1590

New Housing
at Wolsey Mews Garages
London NW5

Sustainability Statement

Prepared for London Borough of Camden
April 2017

Issue 1: Planning Condition No 14

BHA

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Contents

1.0 Introduction

The 2 new housing units at Wolsey Mews Garages have been designed to be both energy and water efficient and to deal with the likely effects of climate change in the future, and this statement sets out the ways this has been achieved. In brief, the key targets and objectives include:

- Producing a design that responds to the local environment by encouraging daylight, solar heat, air movement, while ensuring passive protection against overheating.
- Making sure the building optimises thermal performance through fabric specification and air tightness that goes beyond the requirements of Approved Document L1A 2013.
- Reducing CO2 emissions beyond the baseline in Approved Document L 2013 through energy efficient heating and hot water systems, lighting and ventilation technologies.
- Employing appropriate Renewable or Low Carbon technology, to further reduce the energy use of the building.
- Ensuring low water fittings are specified throughout with a target consumption of less than 110l/person/day.
- Minimising waste throughout all phases of the development, including design, demolition, construction and operation and providing dedicated storage facilities for general, recyclable and food waste.
- Specifying building elements high Green Guide ratings and implementing measures to reduce air, ground, water and noise pollution during the construction phases.

2.0 Passive Design

The design of the proposed development will reduce the energy consumption and associated CO_2 emissions whilst maintaining high levels of comfort for the users. This will be achieved by a range of passive measures (i.e. building massing, orientation, high performance fabric) and active measures (i.e. efficient heating, hot water and lighting systems).

2.1 Building Massing / Orientation

Although the development is constrained by the existing site and adjoining buildings, its form and layout exploits the use of natural daylight wherever possible which reduces the reliance of artificial lighting for portions of the day. In addition, the use of rooflights for Unit 2 allows very good natural light into the open plan 1st floor.

The quantity and positioning of all the glazing, ie a predominantly east west orientation, has been carefully considered to not only provide sufficient daylight, but also to maximise passive solar heating in winter whilst minimising the risk of overheating in summer.

2.2 Building Fabric

By taking a 'fabric first' approach to the design, the building fabric of the proposed development will achieve high levels of thermal performance beyond the minimum Building Regulations requirements to provide better temperature control and reduce the demand for space heating and cooling, as shown below.

Element	Minimum Building Regulation Part L1A 2013 (W/m^2K)	Proposed U-values (W/m^2K)	% Improvement
Walls	0.3	0.15	50%
Floors	0.25	0.09	64%
Roofs	0.2	0.13	35%
Windows	2.0	1.45 (upper average)	27.5%

In addition, the use of exposed masonry walls and concrete ceilings internally provides very high levels of thermal mass which help to adsorb and store both heat and coolth and thereby provide a degree of 'inertia' against temperature fluctuations. Such thermal mass will make a significant contribution to reducing seasonal energy demands.

2.3 Air Tightness

Heat loss due to air infiltration is a major cause of increased energy use, and as such will be limited. The current Building Regulations set a maximum air permeability rate of 10m3/m2 at 50Pa. The current scheme is designed to achieve 3.0m3/m2 at 50Pa, representing a 70% improvement on Part L1A 2013, through the use of a MVHR system and the application of best practice construction techniques.

3.0 Energy Efficient Services

3.1 Heat Generation

Both units will have a 90% efficient gas boiler, in order to deliver heat at high maximum efficiency. The systems will also be fitted with weather compensation which will allow the boiler to modulate its output based on the external air temperature. This allows the boiler to respond very quickly to changes in external conditions and to closely match the varying heat demand for the building.

Each unit will be served buy a combination of under floor heating and radiators including time and temperature controls to each room, to optimise the efficiency of the heating system.

3.2 Ventilation

Natural ventilation for these units is not ideal due to the high levels of road noise and poor air quality associated with the adjacent mews. Therefore it is proposed that each dwelling is ventilated by a whole-house mechanical ventilation with heat recovery (MVHR) system. Each MVHR system will be specified to be at least 90% efficient, have a specific fan power (SFP) of 0.53 and with rigid ductwork serving individual rooms. Each system will have a heat recovery unit that will reduce heating costs and energy consumption by transferring heat from the warm inside air being exhausted to the fresh outside air. Additionally, each system will be supplied by fresh air that has been taken through a below ground air heat exchange, which pre-cools the incoming air in summer, and pre-warms the air in winter (see below), thus further reducing both the heating and cooling demands.

3.3 Hot Water

The gas-fired boilers also provide the hot water via an indirect hot water cylinder. Hot water is typically one of the largest energy consuming elements for residential uses. Although little can be done passively to reduce this consumption, the specification of low water use appliances can offer significant savings compared to typical performance (see 5.0 below).

3.4 Lighting & Electrical Appliances

To maximise efficiency low energy lights will be installed throughout, with consideration given to LEDs wherever possible. All fitted electrical appliances will be selected with energy efficiency ratings of A+ to A+++

4.0 Renewable and Low Carbon Design

4.1 Ground Air Heat Exchanger

Having considered various renewable and low carbon technologies, the most appropriate option given the various site constraints, was the installation of a Ground Air Heat Exchanger (GAHE).

Particularly suited to highly insulated and air tight buildings, the GAHE when used in conjunction with a MVHR system, provides significant energy savings by using the embodied ground energy to pre-condition the incoming ventilation air. The GAHE, which is in effect a series of pipes that are laid underground, takes advantage of the fact that the temperature of the ground, 1.5 to 2m deep, remains a relative constant temperature between 7ºC-12°C throughout the year. The incoming outside air passes through the underground pipe system to pre-heat it in winter and to pre-cool it in summer, which makes it possible to raise the temperature of air taken in by up to 9°C in winter, and to reduce it by up to 14°C in summer.

The attached SAP calculations (see appendix I) demonstrate that both units exceed current building regulations standards without incorporating additional technologies, by reducing CO_2 emissions by 5% for Unit 1 & 8.2% for Unit 2. However, with the introduction of the GAHE system a predicted CO_2 saving of 531kg/m^2 is made (see appendix II), which further reduces emissions by 16.4% for Unit 1 and 19.5% for Unit 2.

5.0 Water Conscious Design

5.1 Low Water Fittings

To ensure the development's water use is minimised and controlled as appropriate whilst still maintaining comfort and effectiveness for the users, the appropriate fittings have been specified. The Water Efficiency Calculations (see appendix III) show that Unit 1 achieves a total consumption of 105 litres/person/day, while Unit 2 achieves a total consumption of 103 litres/person/day. Both of these are less than the 110 l/p/d maximum required by Building Regulations and Planning Condition No 13.

5.2 Rainwater

Rainwater is collected in an underground storage tank before being discharged into the public sewer, in order to attenuate surface water flow from the site. This tank will also be used to store water for irrigation purposes for the courtyard planting. This use of a rainwater storage tank will not only reduce the quantity of mains water used for the development, but will also have the added benefit of reducing the impact on the sewer network and the probability of flooding.

6.0 Waste Minimal Design

6.1 Construction Waste

The aim is to minimise site waste during the construction process by closely following the waste hierarchy of eliminate, reduce, re-use, recycle, and finally disposal. This has been achieved initially through careful design and specification and will be implemented on site by tightly monitored contractor management.

6.2 Operational Waste

Residents will be encouraged to follow the waste hierarchy: prevention, re-use, recycle/compost, energy recovery and then disposal (as the least attractive option). To facilitate this, external bin stores are located conveniently at the entrances to the units and are immediately accessible for collection. Each unit will be provided with space internally for recycling, compost and non-recyclable waste, each bin will have a minimum capacity of 7 litres, with an overall minimum capacity of 30 litres.

7.0 Green Materials & Construction

7.1 An environmentally responsible approach to the selection and specification of building materials has been adopted, to ensure that wherever possible they are environmentally benign in manufacture, use and disposal or that have been or can be recycled.

The majority of the key building elements (roof, external walls, internal walls, upper and ground floors and windows) of the development will be selected to achieve a Green Guide rating of between A+ to C. All the insitu concrete, for example, has been specified to contain a minimum 50% Ground Granulated Blast-furnace Slag (GGBS) which is a recycled cement replacement product that significantly reduces its embodied energy.

In addition, building and finishing elements will be responsibly sourced from certified suppliers where possible (i.e. BES6001 certificate, EMAS certificate, ISO14001 certificate etc.)

8.0 Adaptation to Climate Change

London has a temperate maritime climate which is characterised by a lack of extreme weather conditions with warm summers and cool winters, with maximum temperatures being up to 23ºC and minimum approximately 6-8ºC. However, the effects of climate change and the urban heat island effect could cause higher summertime temperatures in the coming years. The annual precipitation for the area is approximately 600mm, and while it is predicted that annual rainfall levels will remain fairly constant, these are likely to increase in winter and decrease in summer due to the effects of climate change therefore increasing the likely hood of flooding in vulnerable areas.

The design and layout of the development anticipates these potential changes and several features mentioned above will be effective at combating and mitigate their impacts. These include:

• The high levels of thermal mass in the building will prevent overheating during peaks in summer temperature. This is achieved by circulating cooler night-time fresh air to pre-cool the building fabric that is stored and coolth radiated during the next warm day to reduce internal temperatures.

• The GAHE system is well suited to moderating extremes of temperature, both high and low, buy using the relative constant temperature of the ground of between 7ºC-12°C throughout the year.

• The high levels of thermal performance of the building help to moderate extremes of external temperature.

• Rainwater peak flow rates have been reduced through the installation of attenuation chambers and rainwater collection. This will lessen the impact on the drainage system and minimise the likelihood of flash floods as a consequence of intense rainfall events.

Appendix I

SAP Calculations

Sample Report Ltd
1 Sample Street
Sampletown

Building Regulation Compliance

Property Reference: 005232
Survey Reference: Unit 1
Property:

Issued on Date: 12.Jul.2016
Prop Type Ref: Unit 1

SAP Rating: 86 B	**CO2 Emissions (t/year):** 1.26	**DER:** 13.98 Pass	**TER:** 14.72	**Percentage DER<TER:**	5.01 %
Environmental: 88 B	**General Requirements Compliance:** Pass	**DFEE:** 42.60 Pass	**TFEE:** 44.19	**Percentage DFEE<TFEE:**	3.60 %

CfSH Results **Version:** November 2010 - June 2014 Addendum **ENE1 Credits:** 0.8 **ENE2 Credits:** 5.2 **ENE7 Credits:** 0 **CfSH Level:** 3

Surveyor: admin Admin, Tel: 4, Fax: s@l.f Surveyor ID: Admin
Address:
Client: Burd Haward Architects

Software Version: Elmhurst Energy Systems SAP2012 Calculator (Design System) version 3.05r04
SAP version: SAP 2012, Regs Region: England (Part L1A 2013), Calculation Type: New Build (As Designed)

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

1a TER and DER

Fuel for main heating:	Mains gas	
Fuel factor:	1.00 (mains gas)	
Target Carbon Dioxide Emission Rate (TER)	14.72 kg/m^2	
Dwelling Carbon Dioxide Emission Rate (DER)	13.98 kg/m^2	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	44.19 kWh/m^2	
Dwelling Fabric Energy Efficiency (DFEE)	42.60 kWh/m^2	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Openings	1.45 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Boiler system with radiators or underfloor - Mains gas Data from manufacturer TBC TBC Efficiency: 89% Minimum: 88%	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.75 kWh/day Permitted by DBSCG 2.03	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.70	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based On:		
Overshading:	Average	
Windows facing North:	1.00 m^2, No overhang	
Windows facing East:	24.92 m^2, No overhang	
Windows facing South:	0.32 m^2, No overhang	
Windows facing West:	1.00 m^2, No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.14 W/m^{2}K
Party wall U-value	0.00 W/m^{2}K
Floor U-value	0.09 W/m^{2}K
Window U-value	0.90 W/m^{2}K
Roof window U-value	0.76 W/m^{2}K
Air permeability	3.0 m^3/m^{2}h

Sample Report Ltd
1 Sample Street
Sampletown

Building Regulation Compliance

Property Reference: 005233 **Issued on Date:** 12.Jul.2016
Survey Reference: Unit 2 **Prop Type Ref:** Unit 2
Property:

SAP Rating: 86 B **CO2 Emissions (t/year):** 2.32 **DER:** 14.05 Pass **TER:** 15.31 **Percentage DER<TER:** 8.20 %
Environmental: 86 B **General Requirements Compliance:** Pass **DFEE:** 56.88 Pass **TFEE:** 61.07 **Percentage DFEE<TFEE:** 6.86 %

CfSH Results **Version:** November 2010 - June 2014 Addendum **ENE1 Credits:** 1.3 **ENE2 Credits:** 0.0 **ENE7 Credits:** 0 **CfSH Level:** 3

Surveyor: admin Admin, Tel: 4, Fax: s@l.f Surveyor ID: Admin
Address:
Client: Burd Haward Architects

Software Version: Elmhurst Energy Systems SAP2012 Calculator (Design System) version 3.05r04
SAP version: SAP 2012, Regs Region: England (Part L1A 2013), Calculation Type: New Build (As Designed)

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

1a TER and DER

Fuel for main heating:	Mains gas	
Fuel factor:	1.00 (mains gas)	
Target Carbon Dioxide Emission Rate (TER)	15.31 kg/m2	
Dwelling Carbon Dioxide Emission Rate (DER)	14.05 kg/m2	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.07 kWh/m2	
Dwelling Fabric Energy Efficiency (DFEE)	56.88 kWh/m2	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.08 (max. 2.00)	1.50 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.080

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Boiler system with radiators or underfloor - Mains gas Data from manufacturer TBC TBC Efficiency: 89% Minimum: 88%	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.75 kWh/day Permitted by DBSCG 2.03	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:	100%

Minimum	75%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.70	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK
9 Summertime temperature		
Overheating risk (Thames Valley):	Slight	OK
Based On:		
Overshading:	Average	
Windows facing North:	1.13 m^2, No overhang	
Windows facing East:	30.39 m^2, No overhang	
Windows facing South:	1.00 m^2, No overhang	
Windows facing West:	19.69 m^2, No overhang	
Air change rate:	8.00 ach	
Blinds/curtains:	None	
10 Key features		

External wall U-value	0.14 W/m^2K
Party wall U-value	0.00 W/m^2K
Floor U-value	0.09 W/m^2K
Window U-value	0.90 W/m^2K
Roof window U-value	0.76 W/m^2K
Air permeability	3.0 m^3/m^2h

Sample Report Ltd
1 Sample Street
Sampletown

Block Compliance

Property Reference: 005232
Survey Reference: Unit 1
Property:

Issued on Date: 12.Jul.2016
Prop Type Ref: Unit 1

Surveyor: admin Admin, Tel: 4, Fax: s@l.f
Surveyor ID: Admin
Address:
Client: Burd Haward Architects

Software Version: Elmhurst Energy Systems SAP2012 Calculator (Design System) version 3.05r04
SAP version: SAP 2012, Regs Region: England (Part L1A 2013), Calculation Type: New Build (As Designed)

Block Compliance Report - DER

Block Reference: 000194				Block Name: Wolsley Mews			
Property-Survey Reference	**Multiplier (M)**	**Floor Area (F)**	**DER (D)**	**TER (T)**	**F x M**	**D x F x M**	**T x F x M**
005232-Unit 1	**1**	**109.4**	**13.98**	**14.72**	**109.40**	**1,529.41**	**1,610.03**
005233-Unit 2	**1**	**199.1**	**14.05**	**15.31**	**199.10**	**2,797.36**	**3,047.35**
Totals:	**2**	**308.5**	**28.03**	**30.02**	**308.50**	**4,326.77**	**4,657.37**
Average DER= 14.03				PASS			
Average TER= 15.10							

Block Compliance Report - DFEE

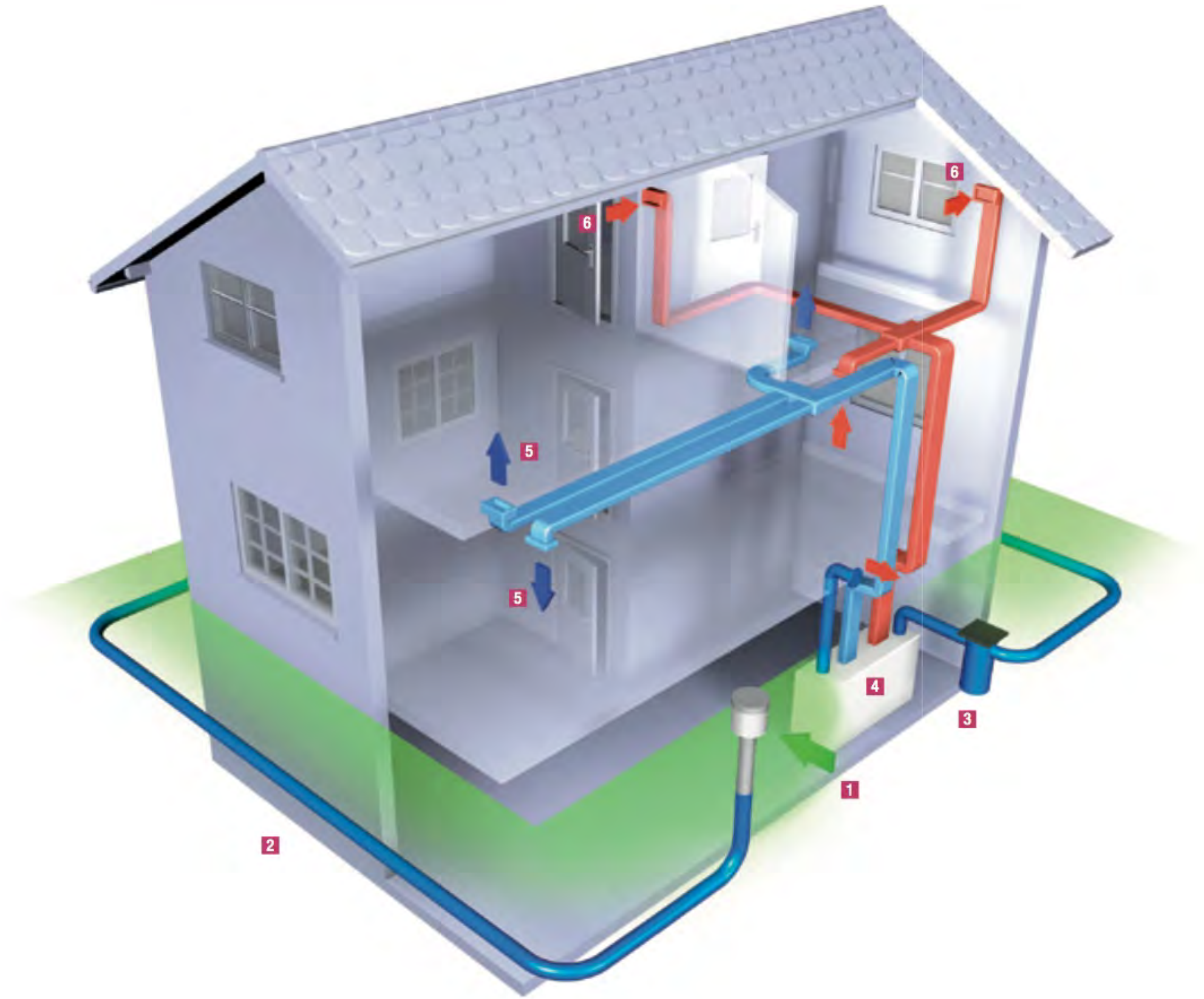
Block Reference: 000194				Block Name: Wolsley Mews			
Property-Survey Reference	**Multiplier (M)**	**Floor Area (F)**	**DFEE (D)**	**TFEE (T)**	**F x M**	**D x F x M**	**T x F x M**
005232-Unit 1	**1**	**109.4**	**42.60**	**44.19**	**109.40**	**4,660.77**	**4,834.74**
005233-Unit 2	**1**	**199.1**	**56.88**	**61.07**	**199.10**	**11,324.20**	**12,158.47**
Totals:	**2**	**308.5**	**99.48**	**105.26**	**308.50**	**15,984.96**	**16,993.21**
Average DFEE= 51.82				PASS			
Average TFEE= 55.08							

Appendix II

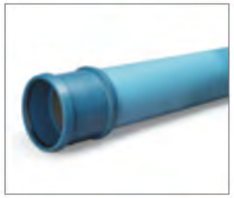
Ground Air Heat Exchanger details

AWADUKT THERMO

DOMESTIC APPLICATIONS



1 Air inlet tower
With a range of filters (G4 or F6) for hygienic, dust and pollen free air supply



2 AWADUKT Thermo Pipe System
- Solid walled PP pipe for optimised heat conductivity
- Antimicrobial inner layer to prevent microbial growth
- High longitudinal rigidity for reliable condensation discharge
- Radon-proof by virtue of special sealing system
- Wide range of fittings for layout flexibility

3 Condensation discharge
- This is installed towards the end of the system to remove any condensation formed during the heat transfer

4 Heat recovery unit

5 Distribution of fresh filtered air

6 Extraction of warm, stale air

Design Data for Ground Air Heat Exchanger

Office:	Contact:	Project Code:
Slough	Charlie Ward	866GA1251

Customer details

Name:	Street:	Town:	Country:	Postcode:
Buddy Haward	North St	London		N7 9DP
Tel.: 020 7267 9815	Fax:		E-Mail: buddy@burdhaward.com	

Building details:

Project location:	London		Building use:	House_	
Airflow rate:	400	[m³/h]	Bypass present:	☐	
Fan efficiency:	85	[%]	Cooling temperature limit:	____________	[°C]
Basement present:	☒		Heating temperature limit:	____________	[°C]
Basement internal temperature:	21	[°C]	Tolerance:	____________	[K]
U-value basement slab	0.24	[W/(m²*K)]			
Distance slab to GAHE:	0.9	[m]			

Climate data:

Climate region:	GBR_London.Gatwick_IWEC				
Max. temperature:	31.3	[°C]	Average temperature:	10.2	[°C]
Min. temperature:	-5.9	[°C]	Average humidity:	79.3	[%]

Ground data:

Type of ground:	slity clay		Groundwater present:	☐	
Thermal conductivity:	2.1000E+000	[W/(m*K)]	Depth of groundwater:	____________	[m]
Temperature conductivity:	9.5455E-007	[m²/s]	Kf-value:	____________	[m/s]
Density:	NaN	[kg/m³]			
Volume. heat capacity:	2.2000E+000	[MJ/(m³*K)]			
Specific heat capacity:	NaN	[MJ/(kg*K)]			

Please note that the energy savings and pressure losses for the Ground Air Heat Exchanger (GAHE) shown in the attachment have been calculated according to the information provided by you and the stated design conditions (eg climate file, soil type, ventilation rate).
Subject to the informations and design conditions and the system being installed and commissioned in accordance to the REHAU Guidelines the energy savings and pressure losses for the GAHE calculated by REHAU are correct.

Pipe data:

Pipe dimensions Heat Transfer pipe (OD x WT):	250.0 x 8.8	[mm x mm]	Installation depth:	4.4	[m]
Pipe dimensions Header pipe (OD x WT):	______	[mm x mm]			
Number of pipe runs:	______	[-]	Number of pipe layers:	______	[-]
Length from air inlet to grid:	______	[m]	Distance between pipe runs (horizontal):	______	[m]
Length from grid to air outlet:	______	[m]	Distance between pipe runs (vertical):	______	[m]

Number of bends	15° bend	30° bend	45° bend	88° bend	additional Zeta
Heat Transfer pipes	______	______	______	______	0
Header pipes	______	______	______	______	______

Air Inlet Tower:

Filter type:	KeinFilter	[-]	Additional pressure loss:	0	[Pa]

Design data:

Length Heat Transfer pipes:	24	[m]			
Heating gain:	1958.93	[kWh/a]	Cooling gain:	-720.96	[kWh/a]
Min. Temperature before GAHE:	-5.9	[°C]	Max. Temperature before GAHE:	31.3	[°C]
Min. Temperature after GAHE:	2.9	[°C]	Max. Temperature after GAHE	21.0	[°C]
CO2-savings Heating:	422.26	[kg/a]	CO2-savings Cooling:	108.66	[kg/a]
Building operating hours:	8760	[h/a]			
GAHE-operating hours:	8760	[h/a]	Bypass operating hours:	0	[h/a]
Heating period:	6011	[h/a]	Cooling period:	2749	[h/a]
Air velocity Heat Transfer pipes:	2.62	[m/s]	Air velocity Header pipe:	______	[m/s]

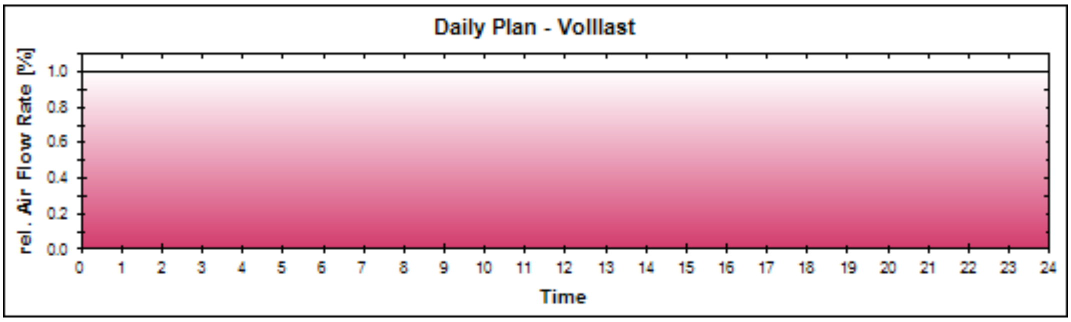
Pressure loss:

Heat Transfer pipes:	9.84	[Pa]	Header pipe:	0.00	[Pa]

	Zeta-Value		Pressure Loss	
Pipe @ 24 [m]		[-]	9.84	[Pa]
Air Inlet Tower		[-]	11.68	[Pa]
Total Pressure Loss		**[-]**	**21.52**	**[Pa]**

Attachments

Ventilation plan



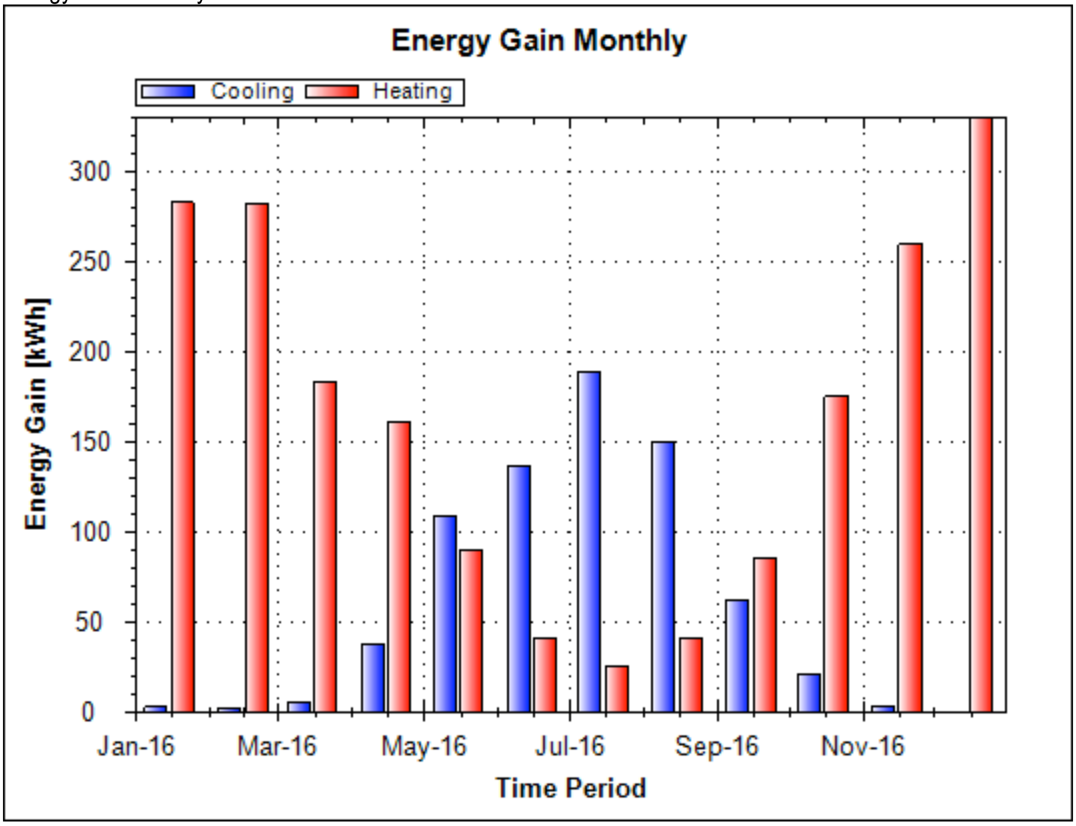
	January						February						March						April					
Mon		4	11	18	25		1	8	15	22	29			7	14	21	28			4	11	18	25	
Tue		5	12	19	26		2	9	16	23			1	8	15	22	29			5	12	19	26	
Wed		6	13	20	27		3	10	17	24			2	9	16	23	30			6	13	20	27	
Thu		7	14	21	28		4	11	18	25			3	10	17	24	31			7	14	21	28	
Fri	1	8	15	22	29		5	12	19	26			4	11	18	25			1	8	15	22	29	
Sat	2	9	16	23	30		6	13	20	27			5	12	19	26			2	9	16	23	30	
Sun	3	10	17	24	31		7	14	21	28			6	13	20	27			3	10	17	24		
	May						June						July						August					
Mon		2	9	16	23	30		6	13	20	27			4	11	18	25		1	8	15	22	29	
Tue		3	10	17	24	31		7	14	21	28			5	12	19	26		2	9	16	23	30	
Wed		4	11	18	25		1	8	15	22	29			6	13	20	27		3	10	17	24	31	
Thu		5	12	19	26		2	9	16	23	30			7	14	21	28		4	11	18	25		
Fri		6	13	20	27		3	10	17	24			1	8	15	22	29		5	12	19	26		
Sat		7	14	21	28		4	11	18	25			2	9	16	23	30		6	13	20	27		
Sun	1	8	15	22	29		5	12	19	26			3	10	17	24	31		7	14	21	28		
	September						October						November						December					
Mon		5	12	19	26			3	10	17	24	31		7	14	21	28			5	12	19	26	
Tue		6	13	20	27			4	11	18	25		1	8	15	22	29			6	13	20	27	
Wed		7	14	21	28			5	12	19	26		2	9	16	23	30			7	14	21	28	
Thu	1	8	15	22	29			6	13	20	27		3	10	17	24			1	8	15	22	29	
Fri	2	9	16	23	30			7	14	21	28		4	11	18	25			2	9	16	23	30	
Sat	3	10	17	24			1	8	15	22	29		5	12	19	26			3	10	17	24	31	
Sun	4	11	18	25			2	9	16	23	30		6	13	20	27			4	11	18	25		

Volllast

Attachments

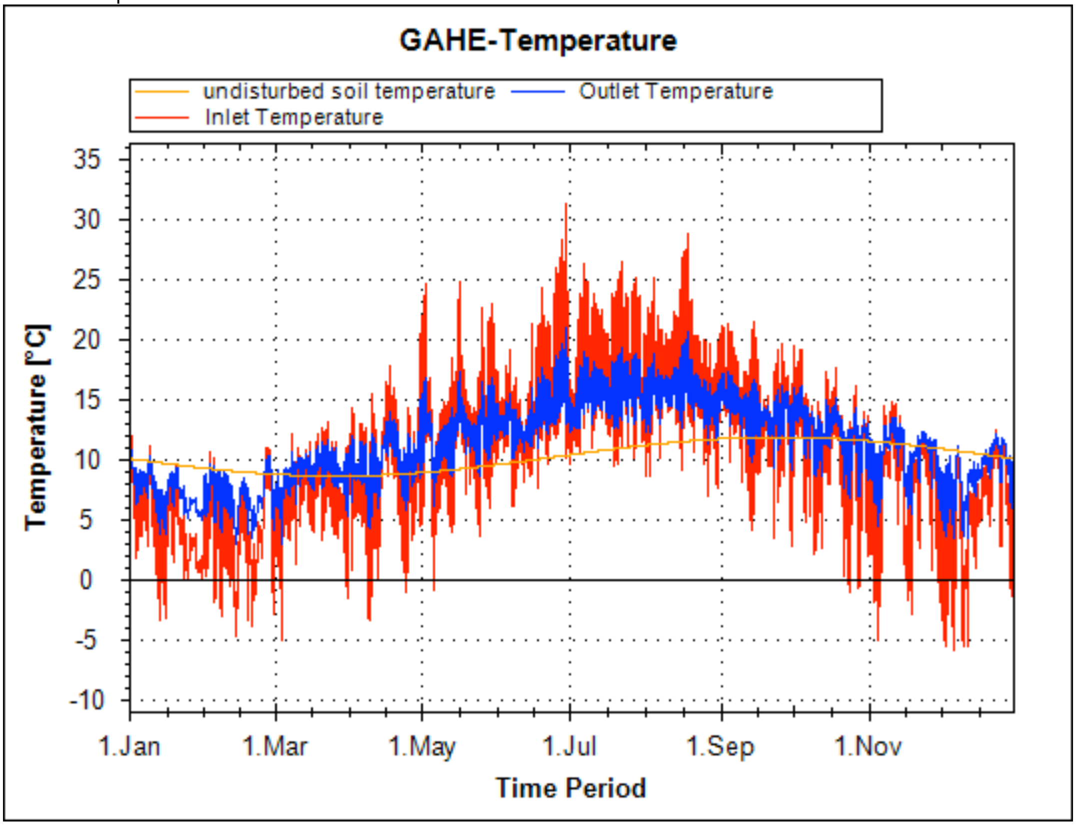
Diagramms

Energy Gain Monthly



Attachments

GAHE-Temperature



Please note that the energy savings and pressure losses for the Ground Air Heat Exchanger (GAHE) shown in the attachment have been calculated according to the information provided by you and the stated design conditions (eg climate file, soil type, ventilation rate).
Subject to the informations and design conditions and the system being installed and commissioned in accordance to the REHAU Guidelines the energy savings and pressure losses for the GAHE calculated by REHAU are correct.

Appendix III

Water Efficiency Calculations

breglobal

Job no: 1590
Date: 24/01/17
Assessor name: TS
Registration no:
Development name: Wolsey Mews

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WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS - (BASIC CALCULATOR)

	House Type:	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8		Type 9		Type 10	
	Description:	Unit 1		Unit 2																	
Installation Type	Unit of measure	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day
Is a dual or single flush WC specified?		Dual		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select	
WC	Full flush volume	3	4.38	3	4.38		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Part flush volume	4.5	13.32	4.5	13.32		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Taps (excluding kitchen and external taps)	Flow rate (litres / minute)	5	9.48	5	9.48		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Are both a Bath & Shower Present?		Bath & Shower		Shower only		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select	
Bath	Capacity to overflow	120	13.20		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Shower	Flow rate (litres / minute)	9	39.33	9	50.40		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Kitchen sink taps	Flow rate (litres / minute)	8	13.88	8	13.88		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a washing machine been specified?		No		No		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select	
Washing Machine	Litres / kg		17.16		17.16		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a dishwasher been specified?		No		No		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select		Click to Select	
Dishwasher	Litres / place setting		4.50		4.50		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a waste disposal unit been specified?		No	0.00	No	0.00	Click to Select	0.00	Click to Select	0.00	Click to Select	0.00	Click to Select	0.00	Click to Select	0.00	Click to Select	0.00	Click to Select	0.00	Click to Select	0.00
Water Softener	Litres / person / day		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Calculated Use			115.2		113.1		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
Normalisation factor			0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91
Code for Sustainable Homes	Total Consumption		104.9		102.9		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
	Mandatory level		Level 3/4		Level 3/4		-		-		-		-		-		-		-		-
Building Regulations 17.K	External use		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0
	Total Consumption		109.9		107.9		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
	17.K Compliance?		Yes		Yes		-		-		-		-		-		-		-		-

Job no:	1590
Date:	24/01/17
Assessor name:	TS
Registration no:	
Development name:	Wolsey Mews

Dwelling Type:	1	2	3	4	5	6	7	8	9	10
Dwelling type description:	Unit 1	Unit 2								
WC	15.47	15.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Taps (excluding kitchen taps)	9.48	9.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bath	13.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shower	39.33	50.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kitchen sink taps	13.88	13.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Washing machine	17.16	17.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dishwasher	4.50	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste Disposal Unit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water Softener	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution from Greywater										
Contribution from Rainwater										
Contribution from Grey/Rainwater (combined system)										
Normalisation factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Total Water Consumption	**102.9**	**100.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Code for Sustainable Homes - credits awarded	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CSH Mandatory Level	**Level 3/4**	**Level 3/4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
External Water Use	5	5	5	5	5	5	5	5	5	5
17. K - Litres/person/day	**107.9**	**105.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
17. K Compliance?	**Yes**	**Yes**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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