326	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.7700	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			18.7700 (ZC1)
Total Floor Area	TFA	89.9700	
Assumed number of occupants	N	2.6253	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5290	
CO2 emissions from appliances, equation (L14)			16.0463 (ZC2)
CO2 emissions from cooking, equation (L16)			2.0230 (ZC3)
Total CO2 emissions			36.8393 (ZC4)
Residual CO2 emissions offset from biofuel CHP			0.0000 (ZC5)
Additional allowable electricity generation, kWh/m²/year			0.0000 (ZC6)
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 (ZC7)
Net CO2 emissions			36.8393 (ZC8)

8.2: Appendixes :
Energy / Renewable Energy Statement

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF TARGET EMISSIONS Page: 13 of 22

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF TARGET EMISSIONS
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	89.9700 (1b)	x	3.5500 (2b)	=	319.3935 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	319.3935	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.0939	(8)
Pressure test		Yes	
Measured/design q50		10.0000	
If based on air permeability value, then (18) = [(17)/20]+(8), otherwise (18) = (16)		0.5939	(18)
Number of sides on which dwelling is sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.5048	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.4000	5.1000	5.1000	4.5000	4.1000	3.9000	3.7000	3.7000	4.2000	4.5000	4.8000	5.1000	(22)
Wind factor	1.3500	1.2750	1.2750	1.1250	1.0250	0.9750	0.9250	0.9250	1.0500	1.1250	1.2000	1.2750	(22a)
(22b)m	0.6815	0.6437	0.6437	0.5679	0.5175	0.4922	0.4670	0.4670	0.5301	0.5679	0.6058	0.6437	(22b)
Effective ach	0.7322	0.7072	0.7072	0.6613	0.6339	0.6211	0.6090	0.6090	0.6405	0.6613	0.6835	0.7072	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Doors			1.8500	2.0000	3.7000			(26)
Windows (Uw = 2.00)			20.6425	1.8519	38.2269			(27)
External Wall	149.7390	22.4925	127.2465	0.3500	44.5363			(29a)
External Roof	89.9700		89.9700	0.1600	14.3952			(30)
Total net area of external elements Aum(A, m2)			239.7090					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		100.8583			(33)
Party Wall			10.6500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (User defined value 0.110 * total exposed areas)		26.3680 (36)
Total fabric heat loss	(33) + (36) =	127.2263 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	77.1783	74.5341	74.5341	69.6988	66.8111	65.4680	64.1920	64.1920	67.5078	69.6988	72.0409	74.5341	(38)
(39)m	204.4046	201.7604	201.7604	196.9251	194.0374	192.6943	191.4183	191.4183	194.7342	196.9251	199.2672	201.7604	(39)
(40)m	2.2719	2.2425	2.2425	2.1888	2.1567	2.1418	2.1276	2.1276	2.1644	2.1888	2.2148	2.2425	(40)
									Average = Sum(40)m / 12 =			2.1925	(40)
(41)m	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy, N		2.6253 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36		101.6327 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m	111.7960	107.7307	103.6654	99.6001	95.5348	91.4695	91.4695	95.5348	99.6001	103.6654	107.7307	111.7960	(44)
(45)m	166.1869	145.3481	149.9862	130.7616	125.4689	108.2701	100.3282	115.1281	116.5031	135.7731	148.2069	160.9431	(45)
Energy content (annual)										Total = Sum(45)m =		1602.9043	(45)
(46)m	24.9280	21.8022	22.4979	19.6142	18.8203	16.2405	15.0492	17.2692	17.4755	20.3660	22.2310	24.1415	(46)

Water storage loss:
b) If manufacturer declared cylinder loss factor is not known :

Cylinder volume (litres) including any solar storage within same cylinder		150.0000 (50)
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.0191 (51)
Volume factor from Table 2a		0.9283 (52)
Temperature factor from Table 2b		0.5400 (53)
Enter (49) or (54) in (55)		1.4364 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(57)m	44.5282	40.2190	44.5282	43.0918	44.5282	43.0918	44.5282	44.5282	43.0918	44.5282	43.0918	44.5282	(57)

Primary circuit loss (annual) from Table 3		610.0000 (58)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(59)m	51.8082	46.7945	51.8082	50.1370	51.8082	50.1370	51.8082	51.8082	50.1370	51.8082	50.1370	51.8082	(59)
(62)m	262.5233	232.3616	246.3226	223.9904	221.8053	201.4989	196.6646	211.4645	209.7318	232.1095	241.4357	257.2795	(62)
(63)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Water heat.	262.5233	232.3616	246.3226	223.9904	221.8053	201.4989	196.6646	211.4645	209.7318	232.1095	241.4357	257.2795	(64)
								Total per year (kWh/year) = Sum(64)m =				2737.1879	(64)
(65)m	132.3263	117.9391	126.9396	118.0613	118.7875	110.5828	110.4282	115.3492	113.3203	122.2137	123.8618	130.5827	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	131.2655	(66)
(67)m	36.2254	32.1750	26.1665	19.8097	14.8080	12.5015	13.5084	17.5587	23.5672	29.9240	34.9257	37.2322	(67)

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF TARGET EMISSIONS Page: 14 of 22

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(68)m	239.0225	241.5028	235.2525	221.9464	205.1498	189.3634	178.8171	176.3368	182.5871	195.8932	212.6898	228.4762	(68)
(69)m	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	36.1265	(69)
(70)m	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	10.0000	(70)
(71)m	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	-105.0124	(71)
(72)m	177.8579	175.5046	170.6177	163.9740	159.6607	153.5873	148.4251	155.0393	157.3893	164.2657	172.0303	175.5144	(72)
(73)m	525.4854	521.5621	504.4164	478.1098	451.9981	427.8319	413.1301	421.3143	435.9232	462.4625	492.0255	513.6025	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	20.6425	19.8726	0.7200	0.7000	0.7700	143.2782	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m	143.2782	277.7138	443.8760	659.0506	801.8769	836.7177	812.1293	706.8139	530.6719	338.2032	178.1320	118.1903	(83)
(84)m	668.7636	799.2759	948.2924	1137.1604	1253.8751	1264.5496	1225.2595	1128.1283	966.5951	800.6657	670.1574	631.7928	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)		21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	30.5664	30.9670	30.9670	31.7274	32.1995	32.4240	32.6401	32.6401	32.0843	31.7274	31.3545	30.9670	
alpha	3.0378	3.0645	3.0645	3.1152	3.1466	3.1616	3.1760	3.1760	3.1390	3.1152	3.0903	3.0645	
(86)m	0.9941	0.9895	0.9772	0.9473	0.8754	0.7501	0.5743	0.6100	0.8579	0.9649	0.9907	0.9947	(86)
(87)m	18.6530	18.8781	19.3124	19.8195	20.3764	20.7483	20.9281	20.9143	20.5810	19.9150	19.1414	18.7191	(87)
(88)m	19.1668	19.1849	19.1849	19.2184	19.2387	19.2481	19.2572	19.2572	19.2338	19.2184	19.2021	19.1849	(88)
(89)m	0.9918	0.9855	0.9675	0.9239	0.8138	0.6172	0.3584	0.3866	0.7561	0.9436	0.9864	0.9925	(89)
(90)m	17.1433	17.3790	17.8082	18.3225	18.8486	19.1463	19.2464	19.2438	19.0312	18.4264	17.6543	17.2216	(90)
Living area fraction										fLA = Living area / (4) =		0.2849	(91)
(92)m	17.5733	17.8061	18.2367	18.7489	19.2837	19.6026	19.7255	19.7197	19.4727	18.8505	18.0779	17.6482	(92)
Temperature adjustment												0.0000	
(93)m	17.5733	17.8061	18.2367	18.7489	19.2837	19.6026	19.7255	19.7197	19.4727	18.8505	18.0779	17.6482	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m	0.9888	0.9809	0.9603	0.9156	0.8157	0.6488	0.4224	0.4533	0.7738	0.9373	0.9824	0.9898	(94)
(95)m	661.2772	783.9951	910.6690	1041.2338	1022.8203	820.4398	517.5839	511.3590	747.9494	750.4575	658.3415	625.3189	(95)
(96)m	4.5000	5.0000	6.8000	8.7000	11.7000	14.6000	16.9000	16.9000	14.3000	10.8000	7.0000	4.9000	(96)
(97)m	2672.2520	2583.7555	2307.4789	1978.8850	1471.5209	963.9784	540.8498	539.7439	1007.3004	1585.3437	2207.4663	2572.0851	(97)
(98)m	1496.1652	1209.4390	1039.2266	675.1089	333.8333	0.0000	0.0000	0.0000	0.0000	621.1553	1115.3699	1448.3941	(98)
Space heating (October to May) (kWh/year)												7938.6922	(98)
Space heating requirement in kWh/m2/year											(98) / (4) =	88.2371	(99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)		0.1000 (201)
Fraction of space heat from main system(s)		0.9000 (202)
Efficiency of main space heating system 1 (in %)		78.9000 (206)
Efficiency of secondary/supplementary heating system, %		100.0000 (208)

Space heating:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m	1496.1652	1209.4390	1039.2266	675.1089	333.8333	0.0000	0.0000	0.0000	0.0000	621.1553	1115.3699	1448.3941	(98)
(211)m	1706.6523	1379.5882	1185.4296	770.0862	380.7984	0.0000	0.0000	0.0000	0.0000	708.5422	1272.2850	1652.1605	(211)
(215)m	149.6165	120.9439	103.9227	67.5109	33.3833	0.0000	0.0000	0.0000	0.0000	62.1155	111.5370	144.8394	(215)

Annual totals kWh/year		
Space heating fuel used, main system 1		9055.5425 (211)
Space heating fuel used, secondary		793.8692 (215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(64)m	262.5233	232.3616	246.3226	223.9904	221.8053	201.4989	196.6646	211.4645	209.7318	232.1095	241.4357	257.2795	(64)
Efficiency of water heater												88.8000	(216)
(217)m	77.0545	76.9137	76.5572	75.8988	74.2695	68.8000	68.8000	68.8000	68.8000	75.6421	76.7165	77.0359	(217)
(219)m	340.6984	302.1070	321.7500	295.1171	298.6494	292.8763	285.8497	307.3611	304.8428	306.8521	314.7117	333.9737	(219)

Water heating fuel used		3704.7892 (219)

Electricity for pumps, fans and electric keep-hot (Table 4f):		
central heating pump		130.0000 (230c)
boiler with a fan-assisted flue		45.0000 (230e)
Total electricity for the above, kWh/year		175.0000 (231)
Electricity for lighting (calculated in Appendix L)		639.7511 (232)

12a. CO2 emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	9055.5425	0.1940	1756.7752	(261)
Space heating - secondary	793.8692	0.4220	335.0128	(263)
Water heating cost (other fuel)	3704.7892	0.1940	718.7291	(264)
Space and water heating			2810.5172	(265)
Pumps and fans	175.0000	0.4220	73.8500	(267)
Energy for lighting	639.7511	0.4220	269.9750	(268)
Total CO2, kg/year			3154.3421	(272)
Emissions per m2 for space and water heating			32.0592	(272a)
Emissions per m2 for lighting			3.0007	(272b)
Target Carbon Dioxide Emission Rate (TER)			21.8400	(273)
= [(32.0592 * 1.00 * 1.0206) + (3.0007 * 1.2251)] * 0.60				

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF TARGET EMISSIONS Page: 15 of 22

8.2: Appendixes :
Energy / Renewable Energy Statement

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF STANDARD ENE7 CO2


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SAP 2009 WORKSHEET FOR New Build (As Designed)   BRE SAP Worksheet 9.90
CALCULATION OF STANDARD ENE7 CO2
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18
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-------------------------------------------------------------------------------------------------------------------------------
1. Overall dwelling dimensions
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                                                                 Area          Storey height                Volume
                                                                 (m2)               (m)                     (m3)
Ground floor                                                  89.9700 (1b)     x       3.5500 (2b)     =    319.3935 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)           89.9700                                        (4)
Dwelling volume                                                                    (3a)+(3b)+(3c)+(3d)+(3e)...(3n) =    319.3935 (5)

-------------------------------------------------------------------------------------------------------------------------------
2. Ventilation rate
-------------------------------------------------------------------------------------------------------------------------------

                                                    main          secondary          other             total       m3 per hour
                                                  heating         heating
Number of chimneys                                      0     +         0     +         0      =          0 * 40 =      0.0000 (6a)
Number of open flues                                    0     +         0     +         0      =          0 * 20 =      0.0000 (6b)
Number of intermittent fans                                                                        3 * 10 =     30.0000 (7a)
Number of passive vents                                                                            0 * 10 =      0.0000 (7b)
Number of flueless gas fires                                                                       0 * 40 =      0.0000 (7c)

                                                                                                                Air changes per hour
Infiltration due to chimneys, flues and fans   = (6a)+(6b)+(7a)+(7b)+(7c) =                                  30.0000 / (5) =      0.0939 (8)
Pressure test                                                                                                        Yes
Measured/design q50                                                                                                  5.0000
If based on air permeability value, then (18) = [(17)/20]+(8),  otherwise (18) = (16)                                0.3439 (18)
Number of sides on which dwelling is sheltered                                                                       1      (19)

Shelter factor                                                                    (20) =  1  -  [0.075 x (19)]  =     0.9250 (20)
Infiltration rate adjusted to include shelter factor                                      (21) = (18) x (20)  =     0.3181 (21)

             Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec
Wind speed    5.4000   5.1000   5.1000   4.5000   4.1000   3.9000   3.7000   3.7000   4.2000   4.5000   4.8000   5.1000 (22)
Wind factor   1.3500   1.2750   1.2750   1.1250   1.0250   0.9750   0.9250   0.9250   1.0500   1.1250   1.2000   1.2750 (22a)
(22b)m        0.4295   0.4056   0.4056   0.3579   0.3261   0.3102   0.2943   0.2943   0.3340   0.3579   0.3818   0.4056 (22b)
Effective ach 0.5922   0.5823   0.5823   0.5640   0.5532   0.5481   0.5433   0.5433   0.5558   0.5640   0.5729   0.5823 (25)

-------------------------------------------------------------------------------------------------------------------------------
3. Heat losses and heat loss parameter
-------------------------------------------------------------------------------------------------------------------------------

Element                                      Gross       Openings        NetArea       U-value         A x U         K-value         A x K
                                              m2           m2             m2          W/m2K            W/K          kJ/m2K          kJ/K
Door                                                                       1.8900        1.0000        1.8900                                 (26)
Windows (Uw = 1.50)                                                       39.5700        1.4151       55.9953                                 (27)
External Wall                                115.0190       39.5700      75.4490        0.1500       11.3174                                 (29a)
Corridor Wall                                 34.7200        1.8900      32.8300        0.2257        7.4108                                 (29a)
External Roof                                 89.9700                    89.9700        0.1300       11.6961                                 (30)
Total net area of external elements Aum(A, m2)                           239.7090                                                          (31)
Fabric heat loss, W/K = Sum (A x U)                                                    (26)...(30) + (32) =      88.3096                      (33)
Party Wall                                                                10.6500        0.0000        0.0000                                 (32)
Floor                                                                     89.9700                                                          (32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                                                                                  250.0000 (35)
Thermal bridges (Default value 0.150 * total exposed area)                                                                          35.9564 (36)
Total fabric heat loss                                                                                          (33) + (36) =     124.2659 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
             Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec
(38)m         62.4206  61.3705  61.3705  59.4504  58.3036  57.7703  57.2636  57.2636  58.5803  59.4504  60.3805  61.3705 (38)
(39)m        186.6865 185.6364 185.6364 183.7163 182.5696 182.0362 181.5295 181.5295 182.8463 183.7163 184.6464 185.6364 (39)
(40)m          2.0750   2.0633   2.0633   2.0420   2.0292   2.0233   2.0177   2.0177   2.0323   2.0420   2.0523   2.0633 (40)
                                                                                    Average = Sum(40)m / 12 =     2.0434 (40)
(41)m            31       28       31       30       31       30       31       31       30       31       30       31 (41)

-------------------------------------------------------------------------------------------------------------------------------
4. Water heating energy requirements (kWh/year)
-------------------------------------------------------------------------------------------------------------------------------

Assumed occupancy, N                                                                                                 2.6253 (42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36                                         96.5511 (43)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of
not more that 125 litres per person per day (all water use, hot and cold)
             Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec
(44)m        106.2062 102.3442  98.4821  94.6201  90.7580  86.8960  86.8960  90.7580  94.6201  98.4821 102.3442 106.2062 (44)
(45)m        157.8775 138.0807 142.4869 124.2236 119.1955 102.8566  95.3118 109.3717 110.6779 128.9844 140.7966 152.8960 (45)
Energy content (annual)                                                                    Total = Sum(45)m =  1522.7591 (45)
(46)m         23.6816  20.7121  21.3730  18.6335  17.8793  15.4285  14.2968  16.4057  16.6017  19.3477  21.1195  22.9344 (46)
Water storage loss:
b) If manufacturer declared cylinder loss factor is not known :
 Cylinder volume (litres) including any solar storage within same cylinder                                         150.0000 (50)
 Hot water storage loss factor from Table 2 (kWh/litre/day)                                                          0.0191 (51)
 Volume factor from Table 2a                                                                                         0.9283 (52)
 Temperature factor from Table 2b                                                                                    0.5400 (53)
Enter (49) or (54) in (55)                                                                                           1.4364 (55)
(57)m         44.5282  40.2190  44.5282  43.0918  44.5282  43.0918  44.5282  44.5282  43.0918  44.5282  43.0918  44.5282 (57)
Primary circuit loss (annual) from Table 3                                                                         360.0000 (58)
(59)m         30.5753  27.6164  30.5753  29.5890  30.5753  29.5890  30.5753  30.5753  29.5890  30.5753  29.5890  30.5753 (59)
(62)m        232.9811 205.9162 217.5905 196.9044 194.2990 175.5375 170.4153 184.4752 183.3587 204.0880 213.4774 227.9995 (62)
(63)m          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000 (63)
                                                                                Solar input (sum of months) = Sum(63)m =     0.0000 (63)
Water heat.  232.9811 205.9162 217.5905 196.9044 194.2990 175.5375 170.4153 184.4752 183.3587 204.0880 213.4774 227.9995 (64)
                                                                                Total per year (kWh/year) = Sum(64)m =  2407.0427 (64)
(65)m        112.5771 100.1802 107.4597  99.4490  99.7153  92.3445  91.7740  96.4489  94.9451 102.9701 104.9595 110.9207 (65)

-------------------------------------------------------------------------------------------------------------------------------
5. Internal gains (see Table 5 and 5a)
-------------------------------------------------------------------------------------------------------------------------------

Metabolic gains (Table 5), Watts
             Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec
```


CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF STANDARD ENE7 CO2


```
(66)m        131.2655 131.2655 131.2655 131.2655 131.2655 131.2655 131.2655 131.2655 131.2655 131.2655 131.2655 131.2655 (66)
(67)m         21.3090  18.9265  15.3921  11.6528   8.7106   7.3538   7.9461  10.3286  13.8631  17.6023  20.5445  21.9013 (67)
(68)m        239.0225 241.5028 235.2525 221.9464 205.1498 189.3634 178.8171 176.3368 182.5871 195.8932 212.6898 228.4762 (68)
(69)m         36.1265  36.1265  36.1265  36.1265  36.1265  36.1265  36.1265  36.1265  36.1265  36.1265  36.1265  36.1265 (69)
(70)m         10.0000  10.0000  10.0000  10.0000  10.0000  10.0000  10.0000  10.0000  10.0000  10.0000  10.0000  10.0000 (70)
(71)m       -105.0124 -105.0124 -105.0124 -105.0124 -105.0124 -105.0124 -105.0124 -105.0124 -105.0124 -105.0124 -105.0124 -105.0124 (71)
(72)m        151.3133 149.0777 144.4351 138.1236 134.0260 128.2562 123.3521 129.6356 131.8682 138.4007 145.7771 149.0870 (72)
(73)m        484.0245 481.8867 467.4594 444.1025 420.2660 397.3531 382.4950 388.6807 400.6979 424.2759 451.3911 471.8442 (73)

-------------------------------------------------------------------------------------------------------------------------------
6. Solar gains
-------------------------------------------------------------------------------------------------------------------------------

[Jan]                                    Area        Solar flux          g              FF           Access          Gains
                                         m2          Table 6a      Specific data  Specific data    factor           W
                                                       W/m2        or Table 6b    or Table 6c    Table 6d
-------------------------------------------------------------------------------------------------------------------------------
Southeast                                12.8400       37.3877        0.7600         0.7000         0.7700       176.9858 (77)
Southwest                                18.2400       37.3877        0.7600         0.7000         0.7700       251.4190 (79)
Northwest                                 8.4900       11.5098        0.7600         0.7000         0.7700        36.0262 (81)
-------------------------------------------------------------------------------------------------------------------------------
(83)m        464.4310  804.0344 1093.7130 1398.0337 1579.6352 1623.4121 1583.4393 1443.1030 1224.8573  921.8117  559.0942  395.3940 (83)
(84)m        948.4556 1285.9210 1561.1723 1842.1362 1999.9012 2020.7652 1965.9342 1831.7837 1625.5552 1346.0876 1010.4853  867.2382 (84)
-------------------------------------------------------------------------------------------------------------------------------
7. Mean internal temperature (heating season)
-------------------------------------------------------------------------------------------------------------------------------

Temperature during heating periods in the living area from Table 9, Th1 (C)                                         21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
             Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec
tau           33.4674  33.6567  33.6567  34.0085  34.2221  34.3224  34.4182  34.4182  34.1703  34.0085  33.8372  33.6567
alpha          3.2312   3.2438   3.2438   3.2672   3.2815   3.2882   3.2945   3.2945   3.2780   3.2672   3.2558   3.2438
(86)m          0.9845   0.9614   0.9164   0.8371   0.7003   0.5325   0.3688   0.3936   0.6490   0.8736   0.9709   0.9871 (86)

(87)m         19.0824  19.4482  19.9212  20.3555  20.7324  20.9198  20.9827  20.9791  20.8470  20.3733  19.5620  19.0913 (87)
(88)m         19.2910  19.2986  19.2986  19.3124  19.3208  19.3247  19.3284  19.3284  19.3188  19.3124  19.3057  19.2986 (88)
(89)m          0.9790   0.9485   0.8888   0.7869   0.6141   0.4105   0.2230   0.2390   0.5232   0.8195   0.9590   0.9823 (89)
(90)m         17.6537  18.0146  18.4639  18.8634  19.1739  19.2971  19.3261  19.3256  19.2584  18.8987  18.1374  17.6688 (90)
Living area fraction                                                                    fLA = Living area / (4) =     0.2849 (91)
(92)m         18.0607  18.4230  18.8791  19.2884  19.6179  19.7594  19.7980  19.7966  19.7109  19.3188  18.5432  18.0740 (92)
Temperature adjustment                                                                                               0.0000
(93)m         18.0607  18.4230  18.8791  19.2884  19.6179  19.7594  19.7980  19.7966  19.7109  19.3188  18.5432  18.0740 (93)

-------------------------------------------------------------------------------------------------------------------------------
8. Space heating requirement
-------------------------------------------------------------------------------------------------------------------------------

             Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec
(94)m          0.9734   0.9398   0.8804   0.7861   0.6308   0.4440   0.2650   0.2837   0.5555   0.8197   0.9517   0.9774 (94)
(95)m        923.2022 1208.4947 1374.4832 1448.0385 1261.6365 897.1535 521.0565 519.4545 903.0026 1103.4505 961.6625 847.6121 (95)
(96)m          4.5000   5.0000   6.8000   8.7000  11.7000  14.6000  16.9000  16.9000  14.3000  10.8000   7.0000   4.9000 (96)
(97)m       2531.5975 2491.7923 2242.3142 1945.2683 1445.5647 939.1962 526.0815 525.8230 989.3682 1565.0369 2131.4154 2445.5798 (97)
(98)m       1196.6461  862.4028  645.6662  358.0055  136.8426   0.0000   0.0000   0.0000   0.0000  343.4203  842.2221 1188.8880 (98)
Space heating (October to May) (kWh/year)                                                                   3574.0936 (98)
Space heating requirement in kWh/m2/year                                                                      (98) / (4) =    61.9550 (99)

-------------------------------------------------------------------------------------------------------------------------------
8c. Space cooling requirement
-------------------------------------------------------------------------------------------------------------------------------

Not applicable

-------------------------------------------------------------------------------------------------------------------------------
9a. Energy requirements - Individual heating systems, including micro-CHP
-------------------------------------------------------------------------------------------------------------------------------

Fraction of space heat from secondary/supplementary system (Table 11)                                                0.1000 (201)
Fraction of space heat from main system(s)                                                                           0.9000 (202)
Efficiency of main space heating system 1 (in %)                                                                    88.9000 (206)
Efficiency of secondary/supplementary heating system, %                                                            100.0000 (208)
Space heating:
             Jan      Feb      Mar      Apr      May      Jun      Jul      Aug      Sep      Oct      Nov      Dec
(98)m        1196.6461  862.4028  645.6662  358.0055  136.8426   0.0000   0.0000   0.0000   0.0000  343.4203  842.2221 1188.8880 (98)
(211)m       1211.4528  873.0737  653.6553  362.4353  138.5358   0.0000   0.0000   0.0000   0.0000  347.6696  852.6433 1203.5986 (211)
(215)m        119.6646   86.2403   64.5666   35.8005   13.6843   0.0000   0.0000   0.0000   0.0000   34.3420   84.2222  118.8888 (215)
Annual totals kWh/year                                                                                               5643.0644 (211)
Space heating fuel used, main system 1                                                                               557.4094 (215)
Space heating fuel used, secondary

Water heating
(64)m         232.9811  205.9162  217.5905  196.9044  194.2990  175.5375  170.4153  184.4752  183.3587  204.0880  213.4774  227.9995 (64)
Efficiency of water heater                                                                                            78.8000 (216)
(217)m         86.9186   86.5734   85.9005   84.7783   82.4333   78.8000   78.8000   78.8000   78.8000   84.5881   86.4647   86.9426 (217)
(219)m        268.0451  237.8516  253.3053  232.2580  235.7045  222.7633  216.2631  234.1056  232.6888  241.2725  246.8955  262.2415 (219)

Water heating fuel used                                                                                              2883.3947 (219)

Electricity for pumps, fans and electric keep-hot (Table 4f):
  central heating pump                                                                                               130.0000 (230c)
  boiler with a fan-assisted flue                                                                                     45.0000 (230e)
Total electricity for the above, kWh/year                                                                            175.0000 (231)
Electricity for lighting (calculated in Appendix L)                                                                  376.3242 (232)

-------------------------------------------------------------------------------------------------------------------------------
12a. CO2 emissions - Individual heating systems including micro-CHP
-------------------------------------------------------------------------------------------------------------------------------

                                                                Energy        Emission factor          Emissions
                                                               kWh/year          kg CO2/kWh          kg CO2/year
Space heating - main system 1                                 5643.0644              0.1980           1117.3268 (261)
Space heating - secondary                                      557.4094              0.5170            288.1806 (263)
Water heating cost (other fuel)                               2883.3947              0.1980            570.9121 (264)
Space and water heating                                                                                1976.4195 (265)
Pumps and fans                                                 175.0000              0.5170             90.4750 (267)
Energy for lighting                                            376.3242              0.5170            194.5596 (268)
Total CO2, kg/year                                                                                     2261.4541 (272)
Dwelling Carbon Dioxide Emission Rate (DER)                                                              25.1400 (273)
```


CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF STANDARD ENE7 CO2

8.2: Appendixes :
Energy / Renewable Energy Statement

CALCULATION DETAILS for survey reference no 'PVs'
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING Page: 19 of 22

SAP 2009 WORKSHEET FOR New Build (As Designed) BRE SAP Worksheet 9.90
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

No improvements selected

CALCULATION DETAILS for survey reference no 'PVs'
REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition Page: 20 of 22

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2010 Edition
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

New Build (As Designed)

1 TER and DER
Fuel for main heating:Mains gas
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.84 kg/m^2
Dwelling Carbon Dioxide Emission Rate (DER) 18.77 kg/m^{2}OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.48 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated using default y-value of 0.15

3 Design air permeability
Design air permeability at 50 pascals: 5.00
Maximum 10.0 OK

4 Heating efficiency
Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 90.0% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system: None

5 Cylinder insulation
Hot water storage: No cylinder

6 Controls
Space heating controls: Time and temperature zone control OK
Hot water controls: No cylinder

Boiler interlock: Yes OK

7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation
Not applicable

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South East: 12.84 m², No overhang
Windows facing South West: 18.24 m², No overhang
Windows facing North West: 8.49 m², No overhang
Ventilation rate: 6.00
Blinds/curtains: None

10 Key features
External wall U-value 0.15 W/m²K
Door U-value 1.00 W/m²K
Party wall U-value 0.00 W/m²K
Photovoltaic array

CALCULATION DETAILS for survey reference no 'PVs'
SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90 Page: 21 of 22

SAP 2009 OVERHEATING ASSESSMENT FOR New Build (As Designed) BRE SAP Worksheet 9.90
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
Region	Thames Valley
Front of dwelling faces	South East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	632.40 (P1)
Transmission heat loss coefficient	124.27 (37)
Summer heat loss coefficient	756.67 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South East	0.000	1.000	None
South West	0.000	1.000	None
North West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South East	12.8400	116.7611	0.7600	0.7000	0.9000	646.0408
South West	18.2400	116.7611	0.7600	0.7000	0.9000	917.7402
North West	8.4900	98.9568	0.7600	0.7000	0.9000	362.0344
					total:	1925.8155

	Jun	Jul	Aug	
Solar gains	2007	1926	1778	(P3)
Internal gains	469	450	459	
Total summer gains	2476	2376	2237	(P5)
Summer gain/loss ratio	3.27	3.14	2.96	(P6)
Summer external temperature	15.40	17.80	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.00	0.00	0.00	
Threshold temperature	18.92	21.19	21.01	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	
Assessment of likelihood of high internal temperature:	Slight			

8.2: Appendixes :
Energy / Renewable Energy Statement

CALCULATION DETAILS for survey reference no 'PVs'
SAP 2009 IMPROVEMENTS

SAP 2009 IMPROVEMENTS
Calculated by program Elmhurst Energy Systems SAP2009 Calculator (Design System) version 3.07r18

21686_New Oxford Street_08Flat

Current energy efficiency rating:	B 83
Current environmental impact rating:	B 84

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
L	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
Q	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic (PV) panels	Not applicable
V Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

		Typical annual savings	Energy efficiency	Environmental impact
Lower cost measures				
(none)				
	Sub Total	£0	0.0000 kg/m²	
Higher cost measures				
(none)				
	Sub Total	£0	0.0000 kg/m²	

Potential energy efficiency rating:	B 83
Potential environmental impact rating:	B 84

Further improvements to achieve even higher standards
(none)

Total Savings £0 0.0000 kg/m²

Enhanced energy efficiency rating:	B 83
Enhanced environmental impact rating:	B 84

Fuel prices for cost data on this page from database revision number 327 TEST (31 Aug 2012)
Recommendation texts revision number 3.9c (09 Jan 2012)

Typical heating and lighting costs of this home (per year):

	Current	Potential	Enhanced
Electricity	£71	£71	£71
Mains gas	£387	£387	£387
Space heating	£327	£327	£327
Water heating	£83	£83	£83
Lighting	£49	£49	£49
Generated (PV)	-£66	-£66	-£66
Total cost	£393	£393	£393
Carbon dioxide emissions	1.6 tonnes	1.6 tonnes	1.6 tonnes
Primary energy	91 kWh/m²	91 kWh/m²	91 kWh/m²

8.2: Appendixes :
Energy / Renewable Energy Statement

8.3: Appendixes :
Sustainability Statement

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Project No: 21686
Report: v1
Prepared for: Zania Universal
Prepared by: Stathis Eleftheriadis
Date: 19/12/2012

PRICE&MYERS

112-116 New Oxford Street

BREEAM Domestic Refurbishment Pre-Assessment Report

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8.3: Appendixes :
Sustainability Statement

Executive Summary

Price & Myers has been commissioned by Zania Universal to carry out a BREEAM pre-assessment for the 112-116 New Oxford Street development. The project involves the refurbishment of an existing property in the London Borough of Camden. The proposed 7-storey development comprises of 7 refurbished flats and 1 additional new flat on the roof top.

This report demonstrates that the refurbished dwellings have the potential to achieve a score of 68.85%, which equates to a Very Good rating.

The report details the performance of the 112-116 New Oxford Street development against the BREEAM Domestic Refurbishment criteria. The current score based on the credits targeted by the design team is 68.85%, which equates to a Very Good rating. This provides a buffer over the target score of 55% (the threshold for Very Good ratings) should credits be lost through design or cost constraints as the project progresses.

Credits such as the daylighting and cycle storage are currently potential credits, as these could be implemented later in the project should additional credits be required.

It is key for the design team to remain in contact with the assessor throughout the process and to check that all specifications are in line with the pre-assessment to ensure the required level is achieved upon construction.

Contents

Contents

1. Introduction

Price & Myers has been commissioned to carry out a Preliminary BREEAM (BRE Environmental Assessment Method) Domestic Refurbishment assessment of the 112-116 New Oxford Street development for Zania Universal.

The development involves the refurbishment and extension of an existing property in the London Borough of Camden. The development will involve 1 additional storey being added to the property, resulting in 8 flats within a 7-storey building.

Fig 1 - Proposed front view of the 112-116 New Oxford Street development

The proposed development is mainly contained within the existing envelope of the building, with a new roof and walls being installed for the 7th floor flat.

Therefore the BREEAM Domestic Refurbishment scheme is applicable to this development. The London Borough of Camden requires dwellings to achieve a Very Good rating on the BREEAM Domestic Refurbishment scheme and minimum standards (% of un-weighted credits) for Energy, Water & Materials sections to be 60%, 60% & 40% respectively. The additional floor will create an entirely new building. The BREEAM for Domestic Refurbishment scheme cannot be applied to this one unit, as it is considered new build. The new flat will be designed to meet similar sustainability standards and improvement over Part L. This assessment applies to flat 1-7

This report comprises a pre-assessment of the development against the BREEAM Domestic Refurbishment scheme in support of the planning application. It concludes the BREEAM score and rating that the development can achieve based on the individual credits targeted by the design team.

8.3: Appendixes :
Sustainability Statement

2. BREEAM Refurbishment - Domestic Buildings

BREEAM Domestic Refurbishment is a performance based assessment method and certification scheme for domestic buildings undergoing refurbishment.

The primary aim of the scheme is to improve the environmental performance of existing dwellings in a robust and cost effective manner. The performance of the dwelling on the scheme is quantified by a number of individual measures and associated criteria stretching across a range of environmental issues, categorised into the following sections:

- Management
- Health and Wellbeing
- Energy
- Water
- Materials
- Pollution
- Waste
- Innovation

BREEAM Scoring

Within each of the BREEAM categories outlined above, there are a number of credit requirements that reflect the options available to designers and managers of buildings.

An environmental weighting is applied to the scores achieved under each category, illustrated in Table 3.1, in order to calculate the final BREEAM score. The weighting factors have been derived from consensus based research with various groups such as government, material suppliers and lobbyists. This research was carried out by BRE to establish the relative importance of each environmental issue.

The current rating benchmarks for this BREEAM scheme are detailed in the table below:

BREEAM Rating	% Score
Outstanding	≥ 85
Excellent	≥ 70
Very Good	≥ 55
Good	≥ 45
Pass	≥ 30
Unclassified	< 30

Table 2.1 - BREEAM rating benchmarks

PRICE&MYERS BREEAM Domestic Refurbishment

Minimum Standards

In order to achieve particular benchmark scores, there is a minimum performance requirement within the BREEAM schemes. The minimum performance requirements are detailed in the table below and a project cannot achieve a particular rating unless the minimum requirements have been met, irrespective of the overall percentage score.

BREEAM Issue	Minimum standards by rating level				
	Pass	Good	Very Good	Excellent	Outstanding
Ene 02: Energy Efficiency Rating Post Refurbishment	0.5 Credits	1 Credit	1.5 Credits	2.5 Credits	3.5 Credits
Wat 01: Internal Water Use	-	-	1 Credit	2 Credits	3 Credits
Hea 05: Ventilation	1 Credit	1 Credit	1 Credit	1 Credit	1 Credit
Hea 06: Safety	1 Credit	1 Credit	1 Credit	1 Credit	1 Credit
Pol 03: Flooding	-	-	-	2 Credits	2 Credits
Mat 02: Responsible Sourcing of Materials	Criterion 3 only	Criterion 3 only	Criterion 3 only	Criterion 3 only	Criterion 3 only

Table 2.2 - Minimum BREEAM standards

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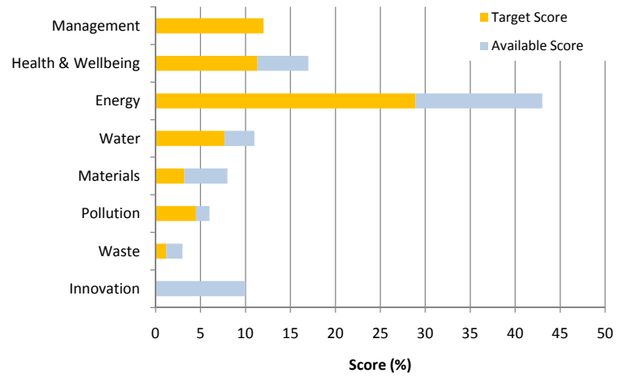
3. Score Summary

The potential BREEAM score of the development has been determined based on discussions with the design team and is currently expected to achieve the following:



BREEAM Section	Credits Available	Credits Targeted	% of Credits Achieved	Section Weighting	Section Score
Management	11	11	100.0%	12%	12.00
Health & Wellbeing	12	8	66.7%	17%	11.33
Energy	29	19.5	67.2%	43%	28.91
Water	5	3.5	70.0%	11%	7.70
Materials	45	18	40.0%	8%	3.20
Pollution	8	6	75.0%	6%	4.50
Waste	5	2	40.0%	3%	1.20
Innovation	10	0	0.0%	10%	0.00
Final BREEAM Score			**68.85**		
BREEAM Rating			**Very Good**		

Table 3.1 - Breakdown of the BREEAM score and rating

Minimum BREEAM Standards					
Rating Level	Pass	Good	Very Good	Excellent	Outstanding
Minimum Standards Achieved	Yes	Yes	Yes	No	No

This report demonstrates that the 112-116 New Oxford Street development has met all of the minimum standards and can achieve a Very Good rating on the BREEAM Domestic Refurbishments scheme.

4. Credit Summary

The following section details the BREEAM credits assessed under the scheme and whether they will be targeted for the 112-116 New Oxford Street development.

Credit	Criteria	Available Score (%)	Status	Targeted Score (%)	Pre-Assessment Stage Assumptions
MANAGEMENT					
Man 01 Home Users Guide	Where a Home User Guide containing the information listed in the 'User Guide Contents List' has been produced and supplied to all homes	3.27	Targeted	3.27	A Home User Guide will be produced containing the information listed in the User Guide Content List.
Man 02 Responsible Construction Practices	CCS Score 25 - 34	1.09	Targeted	1.09	The contractor will be expected to achieve a score of at least 35 on the CCS(a score of 7 in each of the 5 sections must be achieved).
	CCS Score 35 - 39	1.09	Targeted	1.09	
Man 03 Construction Site Impacts	Where 2 or more of the following construction site impact actions are taken: a. Monitor, report and set targets for CO2 production of energy use arising from site activities b. Monitor, report and set targets for water consumption arising from site activities c. A main contractor with an environmental materials policy d. A main contractor that operates an Environmental Management System e. 80% of site timber is reclaimed, re-used or responsibly sourced (And 100% is legally sourced)	1.09	Targeted	1.09	The contractor will be expected to monitor and record activities on site during the construction works, to confirm that all site timber used on the project is sourced in accordance with the UK Government's Timber Procurement Policy and have EMS that follows best practice for pollution policies.
Man 04 Security	Existing doors and windows meet minimum security requirement and new ones are appropriately certified	1.09	Targeted	1.09	All doors and windows will be replaced/new and will meet the required PAS or LPS standards.
	Achieve Secure by Design and implement the recommendations having consulted with an ALO or CPDA	1.09	Targeted	1.09	The design team have consulted with an ALO/CPDA and will implement their recommendations. The design team will also achieve Secure by Design compliance.
Man 05 Protection and Enhancement of Ecological Features	Site survey carried out and any ecological aspects protected during site works (and no ecological features are removed)	1.09	Targeted	1.09	A member of the design team will carry out a site survey and all existing features of ecological value will be protected during the works.
Man 06 Project Management	Assign project roles and responsibilities	1.09	Targeted	1.09	The project manager will be expected to write a project implementation plan and hold an initiation meeting to assign individual and shared responsibilities amongst the project team including all trades on site.
	A handover meeting is arranged AND 2 or more of the following are committed to: a. A site inspection within 3 months of occupation b. Conduct post occupancy interviews with building occupants or a survey via phone or posted information within 3 months of occupation c. Longer term after care e.g. a helpline, nominated individual or other appropriate system to support building users for at least the first 12 months of occupation	1.09	Targeted	1.09	A handover meeting will be arranged and at least 2 of the listed actions carried out.

PRICE&MYERS BREEAM Domestic Refurbishment

Credit	Criteria	Available Score (%)	Status	Targeted Score (%)	Pre-Assessment Stage Assumptions
HEALTH & WELLBEING					
Hea 01 Daylighting	Existing dwellings and change of use projects (e.g. conversions) the refurbishment results in a neutral impact on the dwellings daylighting levels in the kitchen, living room, dining room and study	1.42	Potential	1.42	It is currently unclear whether the credits can be achieved as the view of the sky is questionable. If calculations are undertaken this may be achievable.
	Where the property is being extended the new spaces achieve minimum daylighting levels and the extension does not reduce daylighting levels in the kitchen, living room, dining room or study of neighbouring properties				
	Dwelling achieves minimum daylighting levels in the kitchen (2%), living room, dining room and study (1.5%) + 80% of working plane receives direct sunlight	1.42	Potential	1.42	
Hea 02 Sound Insulation	Compliance with Part E	2.83	Targeted	2.83	The building is expected to achieve an airborne and impact sound attenuation performance 5dB better than that required by the Building Regulations through the use of robust detailing. A programme of pre-completion testing should be carried out by a compliant test body based on the normal programme of testing described in the Building Regulations or Standards for every flat or room for residential purposes
	3dB improvement over Part E	1.42	Targeted	1.42	
	5dB improvement over Part E	1.42	Targeted	1.42	
Hea 03 Volatile Organic Compounds (VOCs)	Avoiding the use of VOCs in compliance with the BREEAM table	1.42	Potential	1.42	All applicable internal finishes and fittings will be specified to avoid the use of volatile organic compounds (VOCs) but it is challenging to obtain appropriate evidence.
Hea 04 Inclusive Design	An access expert or suitably qualified member of the design team has completed section 1 of Checklist A8; Access Statement Template (An architect is expected to satisfy the requirements)	1.42	Targeted	1.42	A suitably qualified member of the design team will complete the access statement to demonstrate reasonable provision to provide accessibility to the dwelling, covering sections 1 and 2 of Checklist A-8. Refer to Appendix B2 for full details of Checklist A-8.
	An access expert or suitably qualified member of the design team has completed sections 1 and 2 of Checklist A8; Access Statement Template (An architect is expected to satisfy the requirements)	1.42	Targeted	1.42	
Hea 05 Ventilation	Minimum background ventilation in the form of trickle ventilation (or an equivalent means of ventilation) should be provided as follows: - Habitable rooms: 5000mm^2 equivalent area; - Kitchens, utility rooms and bathrooms: 2500mm^2 equivalent area; - New rooms (in the case of an extension): 8000mm^2 equivalent area; And a minimum level of extract ventilation is provided in all wet rooms (e.g. kitchen, utility and bath-rooms), compliant with section 5 of AD Part F 2010; And a minimum level of purge ventilation is provided in all habitable rooms and wet rooms, compliant with section 7 of AD Part F 2010	1.42	Targeted	1.42	Minimum background and extract ventilation will be provided to the flats in compliance of Section 5 in AD Part F 2010. If possible, ventilation will be upgraded to achive the 2nd credit.
	Ventilation is provided for the dwelling that meets the requirements of Section 5 of Building Regulations Part F in full	1.42	Potential	1.42	
Hea 06 Safety	Where the dwelling is supplied with mains gas or where any other form of fossil fuel is used within the building (e.g. coal), a compliant fire and carbon monoxide detector and alarm system is provided; Where the project involves electrical re-wiring the power supply for the smoke alarm and compliant carbon monoxide alarm systems are derived	1.42	Targeted	1.42	As the dwelling is supplied with mains gas a compliant fire and carbon monoxide detector and alarm system will be provided. The power supply for the smoke alarm and compliant carbon monoxide alarm systems must be derived from the dwelling's main electricity supply (and not battery operated)

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Credit	Criteria	Available Score (%)	Status	Targeted Score (%)	Pre-Assessment Stage Assumptions
ENERGY					
Ene 01 Improvement in Energy Efficiency Rating	≥ 5 Improvement in EER as calculated from SAP 2009	0.74	Targeted	0.74	Preliminary SAP calculations carried out by Price & Myers show that the improvement in EER from the existing property to the proposed dwelling is 9.7(Refer to Energy Strategy Report).
	≥ 9 Improvement in EER	0.74	Targeted	0.74	
	≥ 13 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 17 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 21 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 26 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 31 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 36 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 42 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 48 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 54 Improvement in EER	0.74	Not Achievable	0.00	
	≥ 60 Improvement in EER	0.74	Not Achievable	0.00	
Ene 02 Energy Efficiency Rating Post Refurbishment	≥ 50 EER rating post refurbishment as calculated from SAP 2009	0.74	Targeted	0.74	Preliminary SAP calculations carried out by Price & Myers show that the post refurbishment EER is 82.75.(Refer to Energy Strategy Report).
	≥ 55 EER rating post refurbishment	0.74	Targeted	0.74	
	≥ 60 EER rating post refurbishment	0.74	Targeted	0.74	
	≥ 65 EER rating post refurbishment	0.74	Targeted	0.74	
	≥ 70 EER rating post refurbishment	0.74	Targeted	0.74	
	≥ 75 EER rating post refurbishment	0.74	Targeted	0.74	
	≥ 80 EER rating post refurbishment	0.74	Targeted	0.74	
	≥ 85 EER rating post refurbishment	0.74	Not Achievable	0.00	
Ene 03 Primary Energy Demand	≤ 400 kWh/m2/yr as calculated from SAP 2009	0.74	Targeted	0.74	Preliminary SAP calculations carried out by Price & Myers show a Primary Energy Demand of 101.75 kWh/m2/yr.
	≤ 370 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 340 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 320 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 300 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 280 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 260 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 240 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 220 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 200 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 180 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 160 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 140 kWh/m2/yr	0.74	Targeted	0.74	
	≤ 120 kWh/m2/yr	0.74	Targeted	0.74	
Ene 04 Renewable Technologies	≥10% of Primary Energy Demand per annum is by LZC technologies AND The dwelling has reduced energy demand prior to the specification of renewable technologies (Must use MCS certified products and installers)	1.48	Not Achievable	0.00	This credit is not currenlty being targeted, as the PV system will not save 10% for this development. However it is listed as a potential credit since LZC technologies could be implemented late on in the project.(Refer to Energy Strategy Report)
	≥15% (mid to high rise flats) or 20% (all others) of Primary Energy Demand per annum is by LZC technologies AND The dwelling has reduced energy demand prior to the specification of renewable technologies (Must use MCS certified products and installers)	1.48	Not Achievable	0.00	
Ene 05 Energy Labelled White Goods	Fridges and freezers or fridge-freezers are recognised by the Energy Saving Trust Recommended labelling scheme OR If no white goods are provided to the dwelling(s), a EU Energy Efficiency Labelling Scheme Information Leaflet is provided to each dwelling	1.48	Targeted	1.48	The specified fridge-freezers will be recognised by the Energy Saving Trust Recommended labelling scheme and carry the Energy Saving Trust Recommended Label.
	Washing machines and dishwashers are recognised by the Energy Saving Trust Recommended labelling scheme, carrying the Energy Saving Trust Recommended Label AND Washer dryers and tumble dryers have a B rating under the EU Energy Efficiency Labelling Scheme OR Where a washer dryer or tumble dryer is not provided, the EU Energy Efficiency Labelling Scheme Information Leaflet is provided to each dwelling	1.48	Targeted	1.48	The specified washing machines and dishwashers will be recognised by the Energy Saving Trust Recommended labelling scheme and carry the Energy Saving Trust Recommended Label. Washer dryers and tumble dryers will have a B rating under the EU Energy Efficiency Labelling Scheme or if not specified, EU Energy Efficiency Labelling Scheme Information Leaflet is provided to each dwelling.

8.3: Appendixes :
Sustainability Statement

Ene 06 Drying Space	Adequate (permanent) internal or external drying line of 4m+ (1-2 bed) or 6m+ (3+ bed) This is either; a heated space with adequate, controlled ventilation, complying with AD Part F 2006, or an unheated outbuilding	1.48	Targeted	1.48	An adequate, secure internal space with posts and footings, or fixings holding will be provided
Ene 07 Lighting	External Lighting - Energy efficient space lighting and security lighting (if present) is provided AND Appropriate control systems i.e. Passive Infra Red (PIR), 'Dusk to Dawn' daylight sensors or time switches	1.48	Targeted	1.48	Energy Efficient Space lighting (including lighting in communal areas) and Energy Efficient Security lighting (where applicable) will be provided to external areas, along with appropriate controls.
	Internal Lighting - Maximum average wattage across the total floor area of the dwelling of 9 W/m^2	1.48	Targeted	1.48	The internal lighting will be designed such that the maximum average wattage across the total floor area of the dwelling of 9 watts/m2.
Ene 08 Energy Display Devices	Current electricity consumption OR Current primary heating fuel consumption data is displayed to occupants	0.00	Targeted	0.00	Current electricity and primary heating fuel consumption data will be displayed to occupants by a compliant Energy Display Device (or Visual Display Unit). An additional exemplary credit is available where the EDD has the capability to record and store energy consumption data.
	Current electricity AND primary heating fuel consumption data are displayed to occupants OR Where electricity is the primary heating fuel and current electricity consumption data are displayed to occupants	2.97	Targeted	2.97	
Ene 09 Cycle Storage	Studios or 1 bed – 1 cycle for every two dwellings 2/3 bed – 1 cycle per dwelling 4+ bed – 2 cycles per dwelling	1.48	Potential	1.48	There is a storage room within the basement of the property which can be utilised as a cycle storage. In order to meet the requirements 1 cycle space will need to be provided for every 1, 2 and 3 bed flats.
	Studios or 1 bed – 1 cycle per dwelling 2/3 bed – 2 cycle per dwelling 4+ bed – 4 cycles per dwelling	1.48	Not Achievable	0.00	
Ene 10 Home Office	Sufficient space and services for a home office: - 1.8m wall length space - Two double power sockets - Telephone point - Window (either the width and height are to be >450mm) - Adequate ventilation (0.5m^2 openable area or meet credit HEA 05)	1.48	Targeted	1.48	A space and facilities for a home office will be provided in each flat. For the dwellings with 3+ bedrooms, this will be in a room other than the kitchen, living room, master bedroom or bathroom. For the 2 bed dwelling,this will be in a room other than the kitchen, living room or bathroom.

Credit	Criteria	Available Score (%)	Status	Targeted Score (%)	Pre-Assessment Stage Assumptions
WATER					
Wat 01 Water	140 - 150 litres / person / day	1.10	Targeted	1.10	Water fittings will be specified such that the Total Water

Credit	Criteria	Available Score (%)	Status	Targeted Score (%)	Pre-Assessment Stage Assumptions
MATERIALS					
Mat 01 Environmental Impact of Materials	Assessment of the following building elements based on their Green Guide to Specification rating and Thermal Performance: - Roof - External Walls - Internal Walls (Including separating walls) - Upper and Ground Floor - Windows	0.18	Targeted	0.18	The following materials have been proposed: - Roof (Metal roof) - External Walls (Retained brickwork/blockwork) - Internal Walls (Timber/Metal stud and blockwork for party & separating walls) - Upper and Ground Floor (Retained Concrete Floors) - Windows (Metal Sash frame) It is expected that 10 credits can be achieved.
		0.18	Targeted	0.18	
		0.18	Targeted	0.18	
		0.18	Targeted	0.18	
		0.18	Targeted	0.18	
		0.18	Targeted	0.18	
		0.18	Targeted	0.18	
		0.18	Targeted	0.18	
		0.18	Targeted	0.18	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
Mat 02 Responsible Sourcing of Materials	Based on responsible sourcing tier for materials within the building elements, fixtures and fittings ≥9% Achieved in BREEAM Calculator Tool	0.36	Targeted	0.36	Materials will be responsibly sourced (i.e. FSC, PEFC, EMS certification) as to achieve at least 18% of credits within the BREEAM Mat 02 calculator tool. All new timber and wood-dervided products will be sourced from only independantly verifiable legal and sustainable sources or FLEGT (forest law enforcement, governace and trade) licensed timber or equivalent timber.
	≥18% Achieved in BREEAM Calculator Tool	0.36	Targeted	0.36	
	≥27% Achieved in BREEAM Calculator Tool	0.36	Not Achievable	0.00	
	≥36% Achieved in BREEAM Calculator Tool	0.36	Not Achievable	0.00	
	≥45% Achieved in BREEAM Calculator Tool	0.36	Not Achievable	0.00	
	≥54% Achieved in BREEAM Calculator Tool	0.36	Not Achievable	0.00	
	All new timber is sourced in line with the UK Gov's Timber Procurement Policy		Targeted		
Mat 03 Insulation	Where the (BREEAM) Insulation Index for new insulation used in the buildings is ≥2 based on the Green Guide rating and thermal performance for insulation within the: - External walls - Ground floor - Roof - Building services	0.18	Targeted	0.18	All new insulation for external walls, roof and building services will be specified with a Green Guide rating of A or A+ (where possible) to achieve at least 2 credits.
		0.18	Targeted	0.18	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	
	Where ≥ 80% of the new thermal insulation used in the building elements is responsibly sourced (for key processes and supply chain)	0.18	Targeted	0.18	At least 80% of the new thermal insulation will be responsibly sourced (i.e. with EMS certification).
		0.18	Targeted	0.18	
		0.18	Not Achievable	0.00	
		0.18	Not Achievable	0.00	

Credit	Criteria	Available Score (%)	Status	Targeted Score (%)	Pre-Assessment Stage Assumptions
POLLUTION					
Pol 01 Nitrogen Oxide Emissions (NOx)	Dry NOx emissions of space heating and hot water systems are <100 mg/kWh	0.75	Targeted	0.75	The current M&E strategy is to use gas fired boilers and so it is expected that the dry NOx emissions will be less than 40 mg/kWh.
	Dry NOx emissions of space heating and hot water systems are <70 mg/kWh	0.75	Targeted	0.75	
	Dry NOx emissions of space heating and hot water systems are <40 mg/kWh	0.75	Targeted	0.75	
Pol 02 Surface Water Runoff	Neutral impact on surface water	0.75	Targeted	0.75	The existing site is impermeable and the proposed site will not add any landscaping. Therefore a nuetral impact on surface water run-off is expected. The additional credits are not expected to be achieved as compliant SUDS (infiltration) will not be provided for this development.
	Reducing run-off from site: Basic	0.75	Not Achievable	0.00	
	Reducing run-off from site: Advanced	0.75	Not Achievable	0.00	
Pol 03 Flooding	Flood Risk Assessment (FRA) carried out and a Low Flood Risk	1.50	Targeted	1.50	A Flood Risk Assessment (FRA) will be carried out and the assessed dwellings are defined as having a low

Credit	Criteria	Available Score (%)	Status	Targeted Score (%)	Pre-Assessment Stage Assumptions
WASTE					
Was 01 Household Waste	If a LA or private collection scheme in place: - 3 internal recycling containers provided where recycling is not sorted post collection - 1 internal recycling container provided where recycling is sorted post collection - Minimum 30l total capacity, no single container less than 7l - Dedicated location	0.60	Targeted	0.60	A LA collection scheme exists and 3 internal recycling containers (in addition to a container for non-recyclable waste) will be provided within a kitchen cupboard. The bins will each have a capacity of at least 7l, with a total capacity (of the 3 bins) of at least 30l.
	Private external space ≥ 4.5m2 (Houses) or ≥ 1m2 per bedroom (Flats): Where a composting service or facility is provided for green/garden waste, kitchen waste and an interior container is provided for kitchen composting waste of at least 7l	0.60	Potential	0.60	There are no current plans to provide composting facilities, however this credit could be targeted at a later date should other credits be lost.
	Private external space ≤ 4.5m2 (Houses) or ≥ 1m2 per bedroom (Flats): Where a composting service or facility is provided for kitchen waste and an interior container is provided for kitchen composting waste of at least 7l				
Was 02 Refurbishment Site Waste	A compliant SWMP is in place	0.60	Targeted	0.60	A Site Waste Management Plan will be put into place for this development.
	First credit achieved Where Non-hazardous construction waste generated by the dwellings refurbishment is ≤26.52m3 or 16.9 Tonnes (per £110k project value)	0.60	Potential	0.60	This credit is not being targeted as the waste generated cannot be accurately predicted at this stage. The credits may still be achievable if waste levels are recorded.
	Where the amount of waste generated against £100k of project value is recorded in the SWMP				
	Where a pre-refurbishment audit of the existing building is completed				
	Where the demolition is included as part of the refurbishment programme, then the audit should also cover demolition materials				
	First 2 credits achieved ≤ 70% (by volume) or 60% (by Tonnes) of non-hazardous construction waste is diverted from landfill	0.60	Not Achievable	0.00	
	AND ≤ 80% (by volume) or 90% (by Tonnes) of non-hazardous demolition waste is diverted from landfill				

Credit		Criteria	Available Score (%)	Status	Targeted Score (%)	Pre-Assessment Stage Assumptions
INNOVATION						
Man 02	Responsible Construction Practices	CCS Score 40 +	1.00	Not Achievable	0.00	This credit is not being targeted.
Man 05	Protection and Enhancement of Ecological Features	SQE appointed and adopt all general ecological recommendations and 30% of additional recommendations	1.00	Not Achievable	0.00	This credit is not being targeted.
Man 06	Project Management	BREEAM Accredited Professional (AP) has been appointed	1.00	Potential	1.00	This credit is not currently targeted, but could be achieved is a BREEAM AP attends key meetings and produces written reports to the design team.
		Thermographic Surveying and Airtightness Testing carried out	1.00	Not Achievable	0.00	This credit is not being targeted.
Hea 04	Inclusive Design	Lifetime Homes and Part M compliance	1.00	Not Achievable	0.00	This credit is not being targeted.
Ene 02	Energy Efficiency Rating Post Refurbishment	≥ 90 EER rating post refurbishment	1.00	Not Achievable	0.00	This credit is not being targeted.
		≥ 100 EER rating post refurbishment	1.00	Not Achievable	0.00	
Ene 08	Energy Display Devices	Where any specified Energy Display Devices is capable of recording consumption data	1.00	Not Achievable	0.00	This credit is not being targeted.
Wat 01	Water Consumption	< 80 litres / person / day	1.00	Not Achievable	0.00	This credit is not being targeted.
Pol 02	Surface Water Runoff	Where all run-off from the developed site is managed on site using source control	1.00	Not Achievable	0.00	This credit is not being targeted.
Was 02	Refurbishment Site Waste	SWMP implemented and achieving higher waste reduction targets	1.00	Not Achievable	0.00	This credit is not being targeted.

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5. Conclusion

This pre-assessment report details the expected BREEAM score and rating for the 112-116 New Oxford Street development, which comprises the refurbishment of a residential property situated in the London Borough of Camden.

It demonstrates that a Very Good rating can be achieved, with a score of 68.85%, based on the credits targeted by the design team. The development performs especially well within the Energy, Management and Pollution sections. The mimimum credits under Energy, Water & Materials have been achieved as per Borough of Camden.

Additional credits have been highlighted as potential credits, such as the daylighting and cycle storage, as these can be adopted later on in the project should additional credits be required.

It is key for the design team to remain in contact with the assessor throughout the process and to check that all specifications are in line with the pre-assessment to ensure that the credit criteria is followed through into the design stages and that the required BREEAM rating is achieved upon construction.

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Appendices

Appendix A - Management
- A1: MAN 01 - Home Users Guide
- A2: Man 03 - Construction Site Impacts
- A3: Man 04 - Security
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8.3: Appendixes :
Sustainability Statement

Appendix A - Management

A1: MAN 01 – Home Users Guide

The list below indicates the type of information that should be included in the Home Users Guide and provided to occupants at handover. Where such features are not relevant to the dwelling (e.g. there are no renewables) or this is an occupied home and residents are already familiar with surrounding area (e.g. location of local amenities), information can be excluded from the Home Users Guide.

About BREEAM Domestic Refurbishment
Background about the scheme, category areas, scoring system (all of this information can be found at the front of the manual).

A copy or photocopy of the BREEAM Domestic Refurbishment certificate should also be provided with a summary of the environmental features that have been designed into the dwelling to help achieve the rating.

Recommendations report
A recommendations report for how the homes could be improved in the future including:

- How to improve the home to the next BREEAM Domestic Refurbishment rating band covering each category
- Use of sustainable material including low VOC materials, responsible sourcing and the Green Guide
- Use of contractors with good green credentials including site waste management, use of considerate constructors scheme or similar and awareness of environmental impacts
- Sources of further guidance on how to improve the home e.g. EST, Green Deal Advisors
- Information on potential funding mechanisms e.g. the Green Deal, Feed in Tariffs etc.
- How to obtain an assessment for future refurbishment work

Energy Efficiency
Information on energy-efficient features and strategies relating to the home, and also provide an overview of the reasons for their use, e.g. economic and environmental savings. Information could include:

- Information on the effective operation and reason for the use (e.g. environmental economic savings) of environmental features/design strategies such as passive solar design, super insulation, energy efficient timber windows, heat recovery systems, solar hot water systems, photovoltaics, passive vents or the use of certified timber or SUDS within the boundary of individual properties.
- Tips on other energy saving measures such as not leaving electrical appliances on standby etc and the cost/environmental savings they can give.
- Information as described in the Building Regulations ADL1b (requirement note L1c) (1) i.e. Sufficient information about the building and its building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances. A way of complying would be to provide suitable set of operating and maintenance instructions aimed at achieving economy in the use of fuel and power in a way that the home owner / tenant can understand. The instructions should be directly related to the particular system/s installed in the dwelling.

APPENDIX BREEAM Domestic Refurbishment

The instructions should explain to the occupier how to operate the system(s) efficiently. These should include: the making of seasonal adjustments to control settings and what routine maintenance is needed to enable operating efficiency to be maintained at a reasonable level through the service live/s of the system/s.

Details of any renewable system/s and how it/they operate/s.

Details of low-energy light fittings (e.g. CFL, LED etc.), their use, their benefits and the benefits of purchasing high efficacy lamps, e.g. how much energy they save compared to traditional light fit-tings and what this can mean in terms of reduced energy bills and payback.

Details of the EU labelling scheme for white goods.

Include information on smoke detector/s. User guide in Plain English on the following technologies where included with basic user instructions labelled on equipment or controls where appropriate:

- Boiler
- Air Source Heat Pump
- Ground Source Heat Pump
- Mechanical Ventilation with Heat Recovery (MVHR)
- Solar hot water
- PV
- CHP
- Smart meter / display energy device
- Water meter

Water Use
Details of water saving features and their use and benefits, e.g. low/dual flush toilets, low water use showers, low water use white goods (washing machines, dishwashers etc), and tips as well as details of external water use and efficiency, e.g. the use of water butts or other type of rainwater recycling systems.

Transport Facilities
Include details of resident car-parking and cycle storage provision, cycle paths in the area including if available cycle path network maps for the whole town/local area plus local public transport information, maps and timetables where relevant (i.e. this may not be relevant to existing occupied homes).

Information on alternative methods of transport such as park and ride, car sharing schemes and/or car pools/car hire in the area and local 'green' transport initiatives should be included. Information on the location of amenities and places of interest/cultural value, areas of outstanding natural beauty (AONB's), nature reserves, allotments etc. Also details on how to get to local amenities in the area, using public transport or cycling as relevant.

Materials & Waste
Information on the use & benefits of:

- Low energy/low water white goods
- Electrical equipment, including light fittings and bulbs
- Timber products from sustainable sources

Information on the location of recyclable materials storage areas (especially within flats) and how to use them appropriately.

APPENDIX BREEAM Domestic Refurbishment

Information on responsible purchasing of:

- Low energy/low water white goods
- Electrical equipment, including light fittings and bulbs
- Timber products from sustainable sources
- Organic food procurement/food growing/local produce/local food provision, e.g. farmers markets, organic box schemes, etc

Recycling information as follows:

- Information about the Local Authority collection scheme (if applicable).
- If the home is not covered by a Local Authority collection scheme, details and location of communal recycling bins/skips/facilities.
- Information on the location and use of any recycling and compost bins.
- Information on Waste and Resource Action Plan (WRAP) (4), which can offer guidance on recycling and sustainable waste disposal.
- Information on what to do with waste not covered by the standard weekly Local Authority collection scheme for example fridges/freezers, computer equipment, batteries and other potentially hazardous equipment. In some areas the local authority will collect these items. If this is the case, details and information on such a collection scheme should be provided.
- Information and location detailing local recycling facilities and waste tips.

Environmental recommendations for consideration in any home improvement works, such as the use of low VOC products or the purchase of certified timber

Emergency Information
Information on smoke detector/s and carbon monoxide detectors
Contact details for emergency services including the location of local minor injuries clinics, A&E departments and the nearest police/fire station

Local Amenities
The location of food shops, post boxes, postal facilities, bank/cash points, pharmacies, schools, medical centres, leisure centres, community centres, places of worship, public houses, children's play areas, outdoor open access public areas as deemed relevant occupiers.

Other local amenities such as places of interest/cultural value, areas of beauty / wildlife / conservation / allotments etc.

Provision of Information in Alternative Formats
Include details of the procedure for obtaining a copy of the guide in alternative formats, including foreign languages, Braille, large print or audio cassette / CD. It should include the contact details of the person/organisation responsible for producing the guide

SuperHomes network
SuperHomes is a network of over 100 energy aware households. The homeowners have refurbished their old homes to the highest standards of energy efficiency and have achieved at least 60% reduction on fossil fuel use. The homes are examples which are open for visits to aid other refurbishment projects. For more information about the SuperHomes network and the projects visit www.superhomes.org.uk

Links & References
This should include links to other information including websites, publications and organisations providing information on how to reduce the environmental impact in terms of transport, the use

of local amenities, responsible purchasing etc. As a minimum, this should include links and address/telephone contact numbers to:

- The Energy Saving Trust good practice guidance
- The Local Authority
- The company responsible for the refurbishment of the property
- The company responsible for the management of the home (where applicable)
- Act on CO2

A2: Man 03 – Construction Site Impacts
Site monitoring

Requirements for monitoring reporting and target setting (for requirements a. energy monitoring and b. water monitoring):

- Monthly measurements of energy use will be/has been recorded and displayed on site.
- Appropriate target levels of energy/water consumption will be/were set and displayed (targets could be annual, monthly, or project targets).
- As a minimum, monitoring will/did include checking the meters and displaying some form of graphical analysis in the site office to show consumption over the project duration and how actual consumption compares to the targets set.
- The design/site management team will/did nominate an individual who will be responsible for the monitoring and collection of data.

Notes:
Targets for energy consumption during the refurbishment process should be set using DTI's Environmental KPI benchmarks. These documents do not specify targets but facilitate projects in setting appropriate targets (see references section of main credit for further details).

BREEAM does not require targets to be met but is encouraging the process of setting, moitoring and reporting against targets.

Environmental materials policy
The main contractor operates an environmental materials policy, used for sourcing of construction materials to be utilised on site. The policy should cover/promote the following:

- Use of local materials (where possible)
- Use of responsibly sourced materials
- Re use of materials
- Use of materials with a high recycled content
- Waste minimisation and recycling
- Use of non-toxic materials & refrigerants with a high global warming potential
- Use of materials with a low embodied impact
- Use of durable materials

EMS
Third party certified, to ISO14001/EMAS or equivalent standard. OR

The structure of the EMS is in compliance with British Standard 8555 2003 and has reached phase four of the implementation stage, 'implementation and operation of the environmental management system', and completed phase audits one to four, as defined in BS8555.
80% of timber used during construction, including formwork, site hoardings and other temporary site timber used for the purpose of facilitating construction, will be/was procured

from sustainably managed sources, independently certified by one of the top two levels as set out in the Responsible Sourcing of Materials Issues (BREEAM credit Mat 2). Re-used timber from off site can be counted as equivalent. Additionally 100% of all site timber will be/was legally sourced.

A3: Man 04 – Security
Requirements for new doors & windows:

External Door sets:
PAS 24:2007 or
LPS 1175 Issue 7 Security Rating 1 1 or equivalent

Windows are certified to:
BS 7950:1997 (36)
LPS 1175 Issue 7 Security Rating 1 or equivalent

Requirements for existing windows & doors:
External doors are of good quality with working key locks and a strong frame, where there is no sign of warping, splitting or rotting to the door or its frame. Where the door contains glazing this should be a minimum of double glazing. Putty or beading to glazed areas should be on the unexposed side of the door, in good condition, with no sign of degradation.

Accessible Windows should have a minimum of double glazing with working key locks. Putty or beading to glazed areas should be on the unexposed side of the window, in good condition, with no sign of degradation. The window frame should be strong with no sign of warping, splitting or rot.

A4: Man 06 – Project Management

For large scale projects, the project manager assigns individual and shared responsibilities across the following key design and refurbishment stages:

- Planning and Building control notification
- Design
- Refurbishment
- Commissioning and handover
- Occupation

Key design team meetings should be held to define and make key decisions that influence/affect the dwelling's proposed designs, and their refurbishment in accordance with the design (and therefore the dwelling's sustainability impacts and BREEAM performance). These meetings may be site or office based and would typically include representatives from at least three of the parties (below).

- Representatives of the Client / Developer
- The Main Contractor
- The Architect
- Structural Engineers
- Building Services Engineers
- Cost Consultants
- Environmental Consultants
- Project Management Consultants

Appendix B - Health & Wellbeing

B1: Hea 03 – VOCs

Product	European Standard	Emission level required
Decorative paints and varnishes	BS EN 13300:2001 (24) referred to the requirements of Decorative Paint Directive 2004/42/CE	VOC (organic solvent) content (testing req. 6), requirement for Phase 2. Fungal and algal resistant.
Wood Panels Particleboard, Fibreboard includ-ing MDF, OSB, Cement-bonded particleboard Plywood Solid wood panel and acoustic board	EN 13986:2004 (13)	Formaldehyde E1 in accordance with EN 3986:2004 Annex B (see also compliance notes) Verify that regulated wood preservatives are absent as defined by the standard.
Timber Structures Glued laminated timber	EN 14080:2005 (14)	Formaldehyde E1 (Testing req 1)
Wood flooring parquet flooring	EN 14342:2005 (15)	Formaldehyde E1 (Testing req. 1) Verify that regulated wood preservatives are absent as defined by the standard.
Resilient, textile and laminated Floor coverings Vinyl/linoleum Cork and rubber Carpet Laminated wood flooring	EN 14041:2004 (16)	Formaldehyde E1 (Testing req. 1) Verify that regulated preservatives are absent as defined by the standard.
Suspended ceiling tiles	EN 13964:2004 (17)	Formaldehyde E1 (Testing req 1). No asbestos.
Flooring adhesives (and if relevant adhesives for rigid wall coverings)	EN 13999–1:2007 (18)	Verify that carcinogenic or sensitising volatile substances are absent.(Testing req. 2–4)

8.3: Appendixes :
Sustainability Statement

Wall-coverings Finished wall-papers Wall vinyls and plastic wall-cov-erings Wallpapers for subsequent dec-oration. Heavy duty wall-coverings Textile wall-cov-erings	EN 233:1999 (19) EN 234:1997 (20) EN 259:2001 (21) EN 266:1992 (22)	Formaldehyde (Testing req. 5) and Vinyl chloride monomer (VCM) (Testing req. 5) release should be low and within the BS EN standard for the material. Verify that the migration of heavy metals and other toxic substances are within the EN standard for the material.
Adhesive for hanging flexible wall-coverings (for rigid wall coverings use flooring adhesives criteria)	BS 3046:1981 (23)	No harmful substances and preservatives used should be of minimum toxicity.

Table B1-1

Testing requirements:

1. EN 717–1:2004 (25)
2. EN 13999–2:2007—Volatile Organic Compounds (VOCs) (18)
3. EN 13999–3:2007—Volatile aldehydes (18)
4. EN 13999–4:2007—Volatile diisocyanates (18)
5. EN 12149:1998 (26)
6. BS EN ISO 11890–2:2006 (27)

B2: Hea 04 - Inclusive Design

Suitably qualified design team member
A suitably Qualified member of the design team would need to poses the minimum competences and skills requirements listed by the National Register of Access Consultants (NRAC) for Access Auditors (actual qualification is not required).

Please refer to the following website for these competencies:

http://www.nrac.org.uk/Information_pack.html#Anchor-44591

Access Statement
The requirements of the access statement template are detailed below.

Section 1

Means of access into the dwelling - An accessible threshold is provided into the entrance. Note: The design of an accessible threshold should also satisfy the requirements of Building regulations Part C.

Accessible switches and socket outlets in the dwelling(s) - switches and socket outlets for lighting and other equipment in habitable rooms at appropriate heights between 450mm and 1200mm from finished floor level

1. WC provision in the entrance storey of the building, as follows:

   a. WC is provided in the entrance storey of a dwelling which contains a habitable room; or where the dwelling is such that there are no habitable rooms in the entrance storey, if a WC is provided in either the entrance storey or the principal storey.
   b. The door to the WC compartment opens outwards, and is positioned to enable wheelchair users to access the WC and has a clear opening width in accordance with table Table B2-1.
   c. the WC compartment provides a clear space for wheelchair users to access the WC (see diagrams 31 and 32 within Approved Document M) and washbasin is positioned so that it does not impeded access.

2. Requirements for entrances should be adhered to as follows:
   a. All entrances to dwellings/communal entrances to blocks of dwellings should be illuminated.
   b. All entrances to dwellings, all communal entrances to blocks of dwellings and all associated communal doors should have level access over the threshold (threshold upstand should not exceed 15mm).
   c. Main entrances to dwellings and main entrances to blocks of dwellings should be covered.

3. Walls in bathrooms and toilets should be capable of taking adaptations such as handrails (wall reinforcements should be located between 300 and 1500mm from the floor).

4. The bathroom should be designed to incorporate ease of access to the bath, WC and wash basin (Although there is not a requirement for a turning circle in bathrooms, sufficient space should be provided so that a wheelchair user can use the bathroom).

5. Switches, sockets, ventilation and service controls should be at a height usable by all (i.e. between 450 and 1200mm from the floor).

Minimum Widths of Corridors and Passageways for a Range of Doorway widths	
Doorway Clear Opening Width (mm)	Corridor/Passageway width (mm)
750 or narrower	900 (when approached head-on)
750	1200 (when approached not head-on)
775	1050 (when approached not head-on)
800	900 (when approached not head- on)

Table B2-1

Section 2

1. Means of access
   a. Approach to the dwelling - within the plot of the dwelling, a suitable approach is provided from the point of access to the entrance The point of access should be reasonably level and the approach should not have crossfalls greater than 1 in 40. The whole, or part, of the approach may be a driveway. improvements made to meet Part M requirement as far as practical.
   b. Access Doors - An external door providing access for disabled people has a minimum clear opening width of 775mm.

2. Circulation within the entrance storey of the dwelling(s):
   a. A corridor or other access route in the entrance storey or habitable room

containing a WC (which may be a bathroom) on that level, has an unobstructed width in accordance with table x above.
   b. Vertical circulation - In exceptional circumstances, where severely sloping plots are involved, a stepped change of level within the entrance storey may be unavoidable. In those instances, the aim should be to provide a stair of reasonable width for ambulant disabled people to negotiate the steps with assistance and for handrails on both sides. Approved Document K of the Building Regulations contains guidance on the design of private stairs in dwellings. A stair providing vertical circulation within the entrance storey of the dwelling will satisfy requirement M1 if:
      - it has flights whose clear widths are at least 900mm;
      - there is a suitable continuous handrail on each side of the flight and any intermediate landings where the rise of the flight comprises three or more rises: and
      - the rise and going are in accordance with the guidance in the Approved Document for part K for private stairs

3. Passenger Lifts & Common Stairs in Blocks of flats
   a. A building containing flats, in which a passenger lift is not be installed, is provided with a suitable stair, with:
      - all step nosings distinguishable through contrasting brightness;
      - top and bottom landings whose lengths are in accordance with Part K1;
      - steps with suitable tread nosing profiles and uniform rise of each step, which is not more than 170mm;
      - uniform going of each step, which is not less than 250mm, which for tapered treads, should be measured at a point 270mm form the inside of the tread;
   b. In a building, or part of a building which contains flats above the entrance storey, any lift access with a minimum load capacity of 400kg must:
      - have a clear landing at least 1500mm wide and at least 1500mm long in front of its entrance;
      - has a door or doors which provide a clear opening width of at least 800mm;
      - have car whose width is at least 900mm and whose length is at least 1250mm (other dimensions may satisfy Requirement M1 where shown by test evidence or experience in use, or otherwise, to be suitable for an unaccompanied wheelchair user);
      - have landing and car controls which are not less than 900mm and not more than 1200mm above the landing and the car floor, at a distance of at least 400mm from the front wall;
      - is accompanied by suitable tactile indication on the landing and adjacent to the lift call button to identify the storey in question;
      - have suitable tactile indication on or adjacent lift within the car to confirm the floor selected;
      - incorporate a signalling system which gives visual notification that the lift is answering a landing call and a 'dwell time' of five seconds before its doors beginning to close after they are fully open; the system may be overridden by a door re-activating device which relies on appropriate electronic methods, but not a door edge pressure system, provided that the minimum time for a lift door to remain fully open is 3 seconds;
      - incorporates visual and audible indication of the floor reached (when the lift serves more than three storeys).

4. WC Provision in the entrance story
   a. WC is provided in the entrance storey of a dwelling which contains a habitable room; or where the dwelling is such that there are no habitable rooms in the entrance storey, if a WC is provided in either the entrance storey or the principal storey
   b. the door to the WC compartment opens outwards, and is positioned to
   c. enable wheelchair users to access the WC and has a clear opening width in accordance with (door openings wider than the minimum in accordance with the table allow easier manoeuvring and access to the WC by wheel- chair users); and
   d. the WC compartment provides a clear space for wheelchair users to
   e. access the WC (see diagrams 31 and 32 within Approved Document) and washbasin is positioned so that it does not impeded access

Section 3

Where there is car parking adjacent to the home, it should be capable of enlargement to attain 3300mm width - The general provision for a car parking space is 2400mm width. If an additional 900mm width is not provided at the outset, there must be provision (e.g. a grass verge) for enlarging the overall width to 3300mm at a later date. The distance from the car parking space to the home should be kept to a minimum and should be level or gently sloping (where topography prevents a level approach, refer to table B2-2 for maximum gradients).

Distance	Gradient
<5m	1:12
5-10m	1:15
>10m	1:20

Table B2-2

1. The approach to all entrances should be level or gently sloping (where topography prevents a level approach, refer to table x for maximum gradients).

2. Communal stairs & lifts
   a. Minimum dimensions for communal stairs are as follows:
   - Uniform rise not more than 170mm;
   - Uniform going not less than 250mm;
   - Handrails extend 300mm beyond top and bottom step;
   - Handrail height 900mm from each nosing.

   b. Minimum dimensions for lifts are as follows:
   - Clear landing entrances 1500mm x 1500mm;
   - Minimum internal dimensions 1100mm x 1400mm;
   - Lift controls between 900 and 1200mm from the floor and 400mm from the lift's internal front wall.

3. Doorways & Hallways
   Doorway & hallways should comply with the requirements of table B2-3

Doorway Clear Opening Width (mm)	Corridor/Passageway width (mm)
750 or wider	900 (when approached head-on)
750 or wider	1200 (when approached not head-on)
750 or wider	1050 (when approached not head-on)
900	900 (when approached not head- on)

Table B2-3

   a. All front doors to dwellings and communal entrance doors should have a 800mm opening width and a 300mm leading edge

4. A turning circle of 1500mm diameter or a 1700mm x 1400mm in dining areas and living rooms and adequate circulation space for wheelchairs elsewhere.

5. The living room should be at entrance level.

6. In houses of two or more storeys, there should be space on the entrance level that could be used as a convenient bed-space.

7. There should be a wheelchair accessible entrance level WC, with drainage provision enabling a shower to be fitted in the future. For the fully accessible WC a wheelchair user should be able to close the door from within the closet and achieve side transfer from a wheelchair to at least one side of the WC. There must be at least 1100mm clear space from the front of the WC bowl. The shower provision must be within the closet or adjacent to the closet. In small two-bedroom dwellings (not including those on only one level) where the design has failed to achieve the above fully accessible standard WC, the Part M standard WC will meet this requirement.

8. The design should incorporate provision of a stair lift and a suitably identified space for a through-the-floor lift from the ground to the first floor, for example to a bedroom next to a bathroom There must be a minimum of 900mm clear distance between the stair wall (on which the lift would normally be located) and the edge of the opposite handrail/balustrade. Unobstructed 'landings' are needed at the top and bottom of the stairs.

9. The design should provide a reasonable route for a potential hoist from a main bedroom to the bathroom - Most timber trusses today are capable of taking a hoist and tracking. Technological advances in hoist design mean that a straight run is no longer a requirement.

10. Living room window glazing should begin at 800mm or lower and windows should be easy to open/operate - People should be able to see out of the window whilst seated. Wheelchair users should be able to operate at least one window in each room.

Appendix C – Energy

C1: Ene 07 – Lighting

Energy Efficient Space Lighting

General space lighting:
- Lighting for external doors, porch, steps/pathways, patio, garage, garden, carports and any other outbuildings provided by dedicated energy efficient fittings, controlled by manual switching.

Space lighting in communal areas:
- Lighting in lobbies, main external entrances, internal entrance porches, external steps and pathways equipped with dedicated fluorescent fittings (or other efficient luminaires like SON or metal halide) and controlled by a time clock or day-light sensor.
- Lighting in Hallways, landings, stairwells, internal corridors and garages equipped with dedicated fluorescent fittings that are controlled by push button time switches/PIR sensors or equivalent.
- Lighting in communal rooms (laundries, cycle and other storage spaces etc) equipped with dedicated fluorescent fittings and manual switching or occupant sensors.

Energy Efficient Security Lighting:
- Security lighting, which are fittings designated for energy efficiency and are adequately controlled such that:
- Burglar security lights have a maximum wattage of 150 W, movement detection control devices (PIR) and daylight cut-off sensors.
- Other security lighting which has dedicated energy efficient fittings and is fitted with daylight cut-off sensors or timers.
- Lighting design for the affected areas should follow the requirements of the standard(s) applicable or CIBSE LG9, and should not compromise the safety of any persons using the building.

C2: Ene 08 – Energy Display Devices
Compliant energy display device

A system comprising a self-charging sensor(s) fixed to the incoming mains supply/supplies, to measure and transmit energy consumption data to a visual display unit. The visual display unit must be capable of displaying energy consumption data.

To obtain the exemplary credit, any energy display device installed in the dwelling must be capable of recording and storing energy consumption data. The consumption data that the device should be capable of displaying in order to achieve any credits is as follows:

- Current energy consumption (Watts)
- Current emissions (kg CO2)
- Current cost (£ per hour)
- Projected cost (£ per month and £ per year).

8.3: Appendixes :
Sustainability Statement

C3: Ene 09 – Cycle Storage

Compliant cycle storage

- The space is covered overhead to protect from the weather
- Where cycle storage space is to be located externally, cycles can be secured within spaces in rack(s) or fixtures to allow cycles to be free-standing and locked. The rack(s) consists of fixings for one or more spaces.
- The covered area and the cycle racks or fixings are set in or fixed to a permanent structure (building or hard-standing). Alternatively the cycle storage may be located in a locked struc-ture fixed to or part of a permanent structure.
- The distance between each cycle rack, and cycle racks and other obstructions (e.g. a wall), allows for appropriate access to the cycle storage space, to enable bikes to be easily stored and accessed including 1m2 space for tools, where cycles are to be stored in a shed.
- Communal cycle storage is located within 100m of each dwellings main entrance (ideally within 50m), or within 100m of the main communal entrance in the case of flats

Cycle storage can be provided within the dwelling, provided the space is:

- of adequate size within a dedicated storage space such as. a dedicated space within a hallway, adequately sized cupboard or other suitable space with adequate fixtures allowing the cycles to be freestanding
- on the ground floor of the dwelling
- not in a lounge/living room, bedroom, bathroom, dining room or kitchen
- accessed without going through the lounge/living room, bed-rooms (where located on the ground floor), dining room, bathroom or kitchen
- there is adequate access to allow the cycle to be moved in and out of the dwelling taking account of the minimum width needed for a person pushing a bicycle (1.10m width), and 2.0m bike length for manoeuvring the cycle round corners. The storage space should not impede the intended use of that room.

Appendix D – Materials

D1: Mat 02 - Responsible Sourcing of Materials

Building elements to be included in assessment:

- Structural Frame
- Ground floor
- Upper floors (including separating floors)
- Roof
- External walls
- Internal walls (including separating walls)
- Foundation/substructure (excluding sub-base materials)
- Staircase
- Windows, External and internal doors
- Secondary fixes including skirting, panelling, fascias and bal-ustrades
- Fixed furniture
- Any other significant use

Applicable materials within above elements:

- Brick (including clay tiles and other ceramics)
- Resin-based composite materials, including GRP and polymeric render
- Concrete (including in-situ and pre-cast concrete, blocks, tiles, mortars, cementitious renders etc.)
- Glass
- Plastics and rubbers (including EPDM, TPO, PVC and VET roofing membranes including polymeric renders)
- Metals (steel, aluminium etc.)
- Dressed or building stone including slate
- Timber, timber composite and wood panels (including structural laminated timber components, plywood, OSB, MDF, chip-board and cement bonded particleboard)
- Plasterboard and plaster
- Bituminous materials, such as roofing membranes and asphalt
- Other mineral-based materials, including fibre cement and calcium silicate
- Products with recycled content

All other materials should be ignored when providing information

Responsible Sourcing & Tiers		
Scheme	Certification level/scope	Tier level
BRE Global, BES6001 Product /Standard certification	Excellent	2
	Very Good	3
	Good	4
	Pass	5
Canadian Standards Association's (CSA) Chain of Custody Scheme	Chain of custody certification	3
Environmental Management System	Key process and supply chain extraction process4	6

(EMS) (certified)		
Environmental Management System (EMS) (certified)	Key process	7
Forest Stewardship Council (FSC)	Chain of custody certification	3
Green Dragon Environmental Standard	Level 4 and above	7
Recycled materials	Certified EMS for key process	6
Re-used materials	-	3
Malaysian Timber Certification Council (MTCC)	Chain of custody certification	6
Programme for the Endorsement of Forest Certification (PEFC)	Chain of custody certification	3
Sustainable Forestry Initiative (SFI)	Chain of custody certification	3
Société Générale de Surveillance's (SGS) 'Timber Legality and Traceability' scheme	Timber Legality & Traceability Verification (TLTV)	6
Rainforest Alliance's 'Verification of Legal Origin and Compliance' scheme (supersedes SmartWood Verified)	Verification of Legal Origin and Compliance (VLO/VLC)	6

Table D1-1

Key process and supply chain (extraction) processes by material type		
Material	Key Process	Supply Chain Processes
Brick (including clay tiles and other ceramics)	Product Manufacture	Clay Extraction
Resin-based composites and materials (including GRP and polymeric render but excluding timber based composites)	Composite product manufacture	Glass fibre production (or other principle matrix material) Polymer production
In situ Concrete (including ready mix and cemetitious mortars and renders)	Ready mixed concrete plant	Cement production Aggregate extraction and production
Precast concrete and other concrete products (including blocks, cladding, precast flooring, concrete or cementitious roof tiles)	Concrete product manufacture	Cement production Aggregate extraction and production
Glass	Glass production	Sand extraction Soda Ash production or extraction

Plastics and rubbers (including polymeric renders, EPDM, TPO, PVC and VET roofing membranes)	Plastic/rubber product manufacture	Main polymer production
Metals (steel, aluminium etc)	Metal Product manufacture - e.g. cladding production, steel	Metal production: Steel: Electric arc furnace or Basic oxygen furnace process

Table D1-2

D2: Mat 03 - Insulation

Key process and supply chain (extraction) processes for insulation		
Material	Key Process	Supply chain processes
Foam Insulation	Insulation manufacture	Principal Polymer production, e.g. Polystyrene, MDI , Phenolic resin or equivalent
Stone wool, glass & cellular glass made using < 50% recycled input	Product manufacture	Any quarried or mined mineral over 20% of input
Wool	Product manufacture	Wool Scouring
Products using > 50% recycled content except those using timber	Product manufacture	Recycled content by default
Timber-based insulation materials including those using recycled timber	Product manufacture	Recycled timber by default, all other timber from one of the recognised timber certification schemes in Mat 02 Responsible Sourcing of Materials
Other renewable-based insulation materials using agricultural by-products (e.g. straw)	Product manufacture	By-product manufacture by default
Any other product	Product manufacture	1 or 2 main inputs with significant production or extraction impacts should be identified

Appendix E - Pollution

E1: Pol 02 – Surface Water Run-off

First credit – neutral impact on surface water

1. Where any new hard standing areas are permeable, this must include all new pavements, drive-ways and where applicable public rights of way, car parks and non-adoptable roads (e.g. com-munity scale refurbishment projects).
2. Where the building is being extended onto any previously permeable surfaces, or an impermeable surface that drains onto a permeable surface (e.g. paving slabs set on concrete that drained onto soft landscaped areas) the additional run-off for rainfall depths up to 5 mm caused by the area of the extension must be managed on site using appropriate Sustainable Drainage Systems (SuDS) such as Soakaways.
3. Any calculations necessary to demonstrate that criterion 2 will be achieved should be carried out by an Appropriately Qualified Professional (AQP) seeCN6.

Second credit – reducing run-off from site: basic

4. Where all run-off from the roof for rainfall depths up to 5 mm, have been managed on site using source control methods (e.g. through infiltration, soakaways etc.). This should include runoff from all existing and new parts of the roof.
5. Where required, an appropriately qualified professional should be used to design an appropriate drainage strategy for the site, ensuring criterion 1 is achieved

Third Credit – reducing run-off from site: advanced

6. An appropriately qualified professional should be used to design an appropriate drainage strategy for the site.
7. Where run-off as a result of the refurbishment is managed on site using source control achieving the following requirements:
    a. The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event has been reduced by 75% from the existing site.
    b. The total volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration has been reduced by 75%.
    c. An allowance for climate change must be included for all of the above calculations, in accordance with the current best practice (PPS25, 2010)

Exemplary level requirements

8. The following outlines the exemplary level requirements to achieve an innovation credit for this BREEAM issue.
    a. Where all run-off from the developed site is managed on site using source control. The following must be achieved to confirm compliance:
    b. The peak rate of run-off as a result of the refurbishment for the 1 in 1 year event is reduced to zero.
    c. The peak rate of run-off as a result of the refurbishment for the 1 in 100 year event is reduced to zero.
    d. There is no volume of run-off discharged into the watercourses and sewers as a result of the refurbishment, for a 1 in 100 year event of 6 hour duration.
    e. An allowance for climate change must be included for all of the above calculations, in accordance with current best practice (PPS25, 2010).

9. Where an appropriately qualified professional has been employed to provide the above calculations and design an appropriate drainage strategy for the site, ensuring all above criteria are achieved.

Control source:

The control of run-off at or very near to its source. Source control measures acceptable as defined in the SuDS manual include:

- Permeable pavements
- Filter drains
- Filter Strips
- Swales
- Soakaways
- Infiltration trench
- Green Roofs
- Bioretention areas
- Rainwater Harvesting systems

8.3: Appendixes : Sustainability Statement

8.3: Appendixes :
Sustainability Statement

APPENDIX BREEAM Domestic Refurbishment

Appendix F - Waste

F1: Was 02 - SWMP

To demonstrate a compliant SWMP for refurbishments over £300,000 the following must be met:

- A target benchmark for resource efficiency i.e. m3 of waste per £100,000 of project value or tonnes of waste per £100,000 of project value (in line with the credit avail-able).
- Procedures and commitments for minimising non-hazardous construction waste in line with the benchmark and best practice
- Specify waste minimisation actions relating to at least 3 key waste groups as referenced in Table - 36 and recording decisions taken
- Procedures for minimising hazardous waste
- Procedures for sorting, reusing and recycling construction and demolition waste (if generated) (according to the waste streams generated by the scope of the works) either on site or through a licensed external con-tractor
- Procedures for measuring the amount of construction and demolition waste (if generated) diverted from land-fill.
- Licence details for the waste carrier, and permit details for the site the waste is taken to, if waste is removed off-site.
- The name or job title of the individual responsible for implementing the above.

8.3: Appendixes :
Sustainability Statement

ASSESSMENT OF EXTERNAL NOISE INTRUSION TO A NEW RESIDENTIAL DEVELOPMENT AT 112-116 NEW OXFORD STREET, LONDON WC1

Report Reference: 121107-003A

Date: December 2012

ACA Acoustics Limited
Hamilton House, Mabledon Place, Bloomsbury, London WC1H 9BB
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Email: info@aca-acoustics.co.uk
Website: www.aca-acoustics.co.uk

Registered in England & Wales No: 08228154

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The site is currently of a "*Starbucks*" coffee shop over ground and first floor levels with unoccupied commercial offices over second to seventh floors above at 112-116 New Oxford Street, London WC1. The site is bordered to the north and west by Bainbridge Street, to the east by adjoining commercial properties and to the south by New Oxford Street.

A planning application is to be submitted to London Borough of Camden Council for change of use of the second to seventh floors to Class C3 residential flats.

The surrounding area is primarily of commercial premises with shops facing onto New Oxford Street. Centre Point tower is directly opposite the proposed site. While the area is predominantly of commercial properties the author identified a number of existing residential dwellings in the immediate vicinity, including on New Oxford Street, Matilda Apartments and Centre Point House on St Giles High Street opposite the site and on both Bainbridge Street and Great Russell Street to the rear of the proposed development.

The junction of St Giles High Street and New Oxford Street, close to the bottom of Tottenham Court Road and directly opposite the proposed development, is a very busy area with high volume traffic during both day and night time hours, particularly following the re-routing of Charing Cross Road to allow for the current Crossrail construction works.

Noise levels incident on the site are primarily due to traffic on surrounding roads and pedestrian activity within the local area. During the author's visits to site to set up and collect the logging noise equipment then noise from nearby commercial properties was not considered to be audible nor dominant. Although not witnessed by the author at this site, based on manned noise surveys undertaken at other sites within the vicinity it is anticipated that noise levels overnight also currently include contribution from the nearby Crossrail station construction site.

Site Address: **112-116 New Oxford Street**
London
WC1

Client: **Zania Universal Limited**
c/o 37 Church Way
London
N20 0JZ

Report Reference: **121107-003**

Revision: **A: First Issue**

Author: **Rob Cant** MIOA

Date: **December 2012**

CONTENTS

0. SUMMARY

- The client, Zania Universal Limited, is preparing a planning application for the material change-of-use of upper floors at 112-116 New Oxford Street, London WC1 from offices to Class C3, residential use.
- ACA Acoustics Limited has been commissioned by Zania Universal Limited to assess noise incident on the proposed development site. The assessment is required by the Local Planning Authority (London Borough of Camden) to assist their consideration of the planning application for the development.
- A noise survey has been carried out at the site over nominally a 24-hour period between Monday 3rd December and Tuesday 4th December 2012. Results have been used to assess the site's separate daytime, evening and night time LAeq noise levels in accordance with London Borough of Camden's Local Development Framework Policy DP28.
- Existing ambient noise levels incident on the proposed development are primarily comprised of high-volume traffic and pedestrian activity in the area. Although not witnessed by the author at this site, based on manned noise surveys undertaken at other sites within the vicinity it is anticipated that noise levels overnight will also currently include contribution from the nearby Crossrail station construction site.
- Noise levels to the front façade of the proposed site during daytime hours and noise levels to the rear façade are within the range of values requiring attenuation measures to be implemented as defined by London Borough of Camden's Policy DP28. Noise levels to the front façade overlooking New Oxford Street during night-time periods are above the range of values shown in Table A of Policy DP28.
- Although noise levels overnight are at a level above the range of values at which, in accordance with London Borough of Camden Council's Policy DP28, planning permission would not normally be granted, it is the author's opinion that the site is suitable for residential development, subject to implementation of a very high performance scheme of noise insulation measures to ensure that noise levels inside rooms of the new residential properties are reasonable and achieve the guidance limits for noise intrusion into residential dwellings advised within British Standard BS8233:1999 "*Sound insulation and noise reduction for buildings – Code of practice*". A scheme of noise insulation measures is included in this report.
- In summary it is recommended that the site is suitable for residential development, subject to implementation of noise insulation measures as set out in this report.

1. INTRODUCTION

ACA Acoustics Limited has been commissioned by Zania Universal Limited to carry out a survey and assessment of external noise at the site of a proposed residential development at 112-116 New Oxford Street, London WC1.

The noise survey and assessment is required by the Local Planning Authority (London Borough of Camden Council) to assist their consideration of a planning application for the development.

The objective of the assessment is to determine the impact that existing noise sources would have on the proposed new development in accordance with London Borough of Camden Council's Local Development Framework Policy DP28 "*Noise and Vibration*" along with British Standard BS8233:1999 "*Sound insulation and noise reduction for buildings – Code of practice*" and other relevant British Standards and guidance documents.

This report presents results of the noise survey and assessment along with recommendation for sound insulation measures such that noise levels within the proposed residential development comply with guideline limits and includes:

- Description of the site and development proposals;
- Confirmation of London Borough of Camden Council planning consent requirements for noise;
- Measurement and assessment of existing ambient noise levels at the site;
- Review of sound insulation measures required to comply with London Borough of Camden Council's limits.

2. LONDON BOROUGH OF CAMDEN COUNCIL PLANNING CONSENT ACOUSTIC REQUIREMENTS

The proposed noise measurement and assessment methodology is based on ACA Acoustics Limited's experience of undertaking noise assessments for similar developments.

A review of relevant parts of each of the routinely used planning guidance documents and British Standards is provided below.

2.1 Camden Development Policies 2010-2025: Local Development Framework – Policy DP28

Policy DP28 of London Borough of Camden Council's Local Development Framework states that "*the Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for … development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided*".

Paragraph 28.3 of the supporting text to Policy DP28 advises that "*where uses sensitive to noise are proposed to an existing source of noise … the Council will require an acoustic report to ensure compliance with PPG24: Planning and noise*". Discussion of Planning Policy Guidance 24 (PPG24) is provided below.

In addition to the requirements of PPG24, London Borough of Camden have specific requirements for noise and vibration thresholds, set out in Tables A to E of paragraph 28.4. Copy of Policy DP28 and the associated supporting text is included in Appendix B.

ACA Acoustics Limited has carried out an assessment of general (traffic and pedestrian) noise to the proposed residential development in accordance with Policy DP28.

2.2 Planning Policy Guidance 24: Planning and Noise (PPG24)

PPG24 has been used extensively at the planning stage of many new residential developments to determine the suitability of the land for residential development and what noise insulation measures are required.

The document provides a simple mechanism for determining whether noise should be a major factor when granting planning permission and considering suitable planning conditions for a development. The method introduces the concept of Noise Exposure Categories (NEC) to rate the importance of noise in the planning process. The objective of the noise survey and assessment is to determine the noise impact that existing sources would have on the proposed residential development and advise on any mitigating measures to ensure that noise levels inside rooms of new residential properties are reasonable and comply with guidance limits for noise intrusion advised in British Standard BS8233:1999 "*Sound insulation and noise reduction for buildings – Code of practice*" (to which PPG24 makes reference).

PPG24 has recently been withdrawn; however no replacement technical guidance document has been issued by central Government to date.

London Borough of Camden's Policy DP28 states that assessment should be carried out in accordance with guidelines set out in PPG24 with the results compared against criteria set out in Tables A to E (which in turn are based on the guidance in PPG24); It is acknowledged that Local Authorities will need significant time to establish and issue new policies relating to noise to replace PPG24. In view of this ACA Acoustics Limited considers that although withdrawn, continued use of the PPG24 measurement methodology in the interim period will allow Local Authorities to readily evaluate the effect of existing noise sources on proposed residential developments, albeit that adherence to the internal noise limits set out in the, still current, British Standard BS8233:1999 should take precedence above the outdated assessment conclusion of the withdrawn PPG24.

2.3 National Planning Policy Framework (NPPF) and Noise Policy Statement for England (NPSE)

The National Planning Policy Framework (referred to as NPPF) was published by the Department for Communities and Local Government in March 2012 and replaces the previous Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) documents, including PPG24: Planning and Noise.

The NPPF sets out the Governments' planning policies for England and provides guidance on how these are expected to be applied, providing a framework within which Local Authorities can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Paragraph 109 of the NPPF states that "*The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*".

It also talks specifically about noise and states that "*Planning policies and decisions should aim to:*

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational amenity value for this reason.*"

In March 2010 the Department for Environment, Food and Rural Affairs (Defra) issued Noise Policy Statement for England (referred to as NPSE). This sets out the Government's long-term policy aims that are intended to be considered by Local Planning Authorities when development their own Local Policies relating to noise. Stated aims of NPSE are "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy of sustainable development:*

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.*"

Paragraphs 2.19 to 2.24 clarify the above aims, referring to established concepts from toxicology; NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level). It also introduces a new concept relating to "*significant adverse*" of SOAEL (Significant Observed Adverse Effect Level), however stating that "*it is not possible to have a single objective noise-based measure that describes SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times*".

The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, as set out in the NPPF.

Paragraph 2.7 states that "*… the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications*". This provides clear guidance that noise must not be considered in isolation but as part of the overall scheme taking into account the overall sustainability and associated impacts of the proposed development; there is no benefit in reducing noise to an excessively low level if this creates or increases some other adverse impact. Similarly it may be appropriate in some cases for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance to the development as a whole.

Paragraph 2.8 of NPSE states that "*in the longer term, the Government hopes that existing policies could be reviewed (on a prioritised basis), and revised if necessary, so that the policies and any noise management measures being adopted accord with the vision, aims and principles of the NPSE*".

As discussed above, it is acknowledged that Local Authorities will need significant time to establish and issue new policies relating to noise to replace PPG24 and to comply with the guiding principles of NPSE and NPPF and therefore the author considers that although withdrawn, continued use of the measurement methodology of PPG24, and in particular consideration of internal noise level limits provided in BS8233, in the interim period will allow Local Authorities to readily evaluate the effect of existing noise sources on proposed new residential developments.

2.4 British Standard BS8233:1999

In advising guidance on permissible noise levels inside residential dwellings and appropriate noise mitigation measures PPG24 makes frequent reference to British Standard BS8233:1999 "*Sound insulation and noise reduction for buildings – Code of practice*". Guidance limits for internal noise within living rooms and bedrooms, taken from Table 5 of BS8233, are shown in Table 1 below:

Room	Reference Time	Design Range – LAeq, T	
		Good	Reasonable
Living Rooms	Daytime (07:00 – 23:00)	30dB	40dB
Bedrooms	Night time (23:00 – 07:00)	30dB	35dB
		LAFmax ≤45dB	

Table 1: BS8233 guideline internal noise levels

ACA Acoustics Limited's standard approach is to design noise to bedrooms to the lower "good" limit of Leq 30dBA and to the mid-range of maximum Leq 35dB for living rooms.

2.5 World Health Guidance

The World Health Organisation's guidance "*Community Noise 1999*" recommends a limit of Leq 30dBA for bedrooms at night as preventing sleep disturbance to vulnerable people. The WHO guidance also states that "*for a good sleep, it is believed that indoor sound pressure levels should not exceed 45dB LAFmax more than 10-15 times per night*".

The levels advised in The World Health Organisation's guidance correlate very well with those in BS8233 described above.

4. NOISE SURVEY

4.1 Noise Measurement and Assessment Procedure

To assess the impact of existing noise sources, noise samples were recorded at the development site generally in accordance with procedures set out in PPG24.

A single noise measurement position was selected as being worse case representative of the nearest part of the proposed residential façade overlooking New Oxford Street. The rear façade of the development will be set back further from the main noise source of New Oxford Street and with greater screening provided by the building itself.

The noise survey was carried out using an unmanned logging type sound level meter over nominally a 24-hour period between 3rd December and 4th December 2012. The weather included dry and calm periods during the survey. Noise measurements were recorded in terms of 5-minute samples of overall LAeq and LAFmax values.

In addition to the long-term measurements, short-term noise samples of octave band values were also obtained at front and rear facades to provide frequency content information of noise levels to assist with later acoustic calculations.

4.2 Instrumentation

The following equipment was used during the unattended noise survey; the sound level meter was calibrated before and after the survey measurements using the UKAS certified calibrator:

Equipment	Serial Number
Rion sound level meter type NL-31 Class 1 complete with weatherproof and lockable outdoor environmental kit	00773045
Bruel & Kjaer calibrator type 4231 (UKAS Certified)	02326801
Microphone extension cable and telescopic boom arrangements	-

Table 2: Equipment used

4.3 Noise Measurement Results and Observations

Complete LAeq and LAFmax value results of the noise survey over the 24-hour period are provided in graphical form in Appendix C.

Summary of the 12-hour daytime, 4-hour evening and 8-hour night-time period noise levels are shown in Table 3 below.

Description	Daytime (07:00 – 19:00) Leq (12 hour)	Evening (19:00 – 23:00) Leq (4 hour)	Night Time (23:00 – 07:00) Leq (8 hour)
3rd – 4th December 2012	74.2dBA	73.0dBA	71.5dBA

Table 3: Summary noise survey results for daytime, evening and night time periods

During the survey visits subjectively noise levels at the front façade of the development are comprised of traffic on local routes and pedestrian activity within the area.

5. NOISE ASSESSMENT

London Borough of Camden Council's Policy DP28 assesses the impact of noise in terms of daytime LAeq, 12 hours (07:00 – 19:00), evening LAeq, 4 hours (19:00 – 23:00) and night time LAeq, 8 hours (23:00 – 07:00).

Equivalent free-field noise levels at the location of the proposed façade of the new development, compared with the noise limits specified in Policy DP28 are shown in Table 4 below. *Note that in accordance with procedures in PPG24, the 1m façade measured levels (shown in Section 4 and the graph in Appendix C) are taken to be 3dBA higher than the levels incident on the façade.*

Description	LAeq (dB)	Camden Policy DP28 Category
3rd – 4th December 2012		
Daytime	71.2	Daytime and Evening: Table B – Attenuation Required Night Time: Table A – Planning Not Normally Granted
Evening	70.0	
Night time	68.5	

Table 4: LAeq noise level incident on façade and corresponding Policy DP28 Table requirement

Noise levels during daytime and evening periods to the front façade are within the range of values shown in Table B of Policy DP28, requiring attenuation measures to be considered. During night time periods, noise levels to the front façade are above the threshold limits provided in Table A of Policy DP28. Development sites with measured noise levels exceeding the limits of Table A are indicative of a very noisy area; London Borough of Camden would not normally grant planning permission for residential development in these locations.

In this instance it is of benefit to consider the technical acoustic concept of the threshold limits.

The threshold limit provided in Table A of DP28 is taken from the noise levels corresponding to NEC D of PPG24. Annex B of PPG24 provides "*an explanation of how the noise levels in the NEC table in Annex 1 have been calculated or derived"*. Paragraph 11 of Annex B states that *"The upper limit is based on a Building Research Establishment (BRE) survey which has shown that the insulation package supplied under the Noise Insulation Regulations is inadequate for road traffic noise levels of 78dB LA10, 18h and above at a façade. This figure is equivalent to a 'free-field' level of 75dB LA10, 18h; which in turn is equivalent to 73dB LAeq, 16h. The 73dB LAeq 16h has been reduced by 1dB to 72dB LAeq 16h in the table, which is the maximum external level that the standard noise insulation package will reduce to an acceptable internal level"*.

The Noise Insulation Regulations to which PPG24 refers were issued in 1975 and included recommendation for mitigation measures to improve the sound insulation performance of external facades to an existing residential dwelling. Recommendations included installation of secondary glazing to windows with the new secondary glazing formed from glass of minimum 3mm thickness. Through-wall type acoustic ventilators were also recommended.

Design of modern high-performance acoustic glazing or secondary glazing systems is significantly superior to the 3mm thickness glass proposed in the Noise Insulation Regulations, often incorporated either units with toughened or laminated panes of glass. In addition improvements in design of acoustic seals to glazed units greatly increases the sound insulation performance achieved on site.

Use of whole-house ventilation systems (such as MVHR units) or very high performance passive ventilators are also significantly superior to those in the Noise Insulation Regulations.

Paragraph 14 of PPG24 Annex 2 states that "*The standard noise insulation package provides insulation of about 35dBA*". Use of modern high specification façade elements can provide sound insulation in excess of 45dBA; at least 10dBA better than that proposed in the Noise Insulation Regulations.

It is to be expected that advances in construction techniques and proprietary acoustic products over the past 35 years have significantly increased the level of sound insulation performance possible and the above demonstrates that although use of the NEC limits of PPG24 (and in turn the values shown in London Borough of Camden Council's Policy DP28) is useful to provide an indication of the noise character of an area, the prescriptive limits provided in NEC D or Table A of DP28 are outdated and acceptable internal noise levels are readily achievable even at higher external noise levels.

The author considers that the overly prescriptive nature of the PPG24 assessment conclusion is likely one of the reasons for its withdrawal and that a more detailed assessment, considering actual noise levels inside a residential property, allowing for high performance façade sound insulation, rather than noise levels incident on the external façade, is of more benefit and will ensure that the amenity of future occupants is not compromised while allowing for much needed development within town and city centre locations.

As such, a very high performance scheme for sound insulation is proposed to ensure that noise levels inside rooms of the new flats are reasonable and comply with the requirements of BS8233:1999,

By achieving the internal noise limits of BS8233:1999 it is therefore considered that although external noise levels are above London Borough of Camden's typical maximum threshold, amenity of future residents would not be compromised and the site should be considered suitable for residential use.

The author considers that this approach fully complies with the aims of The Noise Policy Statement for England (NPSE) and National Planning Policy Framework (NPPF), whereby potential adverse impacts on health and quality of life due to noise are adequately mitigated and minimised through the careful design of façade sound insulation such that acceptable internal noise levels are achieved. This approach is also in accordance with London Borough of Camden's own policy, which states that "*the Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for … development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided*"; it is the author's opinion that high-performance façade sound insulation should be considered as "appropriate attenuation measures".

There are various existing residential flats within the vicinity of the proposed development. Whilst it is acknowledged that existing residential properties might not be retrospectively assessed for noise intrusion, presence of these properties does establish the nature of the area. This proposed development would therefore not be introducing a noise-sensitive use to an area where there are no existing noise-sensitive uses.

In summary it is considered the site is suitable for residential development providing that a high specification of appropriate sound insulation measures are incorporated into the scheme design to ensure noise levels inside rooms of the new residences achieve the guideline limits in British Standard BS8233:1999.

6. SCHEME OF FAÇADE SOUND INSULATION

By following the calculation procedures outlined in BS EN ISO 12354-3:2000 and Section 6.7 of BS8233:1999 a specification for the acoustic performance of façade elements has been established.

Copy of example acoustic calculations for daytime noise intrusion to a typical living room and night time noise intrusion into a bedroom within the façade of the development directly overlooking New Oxford Street are provided in Appendix D. The calculations use ACA Acoustics Limited's in-house computer calculation model based on BS EN ISO 12354-3 and BS8233. The calculations confirm that intrusive noise levels into rooms of the proposed residential flats will comply with guidance limits in British Standard BS8233 as set out in Section 2.4 of this report.

An item by item scheme for noise insulation measures to the proposed residential dwellings is provided below.

6.1 Walls

External walls are of traditional masonry construction. Values in Table 5 below show the expected sound insulation performance for this type of wall construction. This will provide more than adequate sound insulation and no additional treatments are required.

Description	Octave Band Centre Frequency – Hz (dB)						Rw
	125	250	500	1k	2k	4k	(dB)
Wall	41	45	47	55	60	60	53

Table 5: Traditional solid masonry external wall Sound Reduction Index R dB

6.2 Glazing

Existing glazing to the property is of single pane float glass nominally 4mm thick within casement style metal frame. This type of glazing provides limited acoustic performance and it is recommended that the sound insulation performance of the glazing to façades with line-of-sight to New Oxford Street be improved significantly.

Values in Table 6 on the following page show a specification schedule of glazing sound insulation performance for different parts of the development.

Note that there are many permutations of possible configurations and different glazing suppliers will tend to use their own preferred configuration. Providing that the overall Rw performance and the individual octave band performance are not less than those shown in Table 6 then any alternative configuration can be used.

Description	Octave Band Centre Frequency – Hz (dB)						Rw	Comments
	125	250	500	1k	2k	4k	(dB)	
Bedrooms to front & side facades	29	40	45	47	54	68	48	Very high-performance IGU such as *Pilkington Optiphon* 16.8-20Ar-16.8 or secondary glazing
Bedrooms – rear façade	27	26	31	40	42	46	37	Double glazing such as 4-16-6 IGU
Living Rooms to front & side facades	23	28	41	47	45	55	42	High performance IGU such as *Pilkington Optiphon* 6-16Ar-10.8 or secondary glazing
Living Rooms – rear façade	27	26	31	40	42	46	37	Double glazing such as 4-16-6 IGU
Non-habitable rooms	24	20	26	35	38	42	31	Double-glazing such as 4-16-4 IGU

Table 6: Specification for glazing Sound Reduction Index R dB

It is considered that existing windows of the development may have to be retained for conservation reasons. In this instance secondary glazing will be required to inside of the existing retained outer window for all windows within the new residential flats. In this instance specification for suitable secondary glazing will be provided to the client prior to construction works commencing.

For all living rooms and bedrooms, the window frames will need to have effective acoustic seals all around. Effective seals are rubber or neoprene beaded "P" or "O" profile type that compress all around on closure of the windows. Plastic type or brush type weathering seals are not classed as effective acoustic seals.

6.3 Ventilation Scheme

With regard to ventilation requirements, it is usual to satisfy the noise limits with the background ventilation rate defined by Approved Document F of the Building Regulations, rather than for the rapid ventilation rate. It is therefore anticipated that it will be necessary to incorporate an acoustic ventilation scheme into the design such that residents are able to have background ventilation without necessarily needing to open windows.

Values in Table 7 on the following page show a specification schedule of ventilator sound insulation performance for the development.

Note that the ventilators proposed are very high performance type; around the maximum attainable for passive ventilators. An alternative to using passive acoustic ventilators would be to use mechanical ventilation with inline silencing. Suppliers such as Vent-Axia or Nuiare would be able to offer suitable ventilation systems for residential properties.

If mechanical ventilation (such as MVHR or similar) is used then it is important that any self-noise (i.e. noise from the fans) must not cause internal noise levels to exceed the design requirements. To achieve these limits then it is recommended that the overall noise from any mechanical ventilation system will need to be no higher than LAeq 30dB within living rooms (daytime) and LAeq 25dB within bedrooms (night time) to allow for accumulation of noise sources.

Description	Octave Band Centre Frequency – Hz (dB)						Dn,e,w	Comments
	125	250	500	1k	2k	4k	(dB)	
All habitable rooms	33	40	45	56	67	75	50	Very high-performance acoustic ventilators such as *Caice* acoustic ventilator or equivalent

Table 7: Specification for ventilators Element Normalized Level Difference Dn,e dB

7. SOUND INSULATION THROUGH SEPARATING WALLS & FLOORS

7.1 Sound Insulation between Flats

Separating walls and floors between the new flats will need to comply with the minimum performance requirement standards set out in the Building Regulations 2010 Approved Document E (2003 Edition).

Performance standards for separating walls and floors are given in Table 8, taken from Table 0.1a of Approved Document E.

Description		Approved Document E Performance Standard
Walls	DnT,w + C'tr (Airborne)	≥ 43dB
Floors and stairs	DnT,w + C'tr (Airborne)	≥ 43dB
	L'nT,w (Impact)	≤ 64dB

Table 8: Sound insulation performance standards for separating walls and floors between flats formed by material change of use

Compliance with the above minimum standards would normally be demonstrated by carrying out pre-completion airborne and impact sound insulation tests of the formed walls and floors between the flats at or near to completion of the development works. Results of the tests would be submitted to and approved by the Local Authority Building Control department or an approved inspector.

It is anticipated that as the project progresses ACA Acoustics Limited will undertake an acoustic design review of the development to ensure that proposed separating wall and floor constructions, along with associated flanking details, will achieve the above minimum requirements.

7.2 Sound Insulation of Separating Floor between Commercial Unit and Residential Flats

Any noise associated with the existing commercial unit at first floor level could potentially transmit to the proposed residential flats above through the building structure.

Where residential flats share a common structure with commercial properties it is anticipated that London Borough of Camden Council will require noise from the commercial unit to not exceed the "good" standards for internal noise within residential properties set out in BS8233:1999; this equates to designing noise transfer from the existing Starbucks coffee shop to not exceed a level of LAeq 30dB inside living rooms of the proposed flats.

Starbucks and equivalent coffee shops do not play amplified music internally and it is considered that any change of use of the commercial unit to allow amplified music to be played would require a planning application. Therefore assessment of noise from typical coffee shop with no amplified music has been carried out.

Based on measurements undertaken in similar premises by the author, it is anticipated that noise levels within the Starbucks will typically be within the range LAeq, 1 hour 50dB to 60dB and would not normally exceed LAeq, 1 hour 65dB.

This correlates with guideline noise limits for commercial cafeteria, canteens and retail shops provided in BS8233:1999 of LAeq, T 50dB to 55dB. Measured noise levels within a coffee shop or retail unit do not include high levels of low frequency (bass) noise and are typically of a "broadband" nature.

Based on upper measured noise levels of LAeq, 1 hour 65dB it is recommended that separating floors providing airborne sound insulation performance of DnT,w + C'tr ≥ 43dB would provide more than adequate sound insulation to control noise transfer to the residential flats above and will ensure that noise levels inside the residential flats due to operational noise from the Starbucks is below the "good" limits specified in BS8233:1999. This equates to the Building Regulations 2010 Approved Document E (2003 Edition) minimum requirements for airborne sound insulation between flats.

Note that in accordance with Diagram 0.1 of Approved Document E there is no minimum impact sound insulation performance requirement for the separating floor between first floor commercial unit and second floor proposed flats.

It is anticipated that as the project progresses ACA Acoustics Limited will undertake an acoustic design review of the development to ensure that the proposed separating floor construction, along with associated flanking details, will achieve the above minimum requirements.

APPENDIX B

London Borough of Camden – Local Development Framework Policy DP28

DP28. Noise and vibration

28.1 Noise and vibration can have a major effect on amenity and health and therefore quality of life. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough. Camden's Core Strategy recognises the importance of this issue for Camden's residents and policy DP28 contributes to implementing a number of Core Strategy policies, including CS5 – *Managing the impact of growth and development*, CS9 – *Achieving a successful Central London*, CS11 – *Promoting sustainable and efficient travel* and CS16 – *Improving Camden's health and well-being*.

DP POLICY

DP28 – Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

a) development likely to generate noise pollution; or

b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds.

The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.

28.2 The effect of noise and vibration can be minimised by separating uses sensitive to noise from development that generates noise and by taking measures to reduce any impact. Noise sensitive development includes housing, schools and hospitals as well as offices, workshops and open spaces, while noise is generated by rail, road and air traffic, industry, entertainment (e.g. nightclubs, restaurants and bars) and other uses.

28.3 The Council will only grant planning permission for development sensitive to noise in locations that experience noise pollution, and for development likely to generate noise pollution, if appropriate attenuation measures are taken, such as double-glazing. Planning permission will not be granted for development sensitive to noise in locations that have unacceptable levels of noise. Where uses sensitive to noise are proposed close to an existing source of noise or when development that generates noise is proposed, the Council will require an acoustic report to ensure compliance with PPG24: *Planning and noise*. A condition will be imposed to require that the plant and equipment which may be a source of noise pollution is kept working efficiently and within the required noise limits and time restrictions. Conditions may also be imposed to ensure that attenuation measures are kept in place and effective throughout the life of the development.

28.4 In assessing applications, we will have regard to the Noise and Vibration Thresholds, set out below. These represent an interpretation of the standards in PPG24 and include an evening period in addition to the day and night standards contained in the PPG, which provide a greater degree of control over noise and vibration during a period when noise is often an issue in the borough.

Camden Development Policies – Section 3

Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	74 dB L_{Aeq}·12h	72 dB L_{Aeq}·12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	74 dB L_{Aeq}·4h	72 dB L_{Aeq}·4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	66 dB L_{Aeq}·8h	66 dB L_{Aeq}·8h

Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	65 dB L_{Aeq}·12h	62 dB L_{Aeq}·12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	60 dB L_{Aeq}·4h	57 dB L_{Aeq}·4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	55 dB L_{Aeq}·1h	52 dB L_{Aeq}·1h
Individual noise events several times an hour	Night	2300-0700	>82 dB L_{Amax} (S time weighting)	>82 dB L_{AMAX} (S time weighting)

Table C: Vibration levels on residential sites adjoining railways and roads at which planning permission will not be granted

Vibration description and location of measurement	Period	Time	Vibration levels
Vibration inside critical areas such as a hospital operating theatre	Day, evening and night	0000-2400	0.1 VDV ms-1.75
Vibration inside dwellings	Day and evening	0700-2300	0.2 to 0.4 VDV ms-1.75
Vibration inside dwellings	Night	2300-0700	0.13 VDV ms-1.75
Vibration inside offices	Day, evening and night	0000-2400	0.4 VDV ms-1.75
Vibration inside workshops	Day, evening and night	0000-2400	0.8 VDV ms-1.75

Where dwellings may be affected by ground-borne regenerated noise internally from, for example, railways or underground trains within tunnels, noise levels within the rooms should not be greater than 35dB(A)max

Camden Development Policies – Section 3

Table D: Noise levels from places of entertainment on adjoining residential sites at which planning permission will not be granted

Noise description and measurement location	Period	Time	Sites adjoining places of entertainment
Noise at 1 metre external to a sensitive façade	Day and evening	0700-2300	L_{Aeq}· 5m shall not increase by more than 5dB*
Noise at 1 metre external to a sensitive façade	Night	2300-0700	L_{Aeq}· 5m shall not increase by more than 3dB*
Noise inside any living room of any noise sensitive premises, with the windows open or closed	Night	2300-0700	L_{Aeq}· 5m (in the 63Hz Octave band measured using the 'fast' time constant) should show no increase in dB*

* As compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place

Table E: Noise levels from plant and machinery at which planning permission will not be granted

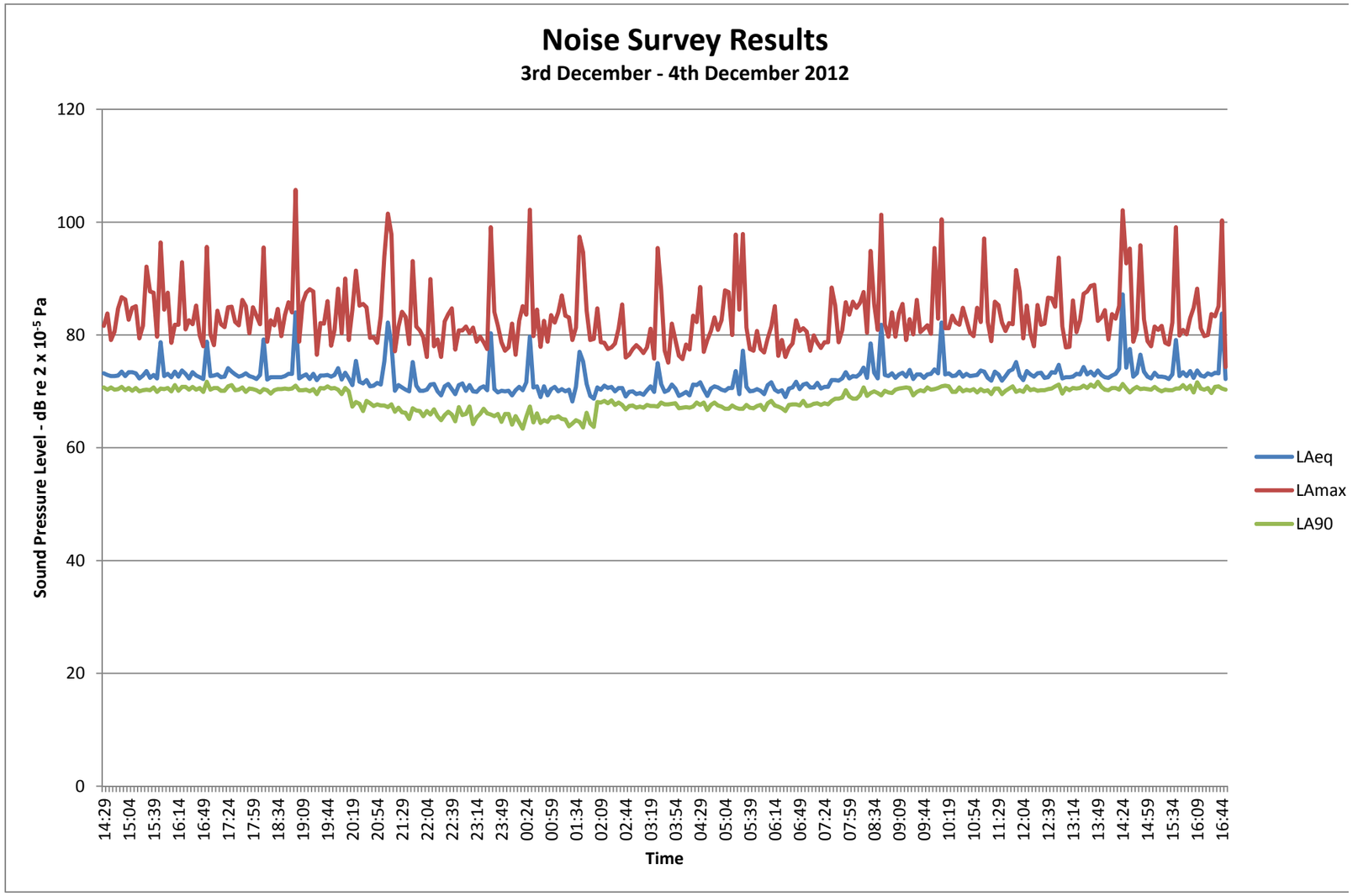
Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL_{Aeq}·

Key evidence and references

- Camden's Noise Strategy, 2002
- The London Plan (Consolidated with Alterations since 2004), 2008
- Planning Policy Guidance 24: Planning and noise

APPENDIX C

Noise Survey Results



Report Reference: 121107-003A

APPENDIX D

Façade Sound Insulation – Acoustic Calculations

Project: 112-116 New Oxford Street, London WC1

BS EN ISO 12354-3 - FAÇADE SOUND INSULATION CALCULATION

Room Reference: Flat 2, Bedroom 2

Measured Lp at Façade:

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Leq,ff	68.5	65	66	66	65	60

Façade 1:

Element	Construction	Area (m^2)
Wall (area including glazing)	Solid masonry	24
Windows	16.8-20Ar-16.8 Optiphon	11.5
Ventilation	Caice acoustic ventilator (Dn,e,w = 50dB)	1
Doors		0
Roof / Ceiling		0

Element Sound Reduction Index

		Sound Reduction Index (R) - dB				
Surface	Area (m^2)	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Walls	24	41	45	47	55	60
Windows	11.5	29	40	45	47	54
Ventilation (Dn,e)	1	33	40	45	56	67
Doors	0					
Roof / Ceiling	0					

Room Volume (m^3):	50
Façade Area (m^2):	24
Roof Area - Exposed Side (m^2):	0

Reverberation Time

		Reverberation Time - Seconds				
Room Type:	Bedroom	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
RT in Furnished Room		0.4	0.35	0.3	0.3	0.3

CALCULATED EQUIVALENT INTERNAL SOUND PRESSURE LEVEL - LAeq

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Leq,2	**26.9**	**38.1**	**29.5**	**24.4**	**18.4**	**6.5**

Project: 112-116 New Oxford Street, London WC1

BS EN ISO 12354-3 - FAÇADE SOUND INSULATION CALCULATION

Room Reference: Flat 2, Living Room

Measured Lp at Façade:

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Leq,ff	71.4	68	68	69	68	63

Façade 1:

Element	Construction	Area (m^2)
Wall (area including glazing)	Solid masonry	14.8
Windows	6-16Ar-10.8 Optiphon	9.5
Ventilation	Caice acoustic ventilator (Dn,e,w = 50dB)	1
Doors		0
Roof / Ceiling		0

Element Sound Reduction Index

		Sound Reduction Index (R) - dB				
Surface	Area (m^2)	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Walls	14.8	41	45	47	55	60
Windows	9.5	23	28	41	47	45
Ventilation (Dn,e)	1	33	40	45	56	67
Doors	0					
Roof / Ceiling	0					

Room Volume (m^3):	68
Façade Area (m^2):	14.8
Roof Area - Exposed Side (m^2):	0

Reverberation Time

		Reverberation Time - Seconds				
Room Type:	Living Room	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
RT in Furnished Room		0.7	0.6	0.5	0.5	0.5

CALCULATED EQUIVALENT INTERNAL SOUND PRESSURE LEVEL - LAeq

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Leq,2	**35.0**	**46.3**	**40.5**	**29.3**	**21.3**	**17.5**

Report Reference: 121107-003A

8.4: Appendixes :
Acoustic Report

APPENDIX E

Typical Noise Mitigation Treatments

Pilkington **Optiphon™**

	dB sound reduction index by octave band – Hz									
	125	250	500	1000	2000	4000	$R_w(C;C_{tr})$	R_w	R_w+C	R_w+C_{tr}
Configuration single glazing										
6.8 mm Pilkington **Optiphon™**	21	26	31	35	37	38	35(-1;-3)	35	34	32
8.8 mm Pilkington **Optiphon™**	24	28	34	38	37	43	37(-1;-4)	37	36	33
10.8 mm Pilkington **Optiphon™**	28	31	36	38	39	47	38(-1;-2)	38	37	36
12.8 mm Pilkington **Optiphon™**	30	32	37	39	41	51	39(-0;-2)	39	39	37
16.8 mm Pilkington **Optiphon™**	29	34	37	39	46	55	40(-0;-2)	40	40	38
Configuration Insulating Glass Unit (IGU), thickness in mm										
6 / 6 to 20 mm / 6.8 Pilkington **Optiphon™**	23	24	34	42	43	52	38(-2;-5)	38	36	33
6 / 6 to 20 mm / 8.8 Pilkington **Optiphon™**	24	26	40	48	46	54	41(-3;-7)	41	38	34
6 / 6 to 20 mm / 10.8 Pilkington **Optiphon™**	23	28	41	47	45	55	42(-3;-7)	42	39	35
6 / 6 to 20 mm / 12.8 Pilkington **Optiphon™**	20	29	43	47	46	49	42(-3;-8)	42	39	34
8.8 Pilkington **Optiphon™** / 6 to 20 mm / 12.8 Pilkington **Optiphon™**	26	36	46	50	52	63	47(-2;-7)	47	45	40
16.8 Pilkington **Optiphon™** / 6 to 20 mm / 16.8 Pilkington **Optiphon™**	29	40	45	47	54	68	48(-2;-6)	48	46	42

The above IGUs with Pilkington **K Glass™** on one pane and a 16 mm 90 % Argon-filled cavity achieve a U value of 1.5 W/m² K
Further information on solar and thermal performance is available on the Pilkington website using the Spectrum program: www.pilkington.com/spectrum
Impact classification EN12600 Class 1(B)1 for all above Pilkington **Optiphon™** products
$R_w(C;C_{tr})$ are in accordance with EN717-1

Non Pilkington **Optiphon™ glass products. Figures from BS EN 12354**

	dB sound reduction index by octave band – Hz									
	125	250	500	1000	2000	4000	$R_w(C;C_{tr})$	R_w	R_w+C	R_w+C_{tr}
Configuration single glazing										
4 mm Float Glass	17	20	26	32	33	26	29(-2;-3)	29	27	26
6 mm Float Glass	18	23	30	35	27	32	31(-2;-3)	31	29	28
8 mm Float Glass	20	24	29	34	29	37	32(-2;-3)	32	30	29
10 mm Float Glass	23	26	32	31	32	39	33(-2;-3)	33	31	30
12 mm Float Glass	27	29	31	32	38	47	34(-0;-2)	34	34	32
Configuration Insulating Glass Unit (IGU), Float glass, thickness in mm										
4 / 6 to 20 mm / 4	21	17	25	35	37	31	29(-1;-4)	29	28	25
6 / 6 to 20 mm / 6	20	18	28	38	34	38	31(-1;-4)	31	30	27
6 / 6 to 20 mm / 4	21	20	26	38	37	39	32(-2;-4)	32	30	28
10 / 6 to 20 mm / 4	24	21	32	37	42	43	35(-2;-5)	35	33	30
10 / 6 to 20 mm / 6	24	24	32	37	37	44	35(-1;-3)	35	34	32

Note that these are conservative figures and cover all products by European glass manufacturers.
R_w = Weighted sound reduction. This scale allows for the response of the human ear and could be used for determining a suitable product to reduce noise such as voices.
C = An adjustment to the R_w scale that could be used for selecting a product to reduce noise from music, radio, tv, high speed traffic and other medium to high frequencies.
C_{tr} = An adjustment to the R_w scale that could be used for selecting a product to reduce noise from urban road traffic, disco music and other noises with a large component of low frequencies.
Note that a 3 dB difference is barely discernable, 5 dB is clearly discernable and 10 dB is a doubling or halving of the noise.

Classification report
Airbourne sound insulation of building elements

Test report 161 31740/1e*)

*) This is a translation of the test report No. 161 31740/1 dated 10th May 2006

ift ROSENHEIM

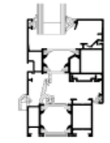
Customer **SCHÜCO International KG**
Karolinenstraße 1-15

33609 Bielefeld

Basis
EN 20140-3 : 1995-01
EN ISO 717-1 : 1996-12
Corresponds to the national version of DIN EN 20140-3 and DIN EN ISO 717-1.
Test report 161 26759/1.0.0 dated 5th May 2003

Product	Single window, single leaf
System designation	Schüco AWS 60
External dimensions (W x H)	1230 mm × 1480 mm
Material	Aluminium profile with thermal break, uncoated
Type of opening	Tilt and turn
Filling	Insulating glass unit, 6/16/4
Special features	-/-

Representation



Instructions for use
This test report may be used to classify the sound insulation of building elements.

Validity
The data and results given relate solely to the described, tested object.
Testing for sound insulation does not allow any statement to be made on further characteristics of the present structure which could define performance and quality.

Notes on publication
The ift notice "Conditions and notes for the use of ift test documents" applies.
The cover sheet can be used as a summary.

Contents
The report comprises a total of 7 pages

Weighted sound reduction index R_w
Spectrum adaptation terms C and C_{tr}

R_w (C; C_{tr}) = 37 (-1;-4) dB

ift Rosenheim
10th May 2006

Dr. Joachim Hessinger, Dipl.-Phys.
Head of test laboratory
ift Centre for acoustics

Bernd Saß, Dipl.-Ing. (FH)
Assistant head of test laboratory
ift Centre for acoustics

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Sachverständige Prüfstelle Gruppe I
für Eignungs- und Gütenprüfung nach DIN 4109

03-02 / 353

Report Reference: 121107-003A

Acoustic Ventilator

Features

- **High acoustic performance $D_{n,e,w}$ 50 dB**
- **Meets the ventilation requirements of Approved Document F 2006**
- **Unit dimensions to suit design requirements**
- **Choice of front or bottom inlet and discharge**
- **Simple design: replaces the brickwork above the window or can be built into the facade**
- **Easy to install: directly below the lintel and above the window**
- **Flush finish: complements the window design**
- **Thermal break can be incorporated**
- **Units can be polyester powder painted to match windows**

Ventilation Problems and the Solution

Providing natural ventilation to a room is essential for all modern buildings, however this can often lead to noise issues as using traditional trickle vents reduces the sound insulation performance of the façade, and consequently causes a rise in ambient noise levels within the room.

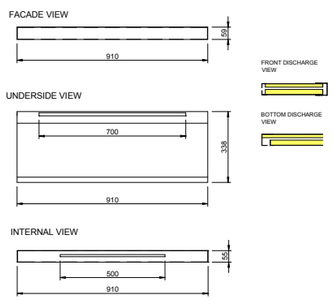
The Caice Acoustic Ventilator bridges the gap between the required ventilation as specified in Approved Document F 2006 and the typical criteria required for comfortable living ambient noise levels.

The acoustic ventilator is not designed to be part of the window, but part of the façade and therefore can sit above the window. Its dimensions are designed to simply replace a series of bricks, meaning that installation is straightforward and hassle free.

Of course not every window in a building will require a ventilator, so dummy panels can also be supplied to maintain a consistently superior look and finish to your building.

The acoustic ventilator shown was developed for a specific project and laboratory tests undertaken confirm the acoustic performance.

Typical Ventilator Design



Acoustic Ventilator

Acoustic Performance

The acoustic ventilators have been tested at an independent test laboratory in accordance with BS EN 140-10, 1992; ISO 140-10, 1991 - Laboratory measurement of airborne sound insulation of small building elements. A measured performance of $D_{n,e,w}$ 50 dB was achieved.

	Octave Band Sound Reduction Index (dB)						
	125	250	500	1k	2k	4k	8k
$D_{n,e}$ (dB)	33	40	45	56	67	75	69
R (dB)	6	12	17	28	41	50	41

$D_{n,e,w}$ (C;Ctr) = 50 (-1,-5) dB

The difference between the $D_{n,e}$ and R (the SRI) is that whereas $D_{n,e}$ is the average composite loss of a typical wall structure with the vent installed, the SRI is the specific dB loss through the vent itself.

Product Specification

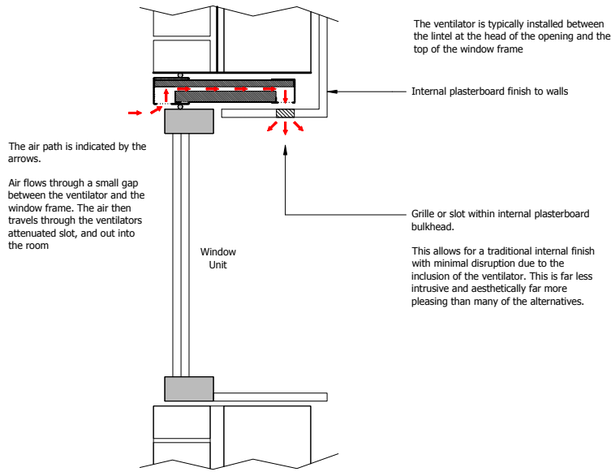
The outer casing shall be constructed with galvanised sheet steel. The acoustic media within the ventilator shall have a class "0" fire rating in accordance with BS 476 Part 24.

The ventilators shall be delivered to site suitably protected to prevent the ingress of dirt whilst on site, and shall be provided with labels detailing a description of the unit.

The manufacturer shall ensure that the ventilators will fit easily and correctly above the window and in the facade.

Polyester powder paints can be used to present the units in a manner that reflects the particular window design and colour scheme.

Typical Installation



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