elmhurst energy

SAP Report Submission for Building Regulations Compliance

Client: Goater Jones

Project: adjacent to , 2, Mount Ararat Road
RICHMOND, Surrey, TW10 6PA

Contact: Gary White
Hibec Limited
gary_hibec@btconnect.com

Report Issue Date: 19/11/2019

EXCELLENCE IN ENERGY ASSESSMENT

PREDICTED ENERGY ASSESSMENT

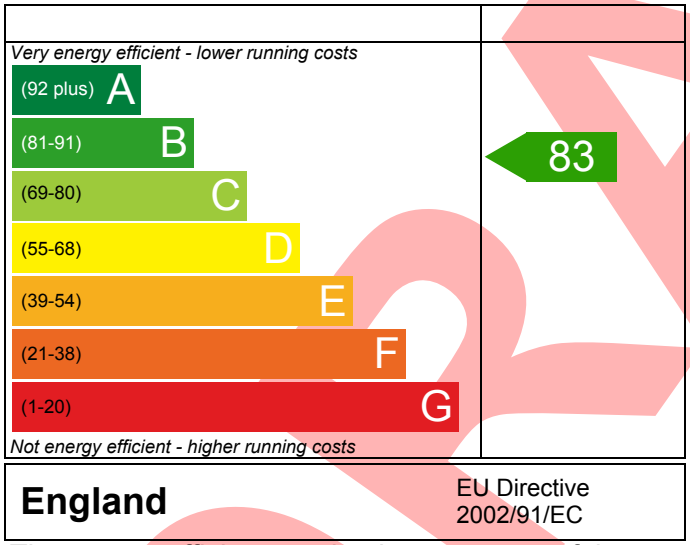
adjacent to , 2, Mount Ararat Road,
RICHMOND,
Surrey,
TW10 6PA

Dwelling type:	House, Detached
Date of assessment:	19/11/2019
Produced by:	Hibec Limited
Total floor area:	296.31 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

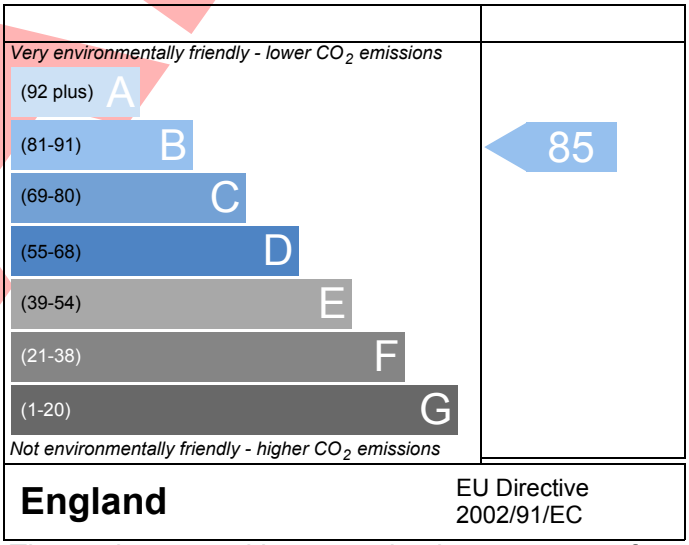
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

THERMAL BRIDGING
Calculation Type: New Build (As Designed)

Property Reference	C1920261	**Issued on Date**	19/11/2019
Assessment Reference	As Designed with ASHP	**Prop Type Ref**	
Property	adjacent to , 2, Mount Ararat Road, RICHMOND, Surrey, TW10 6PA		

SAP Rating	83 B	**DER**	13.61	**TER**	22.21
Environmental	85 B	**% DER<TER**	38.72		
CO_2 Emissions (t/year)	3.26	**DFEE**	60.19	**TFEE**	62.96
General Requirements Compliance	Pass	**% DFEE<TFEE**	4.39		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	Goater Jones, 049		

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	40.63	12.19	
External wall	E3 Sill	Table K1 - Approved	0.040	9.72	0.39	
External wall	E4 Jamb	Table K1 - Approved	0.050	66.24	3.31	
External wall	E5 Ground floor (normal)	Table K1 - Approved	0.160	70.59	11.29	
External wall	E6 Intermediate floor within a dwelling	Table K1 - Approved	0.070	41.66	2.92	
External wall	E14 Flat roof	Table K1 - Default	0.080	99.09	7.93	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	26.68	2.40	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	10.99	-0.99	
External roof	R1 Head of roof window	Table K1 - Default	0.080	2.52	0.20	
External roof	R2 Sill of roof window	Table K1 - Default	0.060	2.52	0.15	
External roof	R3 Jamb of roof window	Table K1 - Default	0.080	16.70	1.34	

Total: **41.13** **W/mK:**

Y-Value: **0.058** **W/m²K:**

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS DESIGNED

Detached House, total floor area 296 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.21 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.61 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)63.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)60.2 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	0.20 (max. 0.25)	0.20 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.39 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

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3 Air permeability
Air permeability at 50 pascals: 5.00 (design value)
Maximum 10.0 OK

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4 Heating efficiency
Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi ECODAN 14kW PUHZ-HW140-VHA(2)-BS

Secondary heating system: None

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5 Cylinder insulation
Hot water storage Measured cylinder loss: 1.90 kWh/day
Permitted by DBSCG 2.30 OK
Primary pipework insulated: Yes OK

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

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

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

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8 Mechanical ventilation
Not applicable

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9 Summertime temperature
Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North East: 23.70 m², No overhang
Windows facing South East: 20.36 m², No overhang
Windows facing South West: 27.03 m², No overhang
Windows facing North West: 19.55 m², No overhang
Air change rate: 8.00 ach
Blinds/curtains: None

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10 Key features
None

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	196.7500	(1a)	x 2.5700	(2a) =	505.6475	(1a) - (3a)
Ground floor	99.5600	(1b)	x 3.2800	(2b) =	326.5568	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	296.3100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		832.2043	(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							5 * 10 =	50.0000	(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) =	50.0000 / (5) =	0.0601	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3101	(18)
Number of sides 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) =	0.2636	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3361	0.3295	0.3229	0.2899	0.2833	0.2504	0.2504	0.2438	0.2636	0.2833	0.2965	0.3097	(22b)
Effective ac	0.5565	0.5543	0.5521	0.5420	0.5401	0.5313	0.5313	0.5297	0.5347	0.5401	0.5440	0.5480	(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			2.4000	1.2000	2.8800			(26)
window (Uw = 1.40)			59.6600	1.3258	79.0947			(27)
glazed doors (Uw = 1.40)			30.9800	1.3258	41.0720			(27)
roof light (Uw = 1.30)			5.6200	1.2357	6.9449			(27a)
Heat Loss Floor			196.7500	0.2000	39.3500			(28a)
External Wall - basement	124.0800		124.0800	0.1800	22.3344			(29a)
External Wall	193.9800	93.0400	100.9400	0.1800	18.1692			(29a)
External Roof	196.7500	5.6200	191.1300	0.1300	24.8469			(30)
Total net area of external elements Aum(A, m2)			711.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		234.6920			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							41.1285	(36)
Total fabric heat loss					(33) + (36) =		275.8205	(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	152.8206	152.2184	151.6282	148.8559	148.3372	145.9227	145.9227	145.4755	146.8527	148.3372	149.3865	150.4835	(38)
Heat transfer coeff	428.6411	428.0389	427.4487	424.6764	424.1578	421.7432	421.7432	421.2961	422.6733	424.1578	425.2070	426.3040	(39)
Average = Sum(39)m / 12 =												424.6740	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4466	1.4446	1.4426	1.4332	1.4315	1.4233	1.4233	1.4218	1.4265	1.4315	1.4350	1.4387	(40)
HLP (average)												1.4332	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		3.1271 (42)
Average daily hot water use (litres/day)		108.4694 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.3163	114.9776	110.6388	106.3000	101.9612	97.6225	97.6225	101.9612	106.3000	110.6388	114.9776	119.3163	(44)
Energy conte	176.9427	154.7552	159.6935	139.2247	133.5894	115.2775	106.8215	122.5793	124.0433	144.5605	157.7991	171.3596	(45)
Energy content (annual)										Total = Sum(45)m =		1706.6462	(45)
Distribution loss (46)m = 0.15 x (45)m	26.5414	23.2133	23.9540	20.8837	20.0384	17.2916	16.0232	18.3869	18.6065	21.6841	23.6699	25.7039	(46)
Water storage loss:													

Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0260	(55)
Total storage loss													
	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060	(56)
If cylinder contains dedicated solar storage													
	31.8060	28.7280	31.8060	30.7800	31.8060	30.7800	31.8060	31.8060	30.7800	31.8060	30.7800	31.8060	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	232.0111	204.4944	214.7619	192.5167	188.6578	168.5695	161.8899	177.6477	177.3353	199.6289	211.0911	226.4280	(62)
Solar input	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)
Output from w/h													
	232.0111	204.4944	214.7619	192.5167	188.6578	168.5695	161.8899	177.6477	177.3353	199.6289	211.0911	226.4280	(64)
								Total per year (kWh/year) = Sum(64)m =				2355.0322	(64)
Heat gains from water heating, kWh/month													
	102.8882	91.2475	97.1528	88.9258	88.4732	80.9634	79.5729	84.8123	83.8780	92.1211	95.1018	101.0318	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5876	36.0496	29.3175	22.1952	16.5912	14.0070	15.1350	19.6731	26.4052	33.5274	39.1315	41.7157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	455.2696	459.9939	448.0889	422.7445	390.7518	360.6831	340.5954	335.8712	347.7762	373.1206	405.1133	435.1819	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	(69)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)													
	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	(71)
Water heating gains (Table 5)													
	138.2905	135.7849	130.5817	123.5081	118.9156	112.4491	106.9528	113.9951	116.4972	123.8186	132.0858	135.7954	(72)
Total internal gains													
	704.0548	701.7354	677.8951	638.3548	596.1655	557.0462	532.5903	539.4463	560.5856	600.3736	646.2375	682.6000	(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	
Northeast	13.0700	11.2829	0.6300	0.7000	0.7700	45.0682	(75)
Southeast	20.3600	36.7938	0.6300	0.7000	0.7700	228.9416	(77)
Southwest	14.6300	36.7938	0.6300	0.7000	0.7700	164.5096	(79)
Northwest	11.6000	11.2829	0.6300	0.7000	0.7700	39.9993	(81)
Northeast	10.6300	11.2829	0.6300	0.7000	0.7700	36.6545	(75)
Southwest	12.4000	36.7938	0.6300	0.7000	0.7700	139.4340	(79)
Northwest	7.9500	11.2829	0.6300	0.7000	0.7700	27.4133	(81)
Horizontal	5.6200	26.0000	0.6300	0.7000	1.0000	57.9950	(82)

Solar gains	740.0153	1331.7208	2003.0258	2771.6538	3359.2929	3444.4886	3275.4817	2822.0536	2267.7402	1521.4060	899.5333	624.6721	(83)
Total gains	1444.0701	2033.4561	2680.9208	3410.0086	3955.4585	4001.5349	3808.0720	3361.4999	2828.3258	2121.7796	1545.7709	1307.2720	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.0054	48.0729	48.1393	48.4536	48.5128	48.7906	48.7906	48.8423	48.6832	48.5128	48.3931	48.2686	
alpha	4.2004	4.2049	4.2093	4.2302	4.2342	4.2527	4.2527	4.2562	4.2455	4.2342	4.2262	4.2179	
util living area													
	0.9990	0.9958	0.9831	0.9328	0.8078	0.6274	0.4753	0.5517	0.8216	0.9761	0.9974	0.9994	(86)
Tweekday	17.9254	18.2057	18.6328	19.1455	19.4918	19.6268	19.6490	19.6467	19.5480	19.0386	18.3741	17.8814	
Tweekend	20.1250	20.2486	20.4387	20.6725	20.8491	20.9313	20.9521	20.9467	20.8720	20.6166	20.3204	20.1036	
24 / 16	9	8	9	8	9	9	9	9	8	9	8	9	
24 / 9	22	20	22	22	22	21	22	22	22	22	22	22	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	(87)
Th 2	19.7278	19.7293	19.7308	19.7380	19.7393	19.7455	19.7455	19.7467	19.7431	19.7393	19.7366	19.7338	(88)
util rest of house													
	0.9987	0.9943	0.9768	0.9080	0.7447	0.5231	0.3458	0.4133	0.7349	0.9631	0.9963	0.9991	(89)
Tweekday	17.9254	18.2057	18.6328	19.1455	19.4918	19.6268	19.6490	19.6467	19.5480	19.0386	18.3741	17.8814	
Tweekend	17.9254	18.2057	18.6328	19.1455	19.4918	19.6268	19.6490	19.6467	19.5480	19.0386	18.3741	17.8814	
MIT 2	19.7278	19.7293	19.7308	19.7380	19.7393	19.7455	19.7455	19.7467	19.7431	19.7393	19.7366	19.7338	(90)
Living area fraction										fLA = Living area / (4) =		0.2361	(91)
MIT	20.0282	20.0293	20.0305	20.0359	20.0370	20.0417	20.0417	20.0426	20.0399	20.0370	20.0349	20.0327	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0282	20.0293	20.0305	20.0359	20.0370	20.0417	20.0417	20.0426	20.0399	20.0370	20.0349	20.0327	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9988	0.9947	0.9785	0.9146	0.7611	0.5492	0.3772	0.4476	0.7583	0.9668	0.9966	0.9992	(94)
Useful gains	1442.3153	2022.7342	2623.3412	3118.9030	3010.5479	2197.7333	1436.5574	1504.4788	2144.7313	2051.3933	1540.5606	1306.2346	(95)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	6741.7374	6475.9477	5783.5940	4729.1680	3536.1821	2294.9974	1451.5110	1534.6018	2510.6224	4002.7556	5500.0069	6749.5611	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	3942.7700	2992.5595	2351.2281	1159.3908	391.0718	0.0000	0.0000	0.0000	0.0000	1451.8135	2850.8013	4049.8349	(98)
Space heating												19189.4700	(98)
Space heating per m2											(98) / (4) =	64.7615	(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 %)												333.3155	(206)
Efficiency of secondary/supplementary heating system, %												100.0000	(208)
Space heating requirement												5757.1484	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3942.7700	2992.5595	2351.2281	1159.3908	391.0718	0.0000	0.0000	0.0000	0.0000	1451.8135	2850.8013	4049.8349	(98)
Space heating efficiency (main heating system 1)	333.3155	333.3155	333.3155	333.3155	333.3155	0.0000	0.0000	0.0000	0.0000	333.3155	333.3155	333.3155	(210)
Space heating fuel (main heating system)	1182.8942	897.8158	705.4061	347.8358	117.3278	0.0000	0.0000	0.0000	0.0000	435.5673	855.2861	1215.0154	(211)
Water heating requirement	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)
Water heating													
Water heating requirement	232.0111	204.4944	214.7619	192.5167	188.6578	168.5695	161.8899	177.6477	177.3353	199.6289	211.0911	226.4280	(64)
Efficiency of water heater												181.8300	(216)
(217)m	181.8300	181.8300	181.8300	181.8300	181.8300	181.8300	181.8300	181.8300	181.8300	181.8300	181.8300	181.8300	(217)
Fuel for water heating, kWh/month	127.5978	112.4646	118.1114	105.8773	103.7550	92.7072	89.0337	97.6999	97.5281	109.7887	116.0925	124.5273	(219)
Water heating fuel used												1295.1835	(219)
Annual totals kWh/year													
Space heating fuel - main system												5757.1484	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												716.7900	(232)
Total delivered energy for all uses												7769.1219	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5757.1484	0.5190	2987.9600	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1295.1835	0.5190	672.2002	(264)
Space and water heating			3660.1603	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	716.7900	0.5190	372.0140	(268)
Total CO2, kg/year			4032.1743	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.6100	(273)

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

DER		13.6100	ZC1
Total Floor Area	TFA	296.3100	
Assumed number of occupants	N	3.1271	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		9.1048	ZC2
CO2 emissions from cooking, equation (L16)		0.6549	ZC3
Total CO2 emissions		23.3697	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		23.3697	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	196.7500	(1a)	x 2.5700	(2a) =	505.6475	(1a) - (3a)
Ground floor	99.5600	(1b)	x 3.2800	(2b) =	326.5568	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	296.3100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	832.2043	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0481	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.2981	(18)
Number of sides 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) =	0.2534	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3230	0.3167	0.3104	0.2787	0.2724	0.2407	0.2407	0.2344	0.2534	0.2724	0.2850	0.2977	(22b)
Effective ac	0.5522	0.5501	0.5482	0.5388	0.5371	0.5290	0.5290	0.5275	0.5321	0.5371	0.5406	0.5443	(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	
TER Opaque door			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.40)			67.5100	1.3258	89.5019			(27)
TER Room Window (Uw = 1.70)			4.1900	1.5918	6.6695			(27a)
Heat Loss Floor			196.7500	0.1300	25.5775			(28a)
External Wall - basement	124.0800		124.0800	0.1800	22.3344			(29a)
External Wall	193.9800	69.9100	124.0700	0.1800	22.3326			(29a)
External Roof	196.7500	4.1900	192.5600	0.1300	25.0328			(30)
Total net area of external elements Aum(A, m2)			711.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		193.8487			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							28.1520	(36)
Total fabric heat loss					(33) + (36) =		222.0007	(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	151.6420	151.0856	150.5402	147.9787	147.4994	145.2684	145.2684	144.8552	146.1277	147.4994	148.4690	149.4826	(38)
Heat transfer coeff	373.6427	373.0863	372.5409	369.9793	369.5001	367.2690	367.2690	366.8559	368.1284	369.5001	370.4696	371.4832	(39)
Average = Sum(39)m / 12 =												369.9770	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2610	1.2591	1.2573	1.2486	1.2470	1.2395	1.2395	1.2381	1.2424	1.2470	1.2503	1.2537	(40)
HLP (average)												1.2486	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.1271	(42)
Average daily hot water use (litres/day)	108.4694	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.3163	114.9776	110.6388	106.3000	101.9612	97.6225	97.6225	101.9612	106.3000	110.6388	114.9776	119.3163	(44)
Energy conte	176.9427	154.7552	159.6935	139.2247	133.5894	115.2775	106.8215	122.5793	124.0433	144.5605	157.7991	171.3596	(45)
Energy content (annual)										Total = Sum(45)m =		1706.6462	(45)
Distribution loss (46)m = 0.15 x (45)m	26.5414	23.2133	23.9540	20.8837	20.0384	17.2916	16.0232	18.3869	18.6065	21.6841	23.6699	25.7039	(46)
Water storage loss:													
Store volume												210.0000	(47)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day): 1.7016 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.9188 (55)
Total storage loss
28.4842 25.7277 28.4842 27.5653 28.4842 27.5653 28.4842 28.4842 27.5653 28.4842 27.5653 28.4842 (56)
If cylinder contains dedicated solar storage
28.4842 25.7277 28.4842 27.5653 28.4842 27.5653 28.4842 28.4842 27.5653 28.4842 27.5653 28.4842 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Total heat required for water heating calculated for each month
228.6893 201.4941 211.4401 189.3020 185.3360 165.3548 158.5681 174.3259 174.1206 196.3071 207.8764 223.1061 (62)
Solar input 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)
Output from w/h
228.6893 201.4941 211.4401 189.3020 185.3360 165.3548 158.5681 174.3259 174.1206 196.3071 207.8764 223.1061 (64)
Total per year (kWh/year) = Sum(64)m = 2315.9205 (64)
Heat gains from water heating, kWh/month
100.2307 88.8472 94.4954 86.3541 85.8157 78.3916 76.9154 82.1549 81.3063 89.4636 92.5301 98.3743 (65)

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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	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5876	36.0496	29.3175	22.1952	16.5912	14.0070	15.1350	19.6731	26.4052	33.5274	39.1315	41.7157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	455.2696	459.9939	448.0889	422.7445	390.7518	360.6831	340.5954	335.8712	347.7762	373.1206	405.1133	435.1819	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	(71)
Water heating gains (Table 5)													
	134.7187	132.2131	127.0099	119.9362	115.3437	108.8773	103.3810	110.4232	112.9254	120.2468	128.5140	132.2236	(72)
Total internal gains													
	703.4829	701.1635	677.3232	637.7829	595.5937	556.4744	532.0184	538.8745	560.0137	599.8018	645.6657	682.0281	(73)

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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	
Northeast	17.6500	11.2829	0.6300	0.7000	0.7700	60.8610	(75)
Southeast	15.1700	36.7938	0.6300	0.7000	0.7700	170.5817	(77)
Southwest	20.1300	36.7938	0.6300	0.7000	0.7700	226.3553	(79)
Northwest	14.5600	11.2829	0.6300	0.7000	0.7700	50.2060	(81)
Horizontal	4.1900	26.0000	0.6300	0.7000	1.0000	43.2383	(82)

Solar gains	551.2422	992.0131	1492.0846	2064.6528	2502.3935	2565.8549	2439.9600	2102.1963	1689.2771	1133.3147	670.0694	465.3214	(83)
Total gains	1254.7252	1693.1767	2169.4078	2702.4358	3097.9872	3122.3293	2971.9784	2641.0708	2249.2908	1733.1165	1315.7351	1147.3496	(84)

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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	55.0716	55.1537	55.2344	55.6168	55.6890	56.0273	56.0273	56.0904	55.8965	55.6890	55.5432	55.3917	
alpha	4.6714	4.6769	4.6823	4.7078	4.7126	4.7352	4.7352	4.7394	4.7264	4.7126	4.7029	4.6928	
util living area													
	0.9996	0.9981	0.9916	0.9610	0.8648	0.6925	0.5294	0.6091	0.8715	0.9870	0.9988	0.9997	(86)
MIT	19.4511	19.6585	19.9894	20.4147	20.7642	20.9412	20.9868	20.9754	20.8193	20.3359	19.8062	19.4154	(87)
Th 2	19.8715	19.8730	19.8745	19.8813	19.8826	19.8885	19.8885	19.8897	19.8862	19.8826	19.8800	19.8773	(88)
util rest of house													
	0.9994	0.9974	0.9884	0.9456	0.8148	0.5955	0.4030	0.4765	0.8022	0.9798	0.9982	0.9996	(89)
MIT 2	17.7947	18.0990	18.5821	19.1938	19.6548	19.8506	19.8839	19.8798	19.7375	19.0926	18.3203	17.7464	(90)
Living area fraction									fLA = Living area / (4) =			0.2361	(91)
MIT	18.1858	18.4672	18.9144	19.4821	19.9167	20.1081	20.1443	20.1384	19.9929	19.3861	18.6711	18.1404	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1858	18.4672	18.9144	19.4821	19.9167	20.1081	20.1443	20.1384	19.9929	19.3861	18.6711	18.1404	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9990	0.9960	0.9845	0.9385	0.8165	0.6160	0.4330	0.5078	0.8101	0.9751	0.9973	0.9993	(94)
Useful gains	1253.4703	1686.4408	2135.6824	2536.2401	2529.5672	1923.4846	1286.9073	1341.2335	1822.1734	1689.9658	1312.2026	1146.5919	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	5188.3180	5061.7216	4624.8647	3915.1559	3036.0787	2022.9665	1301.7117	1371.4677	2169.3530	3246.4739	4286.7465	5178.6428	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	2927.5267	2268.1887	1851.9516	992.8194	376.8446	0.0000	0.0000	0.0000	0.0000	1158.0420	2141.6715	2999.8459	(98)
Space heating												14716.8904	(98)
Space heating per m2										(98) / (4) =		49.6672	(99)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	15739.9897	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	2927.5267	2268.1887	1851.9516	992.8194	376.8446	0.0000	0.0000	0.0000	0.0000	1158.0420	2141.6715	2999.8459	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	3131.0446	2425.8702	1980.6969	1061.8389	403.0424	0.0000	0.0000	0.0000	0.0000	1238.5476	2290.5578	3208.3913	(211)
Water heating requirement													
	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)
Water heating													
Water heating requirement													
	228.6893	201.4941	211.4401	189.3020	185.3360	165.3548	158.5681	174.3259	174.1206	196.3071	207.8764	223.1061	(64)
Efficiency of water heater												79.8000	(216)
(217)m	89.6292	89.5207	89.2734	88.5976	86.6689	79.8000	79.8000	79.8000	79.8000	88.7747	89.4390	89.6677	(217)
Fuel for water heating, kWh/month													
	255.1504	225.0810	236.8456	213.6649	213.8438	207.2116	198.7069	218.4535	218.1963	221.1296	232.4226	248.8144	(219)
Water heating fuel used												2689.5206	(219)
Annual totals kWh/year													
Space heating fuel - main system												15739.9897	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												716.7900	(232)
Total delivered energy for all uses												19221.3003	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	15739.9897	0.2160	3399.8378	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2689.5206	0.2160	580.9364	(264)
Space and water heating			3980.7742	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	716.7900	0.5190	372.0140	(268)
Total CO2, kg/m2/year			4391.7132	(272)
Emissions per m2 for space and water heating			13.4345	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			1.2555	(272b)
Emissions per m2 for pumps and fans			0.1314	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.4345 * 1.55) + 1.2555 + 0.1314, rounded to 2 d.p.			22.2100	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Property Reference	C1920261	**Issued on Date**	19/11/2019
Assessment Reference	As Designed with ASHP	**Prop Type Ref**	
Property	adjacent to , 2, Mount Ararat Road, RICHMOND, Surrey, TW10 6PA		

SAP Rating	83 B	**DER**	13.61	**TER**	22.21
Environmental	85 B	**% DER<TER**	38.72		
CO_2 Emissions (t/year)	3.26	**DFEE**	60.19	**TFEE**	62.96
General Requirements Compliance	Pass	**% DFEE<TFEE**	4.39		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	Goater Jones, 049		

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	196.7500	(1a)	x 2.5700	(2a) =	505.6475	(1a) - (3a)
Ground floor	99.5600	(1b)	x 3.2800	(2b) =	326.5568	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	296.3100					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		832.2043	(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							4 * 10 =		40.0000	(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) =		40.0000 / (5) =	0.0481	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.2981	(18)
Number of sides 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) =	0.2534	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3230	0.3167	0.3104	0.2787	0.2724	0.2407	0.2407	0.2344	0.2534	0.2724	0.2850	0.2977	(22b)
Effective ac	0.5522	0.5501	0.5482	0.5388	0.5371	0.5290	0.5290	0.5275	0.5321	0.5371	0.5406	0.5443	(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			2.4000	1.2000	2.8800			(26)
window (Uw = 1.40)			59.6600	1.3258	79.0947			(27)
glazed doors (Uw = 1.40)			30.9800	1.3258	41.0720			(27)
roof light (Uw = 1.30)			5.6200	1.2357	6.9449			(27a)
Heat Loss Floor			196.7500	0.2000	39.3500			(28a)
External Wall - basement	124.0800		124.0800	0.1800	22.3344			(29a)
External Wall	193.9800	93.0400	100.9400	0.1800	18.1692			(29a)
External Roof	196.7500	5.6200	191.1300	0.1300	24.8469			(30)
Total net area of external elements Aum(A, m2)			711.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		234.6920			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							41.1285	(36)
Total fabric heat loss					(33) + (36) =		275.8205	(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	151.6420	151.0856	150.5402	147.9787	147.4994	145.2684	145.2684	144.8552	146.1277	147.4994	148.4690	149.4826	(38)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat transfer coeff

	427.4625	426.9062	426.3608	423.7992	423.3199	421.0889	421.0889	420.6757	421.9483	423.3199	424.2895	425.3031 (39)
Average = Sum(39)m / 12 =												423.7969 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4426	1.4407	1.4389	1.4303	1.4286	1.4211	1.4211	1.4197	1.4240	1.4286	1.4319	1.4353	(40)
HLP (average)												1.4302	(40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.1271 (42)

Average daily hot water use (litres/day) 108.4694 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	119.3163	114.9776	110.6388	106.3000	101.9612	97.6225	97.6225	101.9612	106.3000	110.6388	114.9776	119.3163	(44)
Energy conte	176.9427	154.7552	159.6935	139.2247	133.5894	115.2775	106.8215	122.5793	124.0433	144.5605	157.7991	171.3596	(45)
Energy content (annual)										Total = Sum(45)m =		1706.6462	(45)
Distribution loss (46)m = 0.15 x (45)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:													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	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 loss	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)
Heat gains from water heating, kWh/month													
	37.6003	32.8855	33.9349	29.5852	28.3877	24.4965	22.6996	26.0481	26.3592	30.7191	33.5323	36.4139	(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	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5876	36.0496	29.3175	22.1952	16.5912	14.0070	15.1350	19.6731	26.4052	33.5274	39.1315	41.7157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	455.2696	459.9939	448.0889	422.7445	390.7518	360.6831	340.5954	335.8712	347.7762	373.1206	405.1133	435.1819	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	(69)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)													
	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	(71)
Water heating gains (Table 5)													
	50.5381	48.9367	45.6114	41.0906	38.1556	34.0229	30.5102	35.0109	36.6100	41.2891	46.5726	48.9434	(72)
Total internal gains													
	616.3023	614.8872	592.9247	555.9373	515.4055	478.6200	456.1476	460.4621	480.6983	517.8441	560.7244	595.7480	(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	
Northeast	13.0700	11.2829	0.6300	0.7000	0.7700	45.0682	(75)
Southeast	20.3600	36.7938	0.6300	0.7000	0.7700	228.9416	(77)
Southwest	14.6300	36.7938	0.6300	0.7000	0.7700	164.5096	(79)
Northwest	11.6000	11.2829	0.6300	0.7000	0.7700	39.9993	(81)
Northeast	10.6300	11.2829	0.6300	0.7000	0.7700	36.6545	(75)
Southwest	12.4000	36.7938	0.6300	0.7000	0.7700	139.4340	(79)
Northwest	7.9500	11.2829	0.6300	0.7000	0.7700	27.4133	(81)
Horizontal	5.6200	26.0000	0.6300	0.7000	1.0000	57.9950	(82)

Solar gains	740.0153	1331.7208	2003.0258	2771.6538	3359.2929	3444.4886	3275.4817	2822.0536	2267.7402	1521.4060	899.5333	624.6721	(83)
Total gains	1356.3176	1946.6079	2595.9505	3327.5912	3874.6984	3923.1086	3731.6294	3282.5157	2748.4386	2039.2501	1460.2577	1220.4201	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.1377	48.2005	48.2621	48.5539	48.6088	48.8664	48.8664	48.9144	48.7668	48.6088	48.4977	48.3822	
alpha	4.2092	4.2134	4.2175	4.2369	4.2406	4.2578	4.2578	4.2610	4.2511	4.2406	4.2332	4.2255	
util living area													
	0.9993	0.9965	0.9849	0.9373	0.8156	0.6365	0.4835	0.5624	0.8321	0.9791	0.9980	0.9995	(86)
MIT	19.2597	19.5150	19.9083	20.3942	20.7657	20.9402	20.9853	20.9731	20.8115	20.2743	19.6614	19.2148	(87)
Th 2	19.7308	19.7322	19.7336	19.7402	19.7414	19.7472	19.7472	19.7483	19.7450	19.7414	19.7390	19.7363	(88)
util rest of house													
	0.9990	0.9952	0.9792	0.9138	0.7535	0.5318	0.3523	0.4224	0.7476	0.9676	0.9970	0.9994	(89)
MIT 2	18.1537	18.4094	18.8001	19.2718	19.5953	19.7227	19.7440	19.7416	19.6462	19.1694	18.5612	18.1130	(90)
Living area fraction									fLA = Living area / (4) =			0.2361	(91)
MIT	18.4148	18.6704	19.0618	19.5368	19.8716	20.0101	20.0371	20.0323	19.9213	19.4302	18.8210	18.3731	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.4148	18.6704	19.0618	19.5368	19.8716	20.0101	20.0371	20.0323	19.9213	19.4302	18.8210	18.3731	(93)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9986	0.9936	0.9751	0.9091	0.7607	0.5552	0.3836	0.4558	0.7615	0.9637	0.9960	0.9991	(94)
Useful gains	1354.3519	1934.2037	2531.4041	3025.1694	2947.5174	2177.9777	1431.5123	1496.0478	2093.0270	1965.2054	1454.4862	1219.2789	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	6033.5544	5878.6706	5355.8422	4507.8558	3459.2042	2278.1491	1447.3272	1528.0345	2456.3072	3738.0139	4973.0804	6027.8669	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	3481.3266	2650.6817	2101.3820	1067.5342	380.6950	0.0000	0.0000	0.0000	0.0000	1318.9695	2533.3878	3577.5894	(98)
Space heating												17111.5664	(98)
Space heating per m2											(98) / (4) =	57.7489	(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.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	3958.2356	3116.0578	3197.1356	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8707	0.9225	0.8842	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	3446.5821	2874.5538	2827.0487	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	4677.5134	4453.4412	3944.3058	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	886.2705	1174.6922	831.2393	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												2892.2020	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)													
	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)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	221.5676	293.6731	207.8098	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												723.0505	(107)
Space cooling per m2												2.4402	(108)
Energy for space heating												57.7489	(99)
Energy for space cooling												2.4402	(108)
Total												60.1890	(109)
Dwelling Fabric Energy Efficiency (DFEE)												60.2	(109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	196.7500	(1a)	x 2.5700	(2a) =	505.6475	(1a) - (3a)
Ground floor	99.5600	(1b)	x 3.2800	(2b) =	326.5568	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	296.3100					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	832.2043	(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							4 * 10 =	40.0000	(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) =	40.0000 / (5) =	0.0481	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.2981	(18)
Number of sides 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) =	0.2534	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.3230	0.3167	0.3104	0.2787	0.2724	0.2407	0.2407	0.2344	0.2534	0.2724	0.2850	0.2977	(22b)
Effective ac	0.5522	0.5501	0.5482	0.5388	0.5371	0.5290	0.5290	0.5275	0.5321	0.5371	0.5406	0.5443	(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	
TER Opaque door			2.4000	1.0000	2.4000			(26)
TER Opening Type (Uw = 1.40)			67.5100	1.3258	89.5019			(27)
TER Room Window (Uw = 1.70)			4.1900	1.5918	6.6695			(27a)
Heat Loss Floor			196.7500	0.1300	25.5775			(28a)
External Wall - basement	124.0800		124.0800	0.1800	22.3344			(29a)
External Wall	193.9800	69.9100	124.0700	0.1800	22.3326			(29a)
External Roof	196.7500	4.1900	192.5600	0.1300	25.0328			(30)
Total net area of external elements Aum(A, m2)			711.5600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		193.8487			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							28.1520	(36)
Total fabric heat loss					(33) + (36) =		222.0007	(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	151.6420	151.0856	150.5402	147.9787	147.4994	145.2684	145.2684	144.8552	146.1277	147.4994	148.4690	149.4826	(38)
Heat transfer coeff	373.6427	373.0863	372.5409	369.9793	369.5001	367.2690	367.2690	366.8559	368.1284	369.5001	370.4696	371.4832	(39)
Average = Sum(39)m / 12 =												369.9770	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2610	1.2591	1.2573	1.2486	1.2470	1.2395	1.2395	1.2381	1.2424	1.2470	1.2503	1.2537	(40)
HLP (average)												1.2486	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.1271	(42)
Average daily hot water use (litres/day)												108.4694	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	119.3163	114.9776	110.6388	106.3000	101.9612	97.6225	97.6225	101.9612	106.3000	110.6388	114.9776	119.3163	(44)
Energy conte	176.9427	154.7552	159.6935	139.2247	133.5894	115.2775	106.8215	122.5793	124.0433	144.5605	157.7991	171.3596	(45)
Energy content (annual)										Total = Sum(45)m =		1706.6462	(45)
Distribution loss (46)m = 0.15 x (45)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:													
Total storage loss													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	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 loss	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)
Heat gains from water heating, kWh/month													
	37.6003	32.8855	33.9349	29.5852	28.3877	24.4965	22.6996	26.0481	26.3592	30.7191	33.5323	36.4139	(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	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	156.3566	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	40.5876	36.0496	29.3175	22.1952	16.5912	14.0070	15.1350	19.6731	26.4052	33.5274	39.1315	41.7157	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	455.2696	459.9939	448.0889	422.7445	390.7518	360.6831	340.5954	335.8712	347.7762	373.1206	405.1133	435.1819	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	38.6357	(69)
Pumps, fans	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)
Losses e.g. evaporation (negative values) (Table 5)													
	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	-125.0853	(71)
Water heating gains (Table 5)													
	50.5381	48.9367	45.6114	41.0906	38.1556	34.0229	30.5102	35.0109	36.6100	41.2891	46.5726	48.9434	(72)
Total internal gains													
	616.3023	614.8872	592.9247	555.9373	515.4055	478.6200	456.1476	460.4621	480.6983	517.8441	560.7244	595.7480	(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	
Northeast	17.6500	11.2829	0.6300	0.7000	0.7700	60.8610	(75)
Southeast	15.1700	36.7938	0.6300	0.7000	0.7700	170.5817	(77)
Southwest	20.1300	36.7938	0.6300	0.7000	0.7700	226.3553	(79)
Northwest	14.5600	11.2829	0.6300	0.7000	0.7700	50.2060	(81)
Horizontal	4.1900	26.0000	0.6300	0.7000	1.0000	43.2383	(82)

Solar gains	551.2422	992.0131	1492.0846	2064.6528	2502.3935	2565.8549	2439.9600	2102.1963	1689.2771	1133.3147	670.0694	465.3214	(83)
Total gains	1167.5445	1606.9003	2085.0093	2620.5901	3017.7991	3044.4749	2896.1076	2562.6584	2169.9754	1651.1588	1230.7937	1061.0694	(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	55.0716	55.1537	55.2344	55.6168	55.6890	56.0273	56.0273	56.0904	55.8965	55.6890	55.5432	55.3917	
alpha	4.6714	4.6769	4.6823	4.7078	4.7126	4.7352	4.7352	4.7394	4.7264	4.7126	4.7029	4.6928	
util living area													
	0.9997	0.9985	0.9928	0.9650	0.8739	0.7052	0.5418	0.6244	0.8835	0.9893	0.9991	0.9998	(86)
MIT	19.4241	19.6319	19.9642	20.3935	20.7511	20.9365	20.9854	20.9727	20.8058	20.3119	19.7799	19.3886	(87)
Th 2	19.8715	19.8730	19.8745	19.8813	19.8826	19.8885	19.8885	19.8897	19.8862	19.8826	19.8800	19.8773	(88)
util rest of house													
	0.9996	0.9979	0.9901	0.9509	0.8257	0.6082	0.4131	0.4901	0.8176	0.9832	0.9987	0.9997	(89)
MIT 2	18.4265	18.6353	18.9673	19.3922	19.7170	19.8603	19.8850	19.8821	19.7753	19.3199	18.7889	18.3956	(90)
Living area fraction									fLA = Living area / (4) =			0.2361	(91)
MIT	18.6621	18.8706	19.2026	19.6286	19.9612	20.1144	20.1448	20.1396	20.0186	19.5542	19.0229	18.6301	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6621	18.8706	19.2026	19.6286	19.9612	20.1144	20.1448	20.1396	20.0186	19.5542	19.0229	18.6301	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9994	0.9972	0.9878	0.9469	0.8296	0.6295	0.4439	0.5221	0.8270	0.9807	0.9982	0.9996	(94)
Useful gains	1166.8093	1602.3673	2059.6426	2481.4906	2503.6603	1916.3589	1285.4833	1337.9571	1794.6675	1619.2911	1228.6121	1060.6440	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	5366.2783	5212.2323	4732.2563	3969.3678	3052.5047	2025.2666	1301.9102	1371.8819	2178.8173	3308.5596	4417.0540	5360.5233	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	3124.4049	2425.8293	1988.4246	1071.2716	408.3402	0.0000	0.0000	0.0000	0.0000	1256.8157	2295.6782	3199.1101	(98)
Space heating												15769.8746	(98)
Space heating per m2											(98) / (4) =	53.2209	(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.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	3452.3289	2717.7908	2788.1047	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8499	0.9115	0.8685	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	2933.9677	2477.2469	2421.5235	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	3669.7035	3494.9679	3117.9584	0.0000	0.0000	0.0000	0.0000	(103)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	529.7297	757.1844	518.1476	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												1805.0617 (104)
Cooled fraction											fC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)												
	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)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	132.4324	189.2961	129.5369	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												451.2654 (107)
Space cooling per m2												1.5230 (108)
Energy for space heating												53.2209 (99)
Energy for space cooling												1.5230 (108)
Total												54.7438 (109)
Target Fabric Energy Efficiency (TFEE)												63.0 (109)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Property Reference	C1920261	**Issued on Date**	19/11/2019
Assessment Reference	As Designed with ASHP	**Prop Type Ref**	
Property	adjacent to , 2, Mount Ararat Road, RICHMOND, Surrey, TW10 6PA		

SAP Rating	83 B	**DER**	13.61	**TER**	22.21
Environmental	85 B	**% DER<TER**	38.72		
CO_2 Emissions (t/year)	3.26	**DFEE**	60.19	**TFEE**	62.96
General Requirements Compliance	Pass	**% DFEE<TFEE**	4.39		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	Goater Jones, 049		

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	Detached House
Number of storeys	2
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South West
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient		2197.02 (P1)
Transmission heat loss coefficient		275.82 (37)
Summer heat loss coefficient		2472.84 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
North East	0.000	1.000	None
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
North East	1.000	0.90	1.000	0.900 (P8)
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)
Horizontal	1.000	1.00	1.000	1.000 (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
North East	13.0700	98.8453	0.6300	0.7000	0.9000	461.4823
South East	20.3600	119.9223	0.6300	0.7000	0.9000	872.1707
South West	14.6300	119.9223	0.6300	0.7000	0.9000	626.7121
North West	11.6000	98.8453	0.6300	0.7000	0.9000	409.5788
North East	10.6300	98.8453	0.6300	0.7000	0.9000	375.3296
South West	12.4000	119.9223	0.6300	0.7000	0.9000	531.1845
North West	7.9500	98.8453	0.6300	0.7000	0.9000	280.7027
Horizontal	5.6200	203.0000	0.6300	0.7000	1.0000	452.8073
total:						4009.9681

	Jun	Jul	Aug	
Solar gains	4264	4010	3529	(P3)
Internal gains	805	773	784	
Total summer gains	5069	4783	4313	(P5)
Summer gain/loss ratio	2.05	1.93	1.74	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	18.30	20.08	19.79	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Property Reference	C1920261	**Issued on Date**	19/11/2019
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CO_2 Emissions (t/year)	3.26	**DFEE**	60.19	**TFEE**	62.96
General Requirements Compliance	Pass	**% DFEE<TFEE**	4.39		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	Goater Jones, 049		

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	22.21	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	13.61	$kgCO_2/m^2$	Pass
	-8.60 (-38.7%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	62.96	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	60.19	$kWh/m^2/yr$	
	-2.8 (-4.4%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Floor	0.20 (max. 0.25)	0.20 (max. 0.70)	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.39 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Heat pump with radiators or underfloor - Electric Mitsubishi ECODAN 14kW PUHZ-HW140-VHA(2)-BS	
Secondary heating system	None	

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.90 kWh/day Permitted by DBSCG 2.30		Pass
Primary pipework insulated	Yes		Pass

6 Controls

Space heating controls	Time and temperature zone control		Pass
Hot water controls	Cylinderstat		Pass
	Independent timer for DHW		Pass

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Not significant	Pass

Based on:

Overshading	Average
Windows facing North East	23.70 m², No overhang
Windows facing South East	20.36 m², No overhang
Windows facing South West	27.03 m², No overhang
Windows facing North West	19.55 m², No overhang
Air change rate	8.00 ach
Blinds/curtains	None

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

10 Key features

None	N/A	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA
Calculation Type: New Build (As Designed)

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CO_2 Emissions (t/year)	3.26	**DFEE**	60.19	**TFEE**	62.96
General Requirements Compliance	Pass	**% DFEE<TFEE**	4.39		

Assessor Details	Mr. Gary White, Hibec Limited, Tel: 01564 795566, gary_hibec@btconnect.com	**Assessor ID**	4104-0001
Client	Goater Jones, 049		

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South West
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2019
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	70.59 m	196.75 m²	2.57 m
1st Storey:	41.66 m	99.56 m²	3.28 m

7.0 Living Area	69.96	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall - basement	Solid Wall	Other	0.18	124.08	124.08
External Wall	Cavity Wall	Other	0.18	193.98	100.94

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof	External Flat Roof	Other	0.13	196.75	191.13

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor	Ground Floor - Solid	Slab on ground, screed over insulation	0.20	196.75

12.0 Opening Types

SUMMARY FOR INPUT DATA
Calculation Type: New Build (As Designed)

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
door	Manufacturer	Solid Door							1.20
window	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
glazed doors	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
roof light	Manufacturer	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.30

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
door	Solid Door	[2] External Wall	South West							2.40	
windows	Window	[2] External Wall	South West	None	0.00					14.63	
doors	Window	[2] External Wall	South West	None	0.00					12.40	
windows	Window	[2] External Wall	South East	None	0.00					7.83	
door	Window	[2] External Wall	South East	None	0.00					12.53	
windows	Window	[2] External Wall	North East	None	0.00					13.07	
door	Window	[2] External Wall	North East	None	0.00					10.63	
windows	Window	[2] External Wall	North West	None	0.00					11.60	
door	Window	[2] External Wall	North West	None	0.00					7.95	
roof lights	Roof Window	[1] External Roof	Horizontal	None						5.62	

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	40.63	0.300	Yes
Table K1 - Approved	E3 Sill	9.72	0.040	No
Table K1 - Approved	E4 Jamb	66.24	0.050	Yes
Table K1 - Approved	E5 Ground floor (normal)	70.59	0.160	Yes
Table K1 - Approved	E6 Intermediate floor within a dwelling	41.66	0.070	Yes
Table K1 - Default	E14 Flat roof	99.09	0.080	No
Table K1 - Approved	E16 Corner (normal)	26.68	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	10.99	-0.090	No
Table K1 - Default	R1 Head of roof window	2.52	0.080	Yes
Table K1 - Default	R2 Sill of roof window	2.52	0.060	Yes
Table K1 - Default	R3 Jamb of roof window	16.70	0.080	Yes

Y-value	0.058	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	5.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows fully open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	8.00

Mechanical Ventilation

Mechanical Ventilation System Present

	No

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				5
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No	
22.0 Lighting		
Internal		
Total number of light fittings	20	
Total number of L.E.L. fittings	20	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	Yes	
Light and motion sensor	Yes	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	Database	
Description	boiler	
Percentage of Heat	100	%
Database Ref. No.	100112	
Fuel Type	Electricity	
Main Heating	PET	
SAP Code	224	
In Winter	350.9	
In Summer	191.4	
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Boiler Compensator	Vaillant Group UK Ltd, Vaillant, VRC 470	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	36° - 45°C	
25.0 Main Heating 2	None	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 1	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	

Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	
Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	210.00	L
Loss	1.90	kWh/day
Pipes insulation	Fully insulated primary pipework	
31.0 Thermal Store	None	

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£86	B 85	
	Typical Cost	**Typical savings per year**	**Ratings after improvement SAP rating**	**Environmental Impact**
Solar photovoltaic panels, 2.5 kWp	£3,500 - £5,500	£317	B 88	