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26 Christchurch Hill

Sustainability Statement

Oct-16

Project	26 Christchurch Hill
MW Reference	J2233 26 Christchurch Hill
Location	Camden
Local Authority	London Borough of Camden
Report Scope	Sustainability Statement
Quantity of Residential Units	2
Other	N/A

Issue 01

Date 26/10/2016

Author Ana Petrovska

Signature *Ana Petrovska*

Checked by Alex Mozaffari

Signature

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Executive Summary

1.1 The proposed development comprises excavation of basement to provide additional accommodation to Grade II listed house.

1.2 Mendick Waring have been appointed to produce a Sustainability Strategy identifying how the development will address the targets set out by Building Regulations Part L1A, 2013 edition, for the newly constructed spaces within the basement.

1.3 In line with Building Control the strategy demonstrates that the new development (subject of the extension) will achieve compliance with 2013 Building Regulations through overall energy efficiency (DER < TER) and FEE (fabric energy efficiency).

1.4 It should be noted that this strategy has been completed as follows:

- All new fabric thermal elements proposed will be designed to achieve the following fabric performance, superseding the minimum standard as defined under Part L1A, 2013 edition (Table 1).

Building Element	New Elements Part L minimum standard U-value	Design U-values
Floors	0.25 W/m²K	0.13 W/m²K
Roofs	0.20 W/m²K	0.13 W/m²K
External Walls	0.30 W/m²K	0.14 -0.16 W/m²K
Glazing	2.00 W/m²K	1.4 W/m²K
Doors	2.00 W/m²K	1.5 W/m²K
Air permeability	10.0 m³/(h*m²)	5.00 m³/(h*m²)

- Approved Construction Details have been used for the thermal bridging calculations required under Part L 1A, 2013 edition.

  (Accredited Construction Details (ACDs) have been developed to assist the construction industry achieve the performance standards required to demonstrate compliance with the energy efficiency requirements (Part L) of the Building Regulations.)

- Efficient energy use and distribution is assured by specifying efficient heating, cooling and ventilation systems.

  Space heating will be provided by high efficient gas system boiler.

  Domestic hot water will be provided by the separate Hot Water Cylinders.

- The Heat Distribution System will be a Pre-insulated medium temp variable flow system.

- Heating emitter will be Underfloor Heating (UFH). The heating controls will have time and temperature zone control.
- Highly efficient whole house mechanical extract ventilation system is specified.
- Cooling is provided by high efficient air source heat pump ASHP (Energy label class A), via split and multi split system with variable speed compressor.
- Internal lighting to have luminous efficacy of ≥ 45 lumens/watt. 100% energy efficient lighting is specified.
- The predicted water use should be ≤125 litres/person/day.

The result of the calculations shows that the Dwelling Emissions Rate (DER) is 1.5% below the Target Emissions Rate (TER). The development therefore meets the Camden Local Development Framework (Core Strategy and Development Policy documents) as adopted on 8th November 2010, The London Plan 2015 Consolidated with Alterations (2011) and the NPPF (2012).

1 Introduction

1.1 Mendick Waring Ltd has been commissioned by Mr Ron Pascalovici to prepare a Sustainability Statement for the basement extension at 26 Christchurch Hill and have developed a strategy to comply with Building Regulations PART L1A - Conservation of fuel and power in new dwellings, 2013 edition.

1.2 In line with the above regulations, a fabric first approach has been followed prior to the consideration of energy efficient building services, incorporating passive measures such as: low U-values, low air leakage and low thermal bridging, approved accredited construction details. Energy efficient building services for heating, cooling and ventilation, with appropriate controls have been incorporated in the design to result in lower energy demand and CO_2 emissions for/from the development.

2 Site location and development proposal

2.1 26 Christchurch Hill is an early 19th (c.1812) century grade II listed detached house situated within the Hampstead Conservation Area. It is constructed with multi coloured stock brick of two storeys under a slated roof with 20th century parapets. The entrance is flanked by 2 storey late 19th century red brick bays. Within the curtilage lies a single storey former garage in the garden fronting Well Road. The house received a substantial side extension in 1973, a rear extension was added to this in 2005.

2.2 The development proposal comprises excavation of basement to provide additional accommodation to the Grade II listed house and installation of secondary glazing.

26 Christchurch Hill

Scale 1:1250

Figure 1 – Existing site

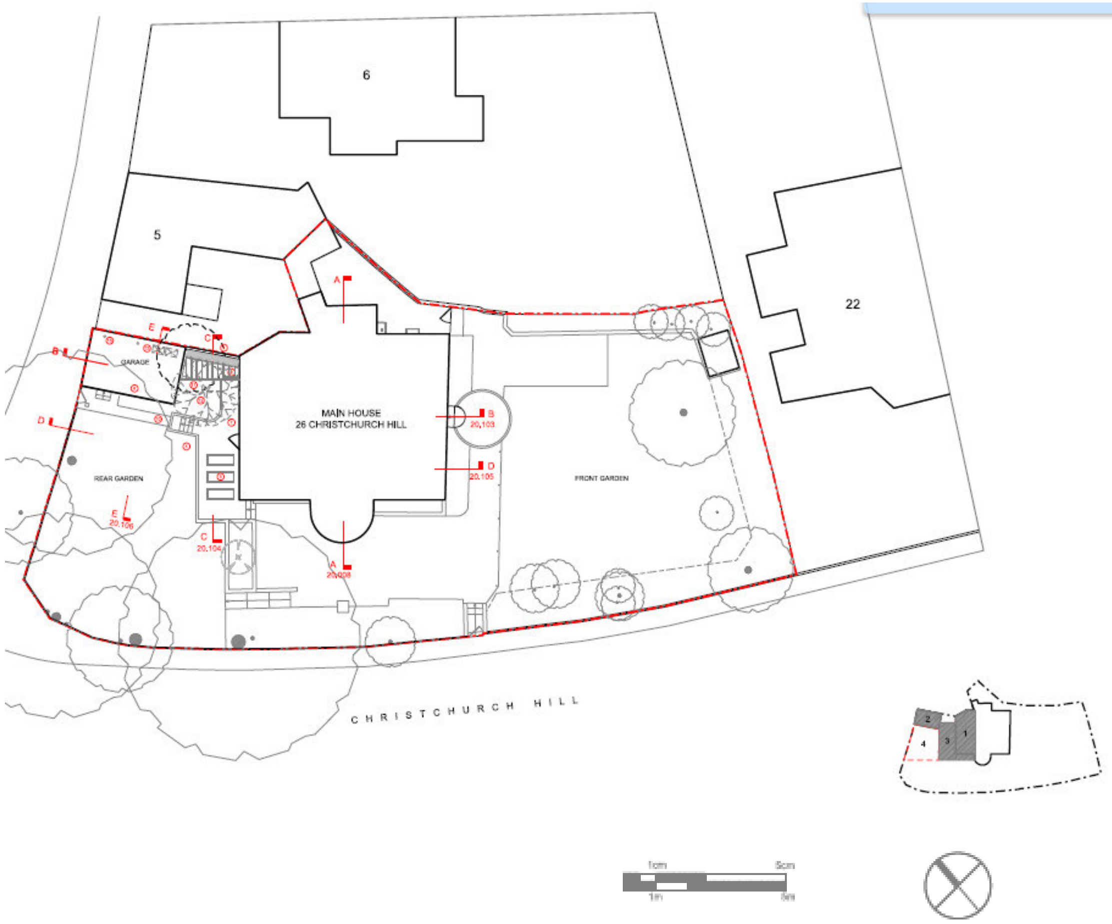

Figure 2 – Proposed Site Plan

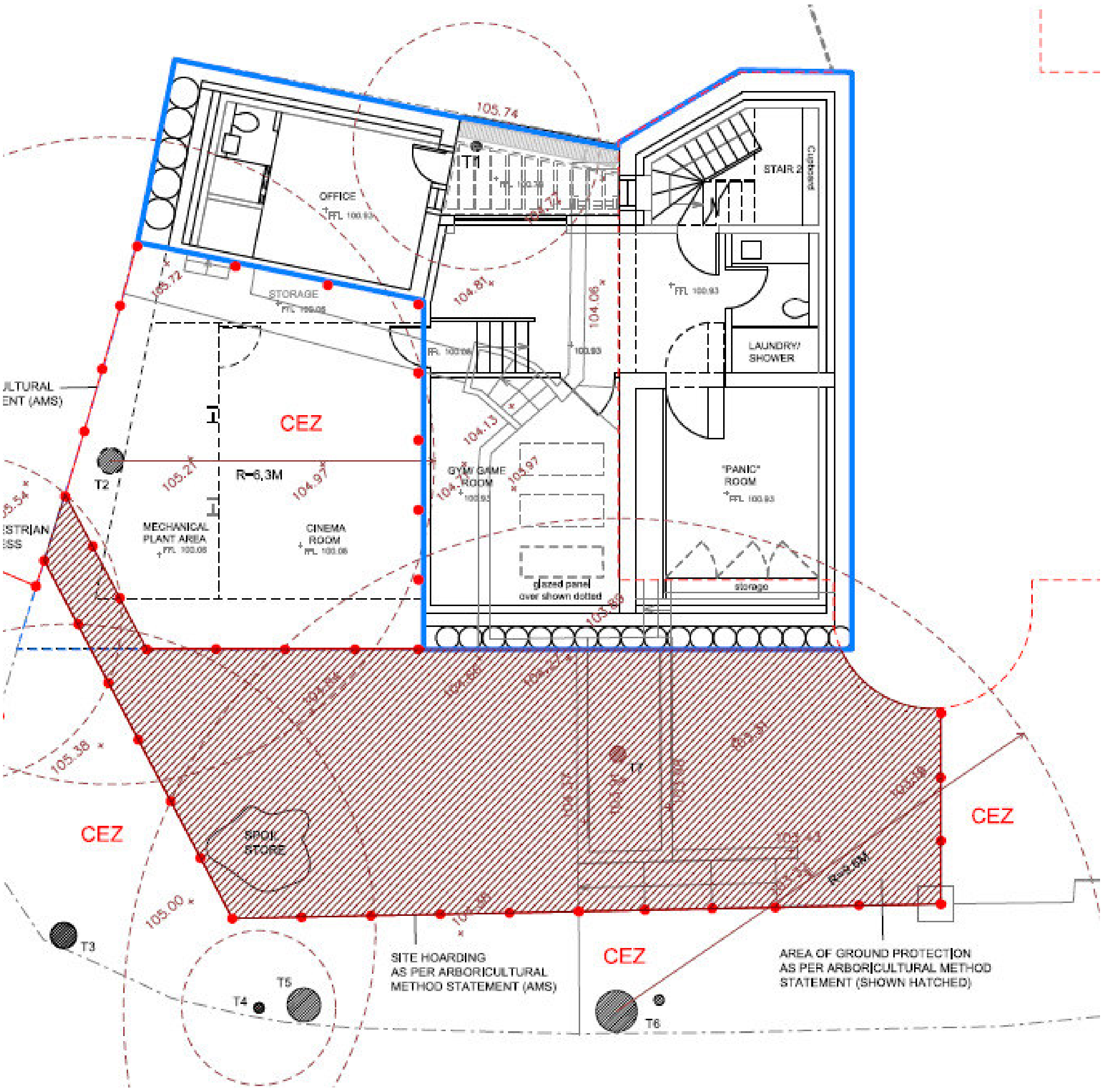

Figure 3 – Proposed Basement Floor Plan With Site Context

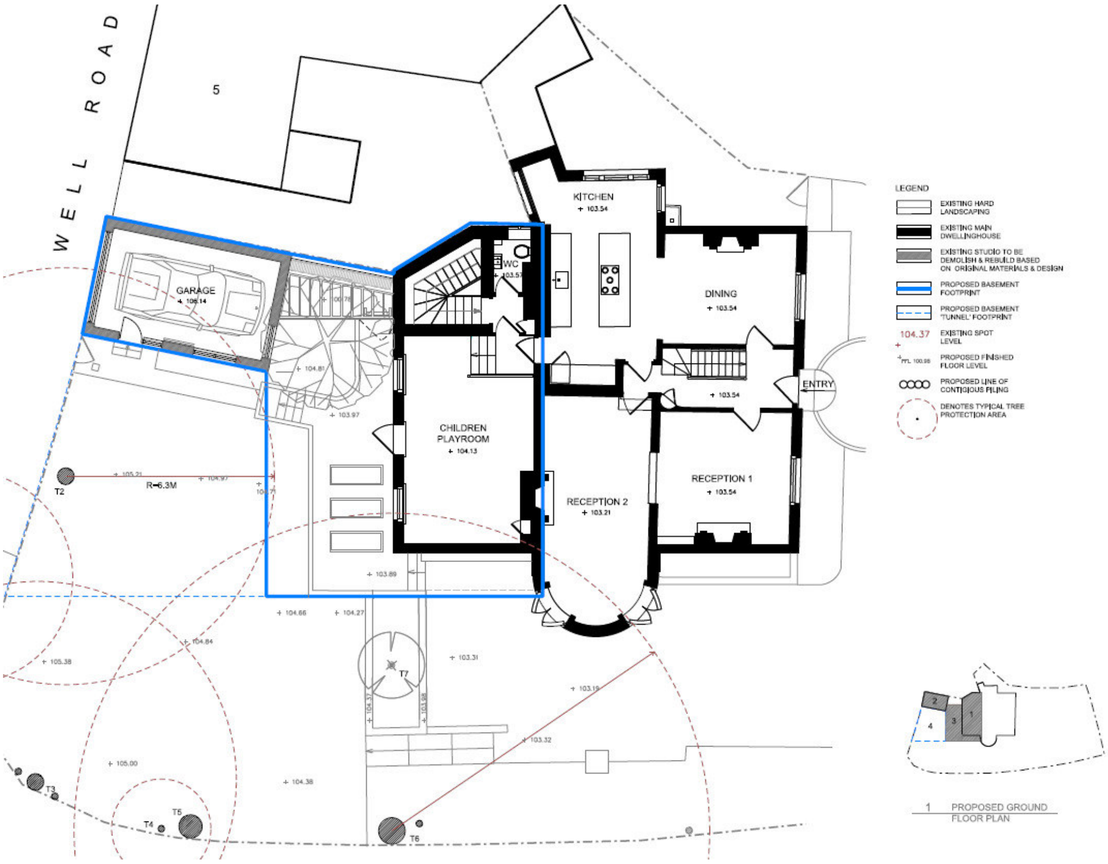

Figure 4 – Proposed Ground Floor Plan With Site Context

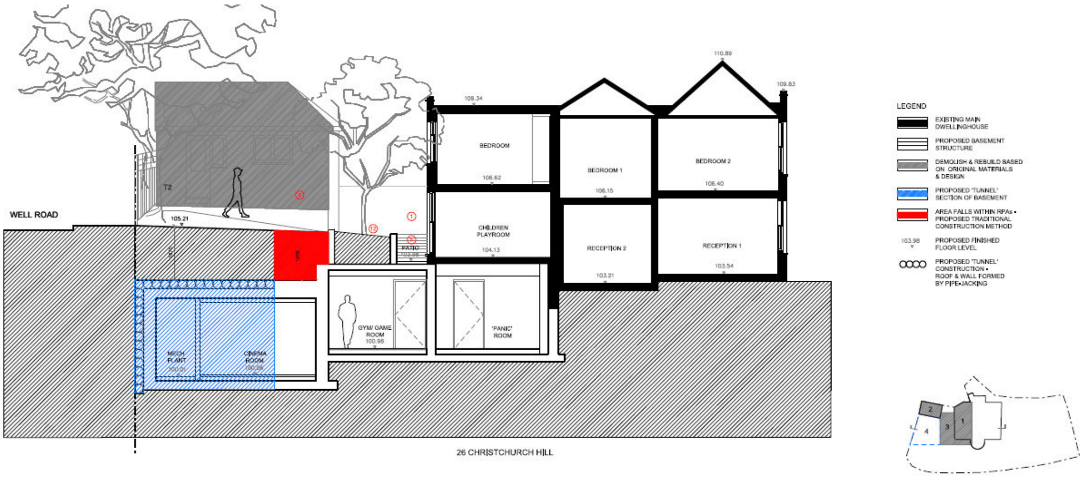

Figure 5 – Proposed Section B-B

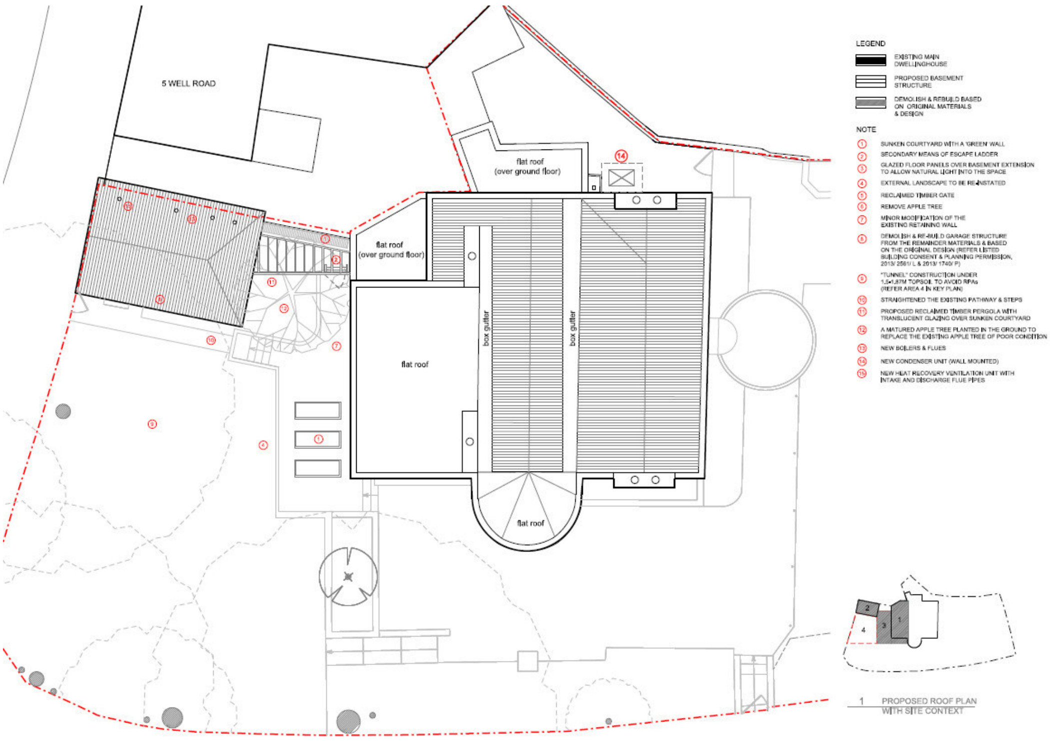

Figure 6 – Proposed Roof Plan

3 Planning Policy Guidance and Legislation

3.1 The relevant polices that would apply to this proposal are taken from the London Borough of Camden Local Development Framework (Core Strategy and Development Policy documents) as adopted on 8th November 2010, The London Plan 2015 Consolidated with Alterations (2011) and the NPPF (2012).

3.2 This development will conform to Building Regulations Part L1A, Edition 2013

Approved document Part L1A – Conservation of fuel and power sets, in new dwellings the standard for energy performance for new dwellings and was last revised in April 2014 (Part L: 2013). The proposed dwellings will need to comply with the criteria set out in the Approved Document, as follows:

1. The predicted Dwelling CO_2 Emission Rate (DER) must be no greater than the Target CO_2 Emission Rate (TER).

2. The performance of the building fabric and fixed building services should be no worse than the design limits set out in Table 2 of the Approved Document.

3. The dwellings will have appropriate passive control measures to limit the effect of solar gains on indoor temperatures in summer.

4. That the performance of dwellings as-built comply with the DER values achieved, including site testing of a representative sample of dwellings demonstrating that the 'air permeability' rate achieved is as per that specified, or better.

5. The necessary provisions for energy efficient operation of dwellings are put in place, including operation and maintenance instructions aimed at achieving economy in the use of fuel and power in a way that householders can understand.

Compliance with the Approved Document Part L1A should be demonstrated at detailed design stage, prior to construction.

4 Methodology

4.1 The Standard Assessment Procedure (SAP) is the Government's approved methodology for assessing the predicted energy consumption and carbon dioxide emissions of new dwellings. Results are derived in respect of floor area and consider energy use (kWh/m2/yr) and associated CO_2 emissions ($kg.CO_2/m^2/yr$) from the following:

Space heating

Domestic hot water

Ventilation

Lighting

4.2 SAP is compliant with the EU Energy Performance of Buildings Directive and is carried out using approved software. For the purposes of this report NHER Plan Assessor 6.2.1 has been used to generate the data.

4.3 Energy demand and resultant CO_2 emissions are estimated for the base case Target Emissions Rate (TER) and improved, through energy efficiency, Dwelling Emission Rate (DER). Low and zero-carbon energy technology is then applied to further enhance performance to meet the target.

4.4 Government approved software (NHER Plan Assessor 6.1) has been used to calculate energy consumption based on current SAP methodology (2012).

5 Energy Modelling

5.1 The proposed development looks to integrate low U-values, a high performance building thermal envelope for the built fabric and provide the necessary improvements to minimise CO_2 of the scheme.

5.2 Government approved software (NHER Plan Assessor 6.2.1) has been used to calculate energy consumption based on SAP methodology (2012) and Part L1A 2013 edition.

Fabric Efficiency

5.3 All new fabric elements proposed will be designed to achieve average fabric performance above the minimum standard as defined under AD Part L1A 2013 (Table 2).

Building Element	New Elements Part L minimum standard U-value	Design U-values
Floors	0.25 W/m^2K	0.13 W/m^2K
Roofs	0.20 W/m^2K	0.13 W/m^2K
External Walls	0.30 W/m^2K	0.14-0.16 W/m^2K
Glazing	2.00 W/m^2K	1.4 W/m^2K
Doors	2.00 W/m^2K	1.5 W/m^2K
Air permeability	10.0 $m^3/(h*m^2)$	5.00 $m^3/(h*m^2)$

5.4 Approved Construction Details have been used for the thermal bridging calculations required under Part L 2013 1A.

(Accredited Construction Details (ACDs) have been developed to assist the construction industry achieve the performance standards required to demonstrate compliance with the energy efficiency requirements (Part L) of the Building Regulations.)

5.5 Efficient energy use and distribution is assured by specifying efficient heating, cooling and ventilation systems.

Heating System

5.6 Space heating will be provided by high efficient gas system boiler.

5.7 Domestic hot water will be provided by the separate Hot Water Cylinder.

5.8 The Heat Distribution System should be a Pre-insulated medium temp variable flow system.

5.9 Heating emitters will be underfloor heating. Heating controls should have time and temperature zone control.

5.10 Internal lighting should be designed to have luminous efficacy of ≥ 45 lumens/watt. 100% energy efficient internal lighting.

Cooling

5.11 Cooling will be provided by Air Source Heat Pump to the spaces via Split and multi-split w/ Variable speed compressor (Energy label class A).

Ventilation

5.12 Whole house (MEV) mechanical extract ventilation system is specified.

Full Specification

5.13 The following specification has been used to model energy efficiency for the development:

Project: **Project No:** **Engineer:** **Date:** **Building Regs:** **Status:**	26 Christchurch Hill J2233 Zach Steels 06/10/2016 2013 Part L1A As Design	
Element	**U-Value (W/m²K)**	**Construction**
Basement Floor	0.13	Solid
External wall	0.16	solid brickwork
Basement Wall	0.14	solid reinforced concrete piled column (600dia) with 200mm thick blockwork wall and 100mm stud wall with insulation
Underground Roof	0.13	Solid
Roof	0.15	Flat
Doors	1.5	Aluminium double glazed doors
Windows	1.4	Aluminium double glazed windows
Building Service	**Detail**	
Ventilation	Whole house (MEV) mechanical extract ventilation system	
Dwelling Heating System	System gas boilers	
Heat Distribution System Heater Emitter Heating Controls Secondary Heating	Pre-insulated low temp variable flow (1991 or later) Underfloor Heating Time and temperature zone control None	

Hot water	System Hot water Cylinder
PV	N/A
Solar Water Heating	N/A
Other Renewables	N/A
Internal Lighting	100% have luminous efficacy of ≥ 45 lumens/watt
Miscellaneous	**Detail**
Electricity Tariff	Standard
Design air permeability	5 m^3/hm^2
Y-Value	ACD
Thermal Mass Parameter	Medium
Window Security Grilles	Installed to the windows of ground floor flats if required by building control
Window Ventilation	Fully open half the time
Window Shading	No Curtains
Cooling	ASHP via Split and multi-split w/ Variable speed compressor (Energy label class A)
Water use	≤125 litres/person/day

Figure 7 shows the Dwelling Emissions Rate (DER) vs Target Emissions Rate (TER)

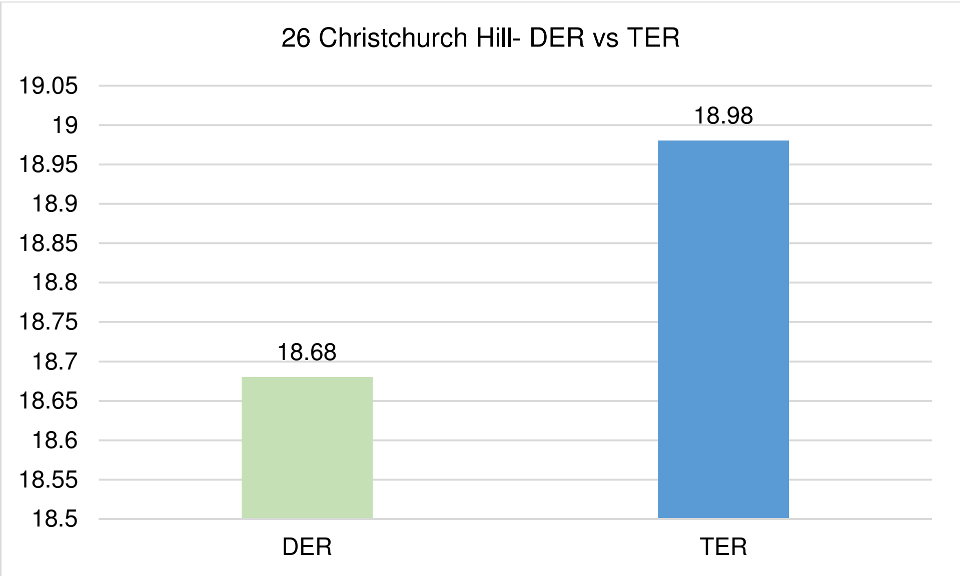

Figure 7 – DER vs TER

6 Conclusion

The strategy is based on Part L1A Conservation of fuel and power in new dwellings, 2013 edition, which supports the energy efficiency requirements of Building Regulations in terms of:

- Limiting heat gains and losses
- through thermal elements and other parts of the building fabric
- from pipes, ducts and vessels used for space heating, space cooling and hot water services
- Providing fixed building services which
- Are energy efficient
- Have effective controls
- Are commissioned and tested to ensure they use no more fuel and power than is reasonable in the circumstances
- New dwellings to achieve or better a fabric energy efficiency target in addition to the carbon dioxide target

The proposed passive measures used alongside the active measures proposed for the basement extension have resulted in decreasing the overall energy demand and related CO_2 emissions from the development.

The current proposal includes: high efficient boiler (89%) for space heating, high efficient cooling system, alongside controls across both, mechanical extract ventilation, highly insulated fabric elements with low U-values, low air permeability (low fabric leakage), 100% energy efficient internal lighting.

The Dwelling CO_2 Emission Rate (DER) of 18.68 is lower compared to the Target CO_2 Emission Rate (TER) of 18.96. This is due to the improved building fabric efficiency on the thermal envelope and efficient building services, which results in 1.5% reduction in CO_2 emissions when measured against Part L1A 2013 Building Regulations.

Appendix A- SAP Worksheet

This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Ms Ana Petrovska	Assessor number	2459
Client		Last modified	06/10/2016
Address	26 Christchurch Hill, London, NW3 1LG		

1. Overall dwelling dimensions

		Area (m²)			Average storey height (m)			Volume (m³)	
Lowest occupied		112.31	(1a)	x	2.90	(2a)	=	325.70	(3a)
Total floor area	(1a) + (1b) + (1c) + (1d)...(1n) =	112.31	(4)						
Dwelling volume							(3a) + (3b) + (3c) + (3d)...(3n) =	325.70	(5)

2. Ventilation rate

			m³ per hour	
Number of chimneys	0	x 40 =	0	(6a)
Number of open flues	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)

				Air changes per hour	
Infiltration due to chimneys, flues, fans, PSVs	(6a) + (6b) + (7a) + (7b) + (7c) =	0	÷ (5) =	0.00	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5.00	(17)
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)		0.25	(18)
Number of sides on which the dwelling is sheltered		2	(19)
Shelter factor	1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(18) x (20) =	0.21	(21)

Infiltration rate modified for monthly wind speed:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table U2	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	(22)
Wind factor (22)m ÷ 4	1.28	1.25	1.23	1.10	1.08	0.95	0.95	0.93	1.00	1.08	1.13	1.18	(22a)
Adjusted infiltration rate (allowing for shelter and wind factor) (21) x (22a)m	0.27	0.27	0.26	0.23	0.23	0.20	0.20	0.20	0.21	0.23	0.24	0.25	(22b)

Calculate effective air change rate for the applicable case:

If mechanical ventilation: air change rate through system	0.50	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor from Table 4h	76.50	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
a) If balanced mechanical ventilation with heat recovery (MVHR) (22b)m + (23b) x [1 - (23c) ÷ 100]	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.31	0.33	0.35	0.36	0.37	(24a)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in (25)	0.39	0.38	0.38	0.35	0.35	0.32	0.32	0.31	0.33	0.35	0.36	0.37	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²		U-value W/m²K		A x U W/K	κ-value, kJ/m².K	A x κ, kJ/K	
Window			12.38	x	1.33	=	16.41			(27)
Basement floor			112.31	x	0.13	=	14.60			(28)
External wall			156.06	x	0.14	=	21.85			(29a)
External wall			8.69	x	0.16	=	1.39			(29a)
Roof			26.79	x	0.15	=	4.02			(30)
Roof			36.39	x	0.13	=	4.73			(30)
Total area of external elements ∑A, m²			352.62							(31)

Fabric heat loss, W/K = ∑(A × U)	(26)...(30) + (32) =	63.00	(33)
Heat capacity Cm = ∑(A x κ)	(28)...(30) + (32) + (32a)...(32e) =	N/A	(34)
Thermal mass parameter (TMP) in kJ/m²K		250.00	(35)
Thermal bridges: ∑(L x Ψ) calculated using Appendix K		15.21	(36)
Total fabric heat loss	(33) + (36) =	78.22	(37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly 0.33 x (25)m x (5)	41.75	41.18	40.61	37.75	37.18	34.33	34.33	33.76	35.47	37.18	38.32	39.47	(38)
Heat transfer coefficient, W/K (37)m + (38)m	119.97	119.39	118.82	115.97	115.40	112.54	112.54	111.97	113.68	115.40	116.54	117.68	
Average = ∑(39)1...12/12 =												115.83	(39)
Heat loss parameter (HLP), W/m²K (39)m ÷ (4)	1.07	1.06	1.06	1.03	1.03	1.00	1.00	1.00	1.01	1.03	1.04	1.05	
Average = ∑(40)1...12/12 =												1.03	(40)
Number of days in month (Table 1a)	31.00	28.00	31.00	30.00	31.00	30.00	31.00	31.00	30.00	31.00	30.00	31.00	(40)

4. Water heating energy requirement

Assumed occupancy, N	2.83	(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	101.37	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	111.50	107.45	103.39	99.34	95.28	91.23	91.23	95.28	99.34	103.39	107.45	111.50	
∑(44)1...12 =												1216.38	(44)
Energy content of hot water used = 4.18 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)	165.35	144.62	149.23	130.11	124.84	107.73	99.83	114.55	115.92	135.09	147.46	160.14	
∑(45)1...12 =												1594.87	(45)
Distribution loss 0.15 x (45)m	24.80	21.69	22.39	19.52	18.73	16.16	14.97	17.18	17.39	20.26	22.12	24.02	(46)
Water storage loss calculated for each month (55) x (41)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
If the vessel contains dedicated solar storage or dedicated WWHRS (56)m x [(47) - Vs] ÷ (47), else (56)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
Primary circuit loss for each month from Table 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
Combi loss for each month from Table 3a, 3b or 3c	50.96	46.03	50.96	48.99	48.56	44.99	46.49	48.56	48.99	50.96	49.32	50.96	(61)

Total heat required for water heating calculated for each month 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m

216.31	190.65	200.19	179.09	173.40	152.72	146.31	163.11	164.91	186.05	196.78	211.10	(62)

Solar DHW input calculated using Appendix G or Appendix H

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(63)

Output from water heater for each month (kWh/month) (62)m + (63)m

216.31	190.65	200.19	179.09	173.40	152.72	146.31	163.11	164.91	186.05	196.78	211.10	

∑(64)1…12 = 2180.61 (64)

Heat gains from water heating (kWh/month) 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

67.72	59.59	62.36	55.51	53.65	47.07	44.81	50.23	50.79	57.66	61.36	65.99	(65)

5. Internal gains

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5)	169.68	169.68	169.68	169.68	169.68	169.68	169.68	169.68	169.68	169.68	169.68	169.68	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	69.27	61.53	50.04	37.88	28.32	23.91	25.83	33.58	45.07	57.22	66.79	71.20	(67)
Appliance gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	410.20	414.46	403.73	380.89	352.07	324.98	306.88	302.62	313.35	336.18	365.01	392.10	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	54.80	54.80	54.80	54.80	54.80	54.80	54.80	54.80	54.80	54.80	54.80	54.80	(69)
Pump and fan gains (Table 5a)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (Table 5)	-113.12	-113.12	-113.12	-113.12	-113.12	-113.12	-113.12	-113.12	-113.12	-113.12	-113.12	-113.12	(71)
Water heating gains (Table 5)	91.02	88.68	83.82	77.09	72.11	65.37	60.23	67.51	70.54	77.50	85.22	88.69	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m	684.85	679.02	651.94	610.22	566.85	528.61	507.30	518.06	543.31	585.26	631.37	666.34	(73)

6. Solar gains

	Access factor Table 6d		Area m²		Solar flux W/m²		g specific data or Table 6b		FF specific data or Table 6c		Gains W	
SouthEast	0.77	x	3.11	x	36.79	x 0.9 x	0.63	x	0.70	=	34.97	(77)
NorthEast	0.77	x	7.66	x	11.28	x 0.9 x	0.63	x	0.70	=	26.41	(75)
NorthWest	0.77	x	1.61	x	11.28	x 0.9 x	0.63	x	0.70	=	5.55	(81)

Solar gains in watts ∑(74)m…(82)m

66.94	124.63	198.73	293.51	371.90	388.19	366.36	304.97	231.10	145.35	82.11	56.03	(83)

Total gains - internal and solar (73)m + (83)m

751.78	803.65	850.67	903.73	938.75	916.80	873.66	823.04	774.41	730.61	713.48	722.37	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area n1,m (see Table 9a)	1.00	0.99	0.99	0.97	0.90	0.73	0.56	0.61	0.85	0.97	0.99	1.00	(86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	20.15	20.23	20.39	20.61	20.80	20.92	20.95	20.94	20.87	20.64	20.37	20.15	(87)
Temperature during heating periods in the rest of dwelling from Table 9, Th2(˚C)	20.03	20.03	20.04	20.06	20.06	20.08	20.08	20.09	20.07	20.06	20.05	20.04	(88)

Utilisation factor for gains for rest of dwelling n2,m

1.00	0.99	0.98	0.95	0.86	0.65	0.45	0.50	0.79	0.96	0.99	1.00	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

18.89	19.02	19.24	19.58	19.84	19.99	20.01	20.01	19.94	19.62	19.23	18.90	(90)

Living area fraction — Living area ÷ (4) = 0.00 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

18.89	19.02	19.24	19.58	19.84	19.99	20.01	20.01	19.94	19.62	19.23	18.90	(92)

Apply adjustment to the mean internal temperature from Table 4e where appropriate

18.74	18.87	19.09	19.43	19.69	19.84	19.86	19.86	19.79	19.47	19.08	18.75	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, ηm	0.99	0.99	0.98	0.94	0.84	0.62	0.42	0.47	0.76	0.95	0.99	0.99	(94)
Useful gains, ηmGm, W (94)m x (84)m	746.80	795.21	832.54	851.15	787.13	570.97	365.11	384.63	590.28	693.87	704.43	718.47	(95)
Monthly average external temperature from Table U1	4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature, Lm, W [(39)m x [(93)m - (96)m]	1732.43	1667.38	1496.12	1220.92	921.82	589.58	366.73	387.58	646.45	1023.83	1395.79	1712.13	(97)
Space heating requirement, kWh/month 0.024 x [(97)m - (95)m] x (41)m	733.30	586.10	493.71	266.24	100.21	0.00	0.00	0.00	0.00	245.48	497.77	739.29	

∑(98)1...5, 10...12 = 3662.10 (98)

Space heating requirement kWh/m²/year — (98) ÷ (4) 32.61 (99)

8c. Space cooling requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm	0.00	0.00	0.00	0.00	0.00	1057.90	832.81	850.98	0.00	0.00	0.00	0.00	(100)
Utilisation factor for loss ηm	0.00	0.00	0.00	0.00	0.00	0.81	0.89	0.86	0.00	0.00	0.00	0.00	(101)
Useful loss ηmLm (watts) (100)m x (101)m	0.00	0.00	0.00	0.00	0.00	861.50	743.31	731.35	0.00	0.00	0.00	0.00	(102)
Gains	0.00	0.00	0.00	0.00	0.00	979.34	932.51	871.52	0.00	0.00	0.00	0.00	(103)
Space cooling requirement, whole dwelling, continuous (kWh) 0.024 x [(103)m - (102)m] x (41)m	0.00	0.00	0.00	0.00	0.00	84.85	140.76	104.29	0.00	0.00	0.00	0.00	

∑(104)6...8 = 329.90 (104)

Cooled fraction — cooled area ÷ (4) = 0.51 (105)

Intermittency factor (Table 10)

0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.00	0.00	0.00	0.00

∑(106)6...8 = 0.75 (106)

Space cooling requirement (104)m x (105) x (106)m

0.00	0.00	0.00	0.00	0.00	10.92	18.12	13.42	0.00	0.00	0.00	0.00

∑(107)6...8 = 42.47 (107)

Space cooling requirement kWh/m²/year — (107) ÷ (4) = 0.38 (108)

9a. Energy requirements - individual heating systems including micro-CHP

Space heating

Fraction of space heat from secondary/supplementary system (table 11)		0.00	(201)
Fraction of space heat from main system(s)	1 - (201) =	1.00	(202)
Fraction of space heat from main system 2		0.00	(202)
Fraction of total space heat from main system 1	(202) x [1- (203)] =	1.00	(204)
Fraction of total space heat from main system 2	(202) x (203) =	0.00	(205)
Efficiency of main system 1 (%)		89.80	(206)
Cooling system energy efficiency ratio (Table 10c)		4.32	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating fuel (main system 1), kWh/month	816.59	652.67	549.79	296.48	111.60	0.00	0.00	0.00	0.00	273.37	554.32	823.26	
∑(211)1...5, 10...12 = 4078.07													(211)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Efficiency of water heater	87.50	87.32	86.90	85.81	83.67	80.50	80.50	80.50	80.50	85.54	86.95	87.55	(217)
Water heating fuel, kWh/month	247.22	218.32	230.36	208.70	207.23	189.71	181.76	202.62	204.85	217.50	226.30	241.10	
∑(219a)1...12 = 2575.68													(219)
Space cooling fuel, kWh/month	0.00	0.00	0.00	0.00	0.00	2.53	4.19	3.11	0.00	0.00	0.00	0.00	
∑(221)6...8 = 9.83													(221)

Annual totals

Space heating fuel - main system 1			4078.07	
Water heating fuel			2575.68	
Space cooling fuel			9.83	
Electricity for pumps, fans and electric keep-hot (Table 4f)				
mechanical ventilation fans - balanced, extract or positive input from outside	268.21			(230a)
central heating pump or water pump within warm air heating unit	30.00			(230c)
boiler flue fan	45.00			(230e)
Total electricity for the above, kWh/year			343.21	(231)
Electricity for lighting (Appendix L)			489.34	(232)
Total delivered energy for all uses		(211)...(221) + (231) + (232)...(237b) =	7496.13	(238)

10a. Fuel costs - individual heating systems including micro-CHP

	Fuel kWh/year		Fuel price		Fuel cost £/year	
Space heating - main system 1	4078.07	x	3.48	x 0.01 =	141.92	(240)
Water heating	2575.68	x	3.48	x 0.01 =	89.63	(247)
Space cooling	9.83	x	13.19	x 0.01 =	1.30	(248)
Pumps and fans	343.21	x	13.19	x 0.01 =	45.27	(249)
Electricity for lighting	489.34	x	13.19	x 0.01 =	64.54	(250)
Additional standing charges					120.00	(251)
Total energy cost				(240)...(242) + (245)...(254) =	462.66	(255)

11a. SAP rating - individual heating systems including micro-CHP

Energy cost deflator (Table 12)	0.42	(256)
Energy cost factor (ECF)	1.24	(257)
SAP value	82.77	
SAP rating (section 13)	83	(258)
SAP band	B	

12a. CO_2 emissions - individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO_2/kWh		Emissions kg CO_2/year	
Space heating - main system 1	4078.07	x	0.22	=	880.86	(261)
Water heating	2575.68	x	0.22	=	556.35	(264)
Space and water heating			(261) + (262) + (263) + (264) =		1437.21	(265)
Space cooling	9.83	x	0.52	=	5.10	(266)
Pumps and fans	343.21	x	0.52	=	178.13	(267)
Electricity for lighting	489.34	x	0.52	=	253.97	(268)
Total CO_2, kg/year			(265)...(271) =		1874.41	(272)
Dwelling CO_2 emission rate			(272) ÷ (4) =		16.69	(273)
EI value					84.03	
EI rating (section 14)					84	(274)
EI band					B	

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

	Energy kWh/year		Primary factor		Primary Energy kWh/year	
Space heating - main system 1	4078.07	x	1.22	=	4975.24	(261)
Water heating	2575.68	x	1.22	=	3142.33	(264)
Space and water heating			(261) + (262) + (263) + (264) =		8117.57	(265)
Space cooling	9.83	x	3.07	=	30.18	(266)
Pumps and fans	343.21	x	3.07	=	1053.66	(267)
Electricity for lighting	489.34	x	3.07	=	1502.27	(268)
Primary energy kWh/year					10703.69	(272)
Dwelling primary energy rate kWh/m2/year					95.30	(273)

Appendix B- Building Regulations Compliance Report

L1A 2013 - Regulations Compliance Report

Design - Draft

This design draft submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix C of AD L1A. It has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the 'as built' property. This report covers only items included within the SAP and is not a complete report of regulations compliance.

Assessor name	Ms Ana Petrovska	Assessor number	2459
Client		Last modified	06/10/2016
Address	26 Christchurch Hill, London, NW3 1LG		

Check	Evidence	Produced by	OK?
Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target			
TER (kg CO_2/m^2.a)	Fuel = N/A Fuel factor = 1.00 TER = 18.96	Authorised SAP Assessor	
DER for dwelling as designed (kg CO_2/m^2.a)	DER = 18.68	Authorised SAP Assessor	
Are emissions from dwelling as designed less than or equal to the target?	DER 18.68 < TER 18.96	Authorised SAP Assessor	Passed
Is the fabric energy efficiency of the dwellling as designed less than or equal to the target?	DFEE 56.06 < TFEE 63.17	Authorised SAP Assessor	Passed
Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits			
Fabric U-values			
Are all U-values better than the design limits in Table 2?	**Element** / **Weighted average** / **Highest** Wall: 0.14 (max 0.30) / 0.16 (max 0.70) Party wall: (no party wall) Floor: 0.13 (max 0.25) / 0.13 (max 0.70) Roof: 0.14 (max 0.20) / 0.15 (max 0.35) Openings: 1.40 (max 2.00) / 1.40 (max 3.30)	Authorised SAP Assessor	Passed
Thermal bridging			
How has the loss from thermal bridges been calculated?	Thermal bridging calculated from linear thermal transmittances for each junction	Authorised SAP Assessor	
Heating and hot water systems			
Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide?	Main heating system: Mains gas, Combi boiler asdf Data from manufacturer Efficiency = 89.00% 2009 SEDBUK Minimum = 88.00% Secondary heating system: None	Authorised SAP Assessor	Passed
Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide?	No hot water cylinder	Authorised SAP Assessor	
Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide?	Space heating control: Time and temperature zone control - plumbing circuit Hot water control: No hot water cylinder Boiler interlock (main system 1)	Authorised SAP Assessor	Passed

Check	Evidence	Produced by	OK?
Fixed internal lighting			
Does fixed internal lighting comply with paragraphs 42 to 44?	Schedule of installed fixed internal lighting Standard lights = 0 Low energy lights = 10 Percentage of low energy lights = 100% Minimum = 75 %	Authorised SAP Assessor	Passed
Criterion 3: the dwelling has appropriate passive control measures to limit solar gains			
Does the dwelling have a strong tendency to high summertime temperatures?	Overheating risk (June) = Not significant (18.61°) Overheating risk (July) = Not significant (20.39°) Overheating risk (August) = Not significant (20.17°) Region = Thames Thermal mass parameter = 250.00 Ventilation rate in hot weather = 3.00 ach Blinds/curtains = Dark-coloured curtain or roller blind	Authorised SAP Assessor	Passed
Criterion 4: the performance of the dwelling, as designed, is consistent with the DER			
Design air permeability ($m^3/(h.m^2)$ at 50Pa)	Design air permeability = 5.00 Max air permeability = 10.00	Authorised SAP Assessor	Passed
Mechanical ventilation system Specific fan power (SFP)	Mechanical ventilation with heat recovery: SFP = 0.54 W/(litre/sec) Max SFP = 1.5 W/(litre/sec) Heat recovery efficiency = 90.00 % Min heat recovery efficiency = 70.00 %	Authorised SAP Assessor	Passed
Have the key features of the design been included (or bettered) in practice?	The following walls have a U-value less than $0.15W/m^2K$: • Basement Underground (0.14) Space cooling is specified	Authorised SAP Assessor	