



Compliance with England Building Regulations Part L 2013

Shell and Core Project name

Highgate Road

As designed

Date: Wed Jun 23 14:01:22 2021

Administrative information

Building Details Address: London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0 Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.8 BRUKL compliance check version: v5.6.b.0

Certifier details

Name: George Farr Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	14.2
Target CO₂ emission rate (TER), kgCO₂/m².annum	14.2
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	11.9
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _{a-Limit}	Ua-Calc	Ui-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	"Ground Floor - Social Enterprise_P_6"
Floor	0.25	0.13	0.13	"Ground Floor - Social Enterprise_S_3"
Roof	0.25	0.13	0.13	"Ground Floor - Social Enterprise_R_5"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"Ground Floor - Social Enterprise_G_11"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]

U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

Ui-Calc = Calculated maximum individual element U-values [W/(m²K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m3/(h.m2) at 50 Pa	10	3

^{*} There might be more than one surface where the maximum U-value occurs.

^{**} Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

^{***} Display windows and similar glazing are excluded from the U-value check.

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	4.35	3.2	-	-	=		
Standard value	2.5*	N/A	N/A	N/A	N/A		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system NO							
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.							

1- POU

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Ε	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(I/s)]						UD officiones				
ID of system type	Α	В	С	D	E	F	G	Н	1	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Ground Floor - Social Enterprise	-	-	-	1	-	-	-	-	-	0.8	0.5

Shell and core configuration

Zone	Assumed shell?
Ground Floor - Store	NO
Ground Floor - Plant	NO
Ground Floor - Social Enterprise	NO

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Ground Floor - Store	110	-	-	10
Ground Floor - Plant	110	-	-	133
Ground Floor - Social Enterprise	110	-	-	552

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Ground Floor - Social Enterprise	YES (+11.1%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	156.3	156.3
External area [m²]	330.4	330.4
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	5
Average conductance [W/K]	120.17	144.54
Average U-value [W/m²K]	0.36	0.44
Alpha value* [%]	19.16	12.38

^{*} Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways

B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	1.02	2
Cooling	6.53	5.39
Auxiliary	2.52	1.73
Lighting	11	17.58
Hot water	1.85	2.14
Equipment*	87.75	87.75
TOTAL**	22.92	28.84

Energy used by equipment does not count towards the total for consumption or calculating emissions.
 ** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	126.56	99.35
Primary energy* [kWh/m²]	70.37	82.26
Total emissions [kg/m ²]	11.9	14.2

^{*} Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

H	HVAC Systems Performance													
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER				
[ST] No Heatin	g or Coolin	g											
	Actual	27.6	0	0	0	0	0	0	0	0				
	Notional	33.6	0.1	0	0	0	0	0						
[ST] Split or m	ulti-split sy	stem, [HS] I	Heat pump	(electric): a	ir source, [HFT] Electr	icity, [CFT]	Electricity					
	Actual	23.2	158.6	1.6	10.2	3.9	4.05	4.33	4.35	6.1				
	Notional	27.2	108.8	3.1	8.4	2.7	2.43	3.6						

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Тур}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	"Ground Floor - Social Enterprise_P_6"
Floor	0.2	0.13	"Ground Floor - Social Enterprise_S_3"
Roof	0.15	0.13	"Ground Floor - Social Enterprise_R_5"
Windows, roof windows, and rooflights	1.5	1.4	"Ground Floor - Social Enterprise_G_11"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the	minimum L	J-value oc	curs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:12:30*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 63.84m²

Site Reference: Highgate Road - GREEN

Plot Reference: 00 - A

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 21.44 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.52 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 63.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 52.5 kWh/m²

ОК

2 Fabric U-values

Element Highest Average External wall 0.17 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.13 (max. 0.25) 0.13 (max. 0.70) OK Roof 0.13 (max. 0.20) 0.13 (max. 0.35) OK Openings 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	5.49m ²	
Windows facing: South West	5.49m ²	
Ventilation rate:	3.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lsar I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Vei				0010943 on: 1.0.5.50	
Address :	F	Property	Address	00 - A					
1. Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor		(63.84	(1a) x	2	.65	(2a) =	169.18	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	63.84	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	169.18	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	x ′	10 =	20	(7a)
Number of passive vents				Ī	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res			Ī	0	x 4	40 =	0	(7c)
				_					
							Air ch	nanges per he	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	20		÷ (5) =	0.12	(8)
Number of storeys in the		iu io (17),	otrierwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	uction			0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)
Infiltration rate	250 amaza dia adia adia mata		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	etre or e	envelope	area	5	(17)
•	s if a pressurisation test has been do				is being u	sed		0.37	(10)
Number of sides sheltere	d							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18	x (20) =				0.37	(21)
Infiltration rate modified for			1 ,		<u> </u>			1	
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0 4.4 4.3 3.8] 3.6	3.1	4	4.3	<u> </u>	4.1	J	
Wind Factor (22a)m = (22	2)m ÷ 4							,	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rate (allo	wing for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.47	0.46 0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43		
Calculate effec	_	e rate for t	he appli	cable ca	se				!		•	
If mechanica	al ventilation: eat pump using A	opendiy N (3	93h) = (23a	a) v Emy (4	aguation (I	V5)) othe	rwice (23h	n) = (23a)			0	(23a)
	heat recovery: e) = (23a)			0	(23b)
	-	-	_					Oh)m . (22h) [:	1 (22a)	. 1001	(23c)
(24a)m= 0	d mechanical	0 verillation	o With he	0		nk) (248	$\frac{a)m = (2.1)}{10}$	0	230) x [0	+ 100j	(24a)
` ′	d mechanical											(= 12)
(24b)m= 0		0	0	0	0	0	0	0	0	0		(24b)
(1/	ouse extract v				ventilatio							, ,
,	1 < 0.5 × (23b)		•	•				.5 × (23b	o)			
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24c)
,	ventilation or v							0.51			•	
(24d)m= 0.61	0.61 0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24d)
	change rate -	enter (24a	ı ı) or (24l	o) or (24	c) or (24	d) in bo	x (25)					
(25)m= 0.61	0.61 0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
0.115.5415.555			· · · ·	1	ı	1	l .	1	ı	ı		
3. Heat losses	Gross			Net Ar	200	U-val		AXU		k-value	`	ΑΧk
ELEMENT	area (m²)	Openir m	iys 1 ²	A,r		W/m2		(W/		kJ/m²-l		kJ/K
Doors				2.55	х	1.2	=	3.06				(26)
Windows Type	1			5.49	x1	/[1/(1.4)+	- 0.04] =	7.28				(27)
Windows Type	2			5.49	x1	/[1/(1.4)+	- 0.04] =	7.28				(27)
Floor				63.84	1 X	0.13	=	8.2992				(28)
Walls Type1	27.27	13.5	3	13.74	1 X	0.18	=	2.47				(29)
Walls Type2	56.63	0	一	56.63	3 X	0.18	-	10.19	Ħ i		7 F	(29)
Roof	3.74	0	一	3.74	x	0.13	-	0.49	₹ i		7 F	(30)
Total area of e	lements, m ²			151.4	8							(31)
Party wall				21.76	3 x	0	=	0	\neg [(32)
Party ceiling				60.09	<u> </u>						7 F	(32b)
Internal wall **				89.09	9				Ī		7 F	(32c)
* for windows and ** include the area					lated using	g formula 1	1/[(1/U-valu	ue)+0.04] á	as given in	paragraph	3.2	
Fabric heat los			•			(26)(30) + (32) =				39.07	(33)
Heat capacity	Cm = S(A x k)					((28).	(30) + (32	2) + (32a).	(32e) =	14861.9	97 (34)
Thermal mass	parameter (T	MP = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used instea			construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge			using Ap	pendix l	K						10.98	(36)
if details of therma	, ,			•								
Total fabric hea	at loss						(33) +	(36) =			50.05	(37)

F	tion hea	1033 0	r						(00)	= 0.33 × (- (0)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m=	34.07	33.83	33.59	32.49	32.29	31.33	31.33	31.15	31.7	32.29	32.7	33.14		(3
leat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
39)m=	84.12	83.88	83.64	82.54	82.34	81.38	81.38	81.2	81.75	82.34	82.75	83.19		
- -laat Ic	see nara	meter (F	41 D) \\\/	/m2K				-		Average = = (39)m ÷	Sum(39) ₁	12 /12=	82.54	(3
40)m=	1.32	1.31	1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.3	1.3		
	1.02	1.01	1.01	1.20	1.20	1.21	1/	1/			Sum(40) ₁ .	<u> </u>	1.29	(4
lumbe	er of day	s in mor	nth (Tab	le 1a)										`
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
4. Wa	iter heat	ting ener	rgy requi	irement:								kWh/ye	ar:	
\ccum	od occu	ipancy, I	NI.											
				[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0	013 x (ΓFA -13.		09		(4
	A £ 13.9		_		(- (,	, ,,	(- /			
								(25 x N)				.79		(
		_		usage by : day (all w		_	_	to achieve	a water us	e target o	Ť			
				· ·		_			0	0.1	NI.	D		
ot wate	Jan	Feb	Mar day for ea	Apr ach month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ı			,	1				·						
4)m=	92.17	88.81	85.46	82.11	78.76	75.41	75.41	78.76	82.11	85.46	88.81	92.17		\neg
nergy c	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,n	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1005.44	(
15)m=	136.68	119.54	123.35	107.54	103.19	89.05	82.51	94.69	95.82	111.67	121.89	132.37		
ı								!	-	Γotal = Su	<u>. </u>	=	1318.29	(
instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,) to (61)					
16)m=	20.5	17.93	18.5	16.13	15.48	13.36	12.38	14.2	14.37	16.75	18.28	19.85		(-
/ater	storage	loss:		-										
		(114)												
·		` ,		•			Ū	within sa	ame ves	sel		150		(
comr	nunity h	eating a	ind no ta	ınk in dw	elling, e	nter 110	litres in	(47)				150		(
comr	munity h	eating a	ind no ta	ınk in dw	elling, e	nter 110	litres in					150		(
comr otherw other s	munity h vise if no storage	eating a stored loss:	ind no ta hot wate	ink in dw er (this in	relling, e icludes i	nter 110 nstantan	litres in neous co	(47)			47)			
comr Otherw Vater s	munity h vise if no storage nanufact	eating a stored loss:	nd no ta hot wate	ink in dw er (this in	relling, e icludes i	nter 110 nstantan	litres in neous co	(47)			47)	39		(
comr Otherw Vater s a) If m	munity havise if no storage anufacterature fa	neating a o stored loss: urer's de actor fro	ind no ta hot wate eclared l m Table	ink in dw er (this in oss facto 2b	relling, e icludes i	nter 110 nstantan	litres in neous co n/day):	(47) ombi boil	ers) ente		1.	39 54		((
comr Otherw Vater : a) If m empe	munity havise if no storage hanufact rature for lost fro	eating a stored loss: urer's de actor from water	nd no ta hot wate eclared le m Table storage	ink in dwer (this in oss facto 2b	relling, e icludes i or is kno ear	nter 110 nstantan wn (kWh	litres in neous co	(47)	ers) ente		1.	39		(
comr Otherw Vater s a) If m Tempe Energy o) If m	munity havise if no storage anufact erature for lost fro anufact	eating a stored loss: urer's de actor fro m water urer's de	nd no ta hot wate eclared le m Table storage eclared d	ink in dw er (this in oss facto 2b	relling, e cludes i or is kno ear oss facto	nter 110 nstantan wn (kWh	litres in neous co n/day): known:	(47) ombi boil	ers) ente		1. 0.	39 54		(.
commotherwork (Common State of	munity havise if no storage nanufact rature favianufact anufact atter storage	eating a stored loss: urer's de actor fro m water urer's de	nd no ta hot wate eclared le m Table storage eclared of factor fr	onk in dw er (this in oss facto 2b , kWh/ye cylinder l	relling, e cludes i or is kno ear oss facto	nter 110 nstantan wn (kWh	litres in neous co n/day): known:	(47) ombi boil	ers) ente		1. 0.	39 54 75		(.
commonth of the common of the	munity havise if no storage anufact rature for anufact	leating a stored loss: urer's de actor from water urer's de age loss leating s from Tal	hot water eclared I m Table storage eclared of factor fr ee section	onk in dw er (this in oss facto 2b k, kWh/ye cylinder I om Tabl on 4.3	relling, e cludes i or is kno ear oss facto	nter 110 nstantan wn (kWh	litres in neous co n/day): known:	(47) ombi boil	ers) ente		47) 1. 0. 0.	39 54 75		(4 (4 (4
f commonth of the common of th	munity havise if no storage anufact rature for anufact	eating a stored loss: urer's de actor fro urer's de age loss eating s	hot water eclared I m Table storage eclared of factor fr ee section	onk in dw er (this in oss facto 2b k, kWh/ye cylinder I om Tabl on 4.3	relling, e cludes i or is kno ear oss facto	nter 110 nstantan wn (kWh	litres in neous co n/day): known:	(47) ombi boil	ers) ente		47) 1. 0. 0.	39 54 75		(+) (+) (+)
commotherwork (a) If mergy (b) If mergy (c)	munity he vise if no storage anufact reture for anufact atter storage munity he factor erature for lost fro	leating a stored loss: urer's de actor from water urer's de age loss leating s from Tal actor from water urer's de age loss leating s from Tal	eclared less restorage eclared of factor free section ble 2a m Table estorage	onk in dw er (this in oss facto 2b k, kWh/ye cylinder I om Tabl on 4.3	relling, e icludes i or is kno ear oss facto e 2 (kWl	nter 110 nstantan wn (kWh	litres in neous co n/day): known:	(47) ombi boil	ers) ente	er 'O' in (1. 0.	39 54 75 0		(4 (4) (4) (4) (4) (4) (4)
f comr Otherw Vater : a) If m empe Energy b) If m Hot wa f comr /olume empe Energy	munity he vise if no storage anufact reture for anufact atter storage munity he factor erature for lost fro	leating a stored loss: urer's de actor fro urer's de age loss leating s from Tal actor fro	eclared less restorage eclared of factor free section ble 2a m Table estorage	onk in dw er (this in oss facto 2b k, kWh/ye cylinder I rom Tabl on 4.3	relling, e icludes i or is kno ear oss facto e 2 (kWl	nter 110 nstantan wn (kWh	litres in neous co n/day): known:	(47) ombi boild (48) x (49)	ers) ente	er 'O' in (47) 1. 0. 0.	39 54 75 0		(+) (+) (+) (+) (+) (+)
f commontherwork Vater: a) If m empe empe f commontherwork f commontherwork empe empe empe empe empe empe	munity havise if no storage anufact rature for anufact ater storage factor erature factor (50) or (50)	leating a stored loss: urer's de actor from water urer's de age loss leating s from Tal actor from water (54) in (5	eclared less storage eclared of factor free section to ble 2a m Table storage estorage factor free sections and table 2a m Table estorage (55)	onk in dw er (this in oss facto 2b k, kWh/ye cylinder I rom Tabl on 4.3	relling, e icludes i or is kno ear oss facto e 2 (kWl	nter 110 nstantan wn (kWh	litres in neous co n/day): known:	(47) ombi boild (48) x (49)	ers) ente	er 'O' in (47) 1. 0. 0.	39 54 75 0		((.: (:: (::

If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	om Append	lix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	 e 3	•	•	•	!	!		0		(58)
Primary circuit	t loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified by	/ factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 183.27	161.63	169.95	152.64	149.79	134.14	129.11	141.28	140.91	158.26	166.98	178.96		(62)
Solar DHW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	•	
(add additiona	I lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	iter	-	-	-	-	-	-	-	-			
(64)m= 183.27	161.63	169.95	152.64	149.79	134.14	129.11	141.28	140.91	158.26	166.98	178.96		
	•	•					Outp	out from w	ater heate	r (annual)	112	1866.91	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m= 82.72	73.42	78.29	71.83	71.59	65.68	64.71	68.76	67.93	74.4	76.6	81.29		(65)
include (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fı	om com	munity h	i leating	
5. Internal ga	ains (see	e Table 5	and 5a):	•						·		
Metabolic gair	,			,									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39	104.39		(66)
Lighting gains	(calcula	ted in Ar	ppendix	L. equat	ion L9 o	r L9a). a	lso see	Table 5		•			
(67)m= 16.75	14.87	12.1	9.16	6.85	5.78	6.24	8.12	10.9	13.83	16.15	17.21		(67)
Appliances ga	ins (calc	ulated ir	n Append	dix L, ea	uation L	13 or L1		see Ta	ble 5	!	!	ı	
(68)m= 182.52	184.41	179.64	169.48	156.65	144.6	136.54	134.65	139.42	149.58	162.41	174.46		(68)
Cooking gains	. (calcula	ated in A	npendix	L. eguat	tion L15	or L15a	L Lalso se	ee Table	5		<u>!</u>	l	
(69)m= 33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44		(69)
Pumps and fa	ns gains	(Table 5	ı 5а)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. e	/aporatio	on (nega	tive valu	es) (Tab	le 5)					•	•		
(71)m= -83.51	-83.51	-83.51	-83.51	-83.51	-83.51	-83.51	-83.51	-83.51	-83.51	-83.51	-83.51		(71)
Water heating	gains (1	rable 5)	!	!	•	!		•	!		•		
(72)m= 111.18	ĭ `	105.23	99.77	96.22	91.22	86.98	92.42	94.35	100.01	106.39	109.26		(72)
Total internal	gains =	:		!	(66)	m + (67)m	ı + (68)m -	+ (69)m +	(70)m + (7	(1)m + (72))m		
(73)m= 367.77	365.85	354.28	335.72	317.03	298.92	287.09	292.5	301.99	320.74	342.27	358.25		(73)
6. Solar gain	s:							•	•	•	•		
Calar ==:== ===													
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orienta	tion.		

Table 6b

Table 6c

Table 6a

m²

Table 6d

(W)

Northeast _{0.9x}							1		_				(75)
<u>L</u>	0.77	X	5.49	×	\vdash	1.28	X	0.63	×	0.7	=	18.93	(75)
Northeast _{0.9x}	0.77	X	5.49	×	2:	2.97	X	0.63	X	0.7	_ =	38.53	(75)
Northeast _{0.9x}	0.77	X	5.49	X	4	1.38	X	0.63	X	0.7	=	69.43	(75)
Northeast _{0.9x}	0.77	X	5.49	X	6	7.96	X	0.63	X	0.7	=	114.02	(75)
Northeast _{0.9x}	0.77	X	5.49	Х	9	1.35	X	0.63	X	0.7	=	153.26	(75)
Northeast _{0.9x}	0.77	X	5.49	X	9.	7.38	X	0.63	X	0.7	=	163.39	(75)
Northeast _{0.9x}	0.77	X	5.49	X	9	1.1	X	0.63	X	0.7	=	152.85	(75)
Northeast _{0.9x}	0.77	X	5.49	X	7:	2.63	X	0.63	X	0.7	=	121.85	(75)
Northeast _{0.9x}	0.77	X	5.49	X	50	0.42	X	0.63	X	0.7	=	84.6	(75)
Northeast 0.9x	0.77	X	5.49	x	2	8.07	x	0.63	x	0.7	=	47.09	(75)
Northeast _{0.9x}	0.77	X	5.49	х	1	4.2	x	0.63	X	0.7	=	23.82	(75)
Northeast _{0.9x}	0.77	X	5.49	x	9	.21	x	0.63	x	0.7	=	15.46	(75)
Southwest _{0.9x}	0.77	x	5.49	x	3(6.79	ĺ	0.63	x	0.7	=	61.73	(79)
Southwest _{0.9x}	0.77	x	5.49	x	62	2.67	ĺ	0.63	x	0.7	=	105.15	(79)
Southwest _{0.9x}	0.77	X	5.49	x	8	5.75	j	0.63	x	0.7	_	143.88	(79)
Southwest _{0.9x}	0.77	x	5.49	×	10	06.25	j	0.63	×	0.7	_ =	178.27	(79)
Southwest _{0.9x}	0.77	x	5.49	×	11	9.01	j	0.63	x	0.7	=	199.68	(79)
Southwest _{0.9x}	0.77	x	5.49	x	11	8.15	j	0.63	x	0.7		198.23	(79)
Southwest _{0.9x}	0.77	x	5.49	×	11	3.91	j	0.63	×	0.7	_	191.12	(79)
Southwest _{0.9x}	0.77	X	5.49	= x	_)4.39	,]	0.63	×	0.7	= =	175.15	(79)
Southwest _{0.9x}	0.77	X	5.49	= x		2.85	<u>,</u>]	0.63	×	0.7	= =	155.79	(79)
Southwest _{0.9x}	0.77	×	5.49	= x	_	9.27]	0.63	×	0.7	= =	116.22	(79)
Southwest _{0.9x}	0.77	X	5.49	= x	_	4.07	<u> </u> 	0.63	×	0.7	= =	73.94	(79)
Southwest _{0.9x}	0.77	×	5.49	x		1.49	<u> </u> 	0.63	×	0.7	= =	52.83	(79)
	0.11		0.10			11.10	J	0.00				02.00	
Solar gains in	watts calc	culated	for each me	onth			(83)m	n = Sum(74)m .	(82)m				
7	Y		292.29 352		61.63			7 240.38			68.29]	(83)
Total gains – i	nternal and	d solar	(84)m = (73)	3)m + (83)m ,	watts				!		ı	
(84)m= 448.43	509.54 5	567.59	628.01 669	9.97 6	60.55	631.06	589	.51 542.37	484.0	5 440.03	426.54		(84)
7. Mean inter	nal tempe	rature (heating sea	ason)	,			•		,		•	
Temperature		•			area f	rom Tab	ole 9.	Th1 (°C)				21	(85)
Utilisation fac	ŭ	٠.		·				()					
Jan	Feb	Mar		1ay	Jun	Jul	Α	ug Sep	Oc	Nov	Dec]	
(86)m= 1	0.99	0.98			0.71	0.55	0.0		0.97		1		(86)
Magn interna	1 40 000 0 000		vina oros T	· 4 /6 all a		2 4 2 7		abla Oa)				J	
Mean interna (87)m= 19.63		20.06		$\overline{}$	20.93	20.98	20.		20.44	19.98	19.61	1	(87)
` ′					!				20.44	19.90	19.01		(07)
Temperature					Ť							1	(00)
(88)m= 19.83	19.83	19.83	19.85 19	.85	19.86	19.86	19.	86 19.86	19.85	19.84	19.84		(88)
Utilisation fac	tor for gair	ns for re	est of dwell	ng, h2	,m (se	e Table	9a)		1			1	
(89)m= 0.99	0.99	0.98	0.93 0.	82	0.61	0.42	0.4	0.76	0.95	0.99	1		(89)
Mean interna	l temperat	ure in tl	he rest of d	welling	T2 (fc	ollow ste	eps 3	to 7 in Tabl	e 9c)				

m= 18.03 18.27 18.66 19.18 19.6 19.81 19.85 19.85 19.73 19.22 18.54 18 fLA = Living area ÷ (4) = 0.58	(90)
$ILA = Living area \div (4) = 0.58$	— ₍₀₁₎
	(91)
ean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
m= 18.96 19.15 19.47 19.9 20.26 20.46 20.51 20.5 20.37 19.93 19.37 18.93	(92)
oply adjustment to the mean internal temperature from Table 4e, where appropriate	
m= 18.96 19.15 19.47 19.9 20.26 20.46 20.51 20.5 20.37 19.93 19.37 18.93	(93)
Space heating requirement	
et Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate e utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
ilisation factor for gains, hm:	
m= 0.99 0.99 0.97 0.93 0.84 0.67 0.49 0.55 0.8 0.95 0.99 0.99	(94)
seful gains, hmGm , W = (94)m x (84)m	
m= 445.45 503.31 552.83 587 563.55 441.95 311.29 322.42 432.96 460.76 434.53 424.26	(95)
onthly average external temperature from Table 8	
m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
eat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
m= 1232.9 1195.23 1085.01 908.06 704.61 476.82 318.03 333.1 512.96 767.89 1015.7 1225.53	(97)
pace heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
m= 585.87 464.97 395.94 231.16 104.95 0 0 0 228.5 418.45 596.14	—
Total per year (kWh/year) = $Sum(98)_{15.912}$ = 3025.98	(98)
pace heating requirement in kWh/m²/year 47.4	(99)
Energy requirements – Individual heating systems including micro-CHP)	
pace heating:	_
action of space heat from secondary/supplementary system 0	(201
action of space heat from main system(s) (202) = 1 - (201) =	(202
action of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$	(204
ficiency of main space heating system 1 93.5	(206
ficiency of secondary/supplementary heating system, %	(208
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/y	— ear
pace heating requirement (calculated above)	
585.87 464.97 395.94 231.16 104.95 0 0 0 228.5 418.45 596.14	
	(211
585.87 464.97 395.94 231.16 104.95 0 0 0 0 228.5 418.45 596.14 1)m = {[(98)m x (204)] } x 100 ÷ (206)	(211
1)m = {[(98)m x (204)] } x 100 ÷ (206)	(211
1)m = {[(98)m x (204)] } x 100 ÷ (206) 626.6 497.3 423.47 247.23 112.25 0 0 0 0 244.39 447.54 637.59 Total (kWh/year) = Sum(211) _{15,1012} = 3236.35	_
1)m = {[(98)m x (204)] } x 100 ÷ (206) 626.6 497.3 423.47 247.23 112.25 0 0 0 0 244.39 447.54 637.59	_
1)m = {[(98)m x (204)] } x 100 ÷ (206) 626.6 497.3 423.47 247.23 112.25 0 0 0 0 244.39 447.54 637.59 Total (kWh/year) =Sum(211) _{15,1012} 3236.35 pace heating fuel (secondary), kWh/month	_
1)m = {[(98)m x (204)] } x 100 ÷ (206) 626.6	_
1)m = {[(98)m x (204)] } x 100 ÷ (206) 626.6	(211
1)m = {[(98)m x (204)] } x 100 ÷ (206) 626.6	(211
1)m = {[(98)m x (204)] } x 100 ÷ (206) 626.6 497.3 423.47 247.23 112.25 0 0 0 0 244.39 447.54 637.59 Total (kWh/year) = Sum(211) _{15,1012} 3236.35 Deace heating fuel (secondary), kWh/month (98)m x (201)] } x 100 ÷ (208) Si)m = 0 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) = Sum(215) _{15,1012} 0 ter heating	(211

(0.5)							1	(047)			
` '	79.8 79.8	79.8	79.8	85.79	87.17	87.78		(217)			
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m											
· / - · · · · · · · · · · · · · · · · ·	68.09 161.7	79 177.04	176.58	184.47	191.57	203.87					
	•	Tota	ıl = Sum(2	19a) ₁₁₂ =	•		2208.72	(219)			
Annual totals				k'	Wh/yeaı	r	kWh/year	-			
Space heating fuel used, main system 1							3236.35	_			
Water heating fuel used							2208.72]			
Electricity for pumps, fans and electric keep-hot											
central heating pump:						30		(230c)			
boiler with a fan-assisted flue						45		(230e)			
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)			
Electricity for lighting 295.76 (232)											
Total delivered energy for all uses (211)(221) +	(231) + (23	32)(237b)	=				5815.83	(338)			
12a. CO2 emissions – Individual heating system	s including	micro-CHF)								
	Energy			Emiss	ion fac	tor	Emissions				
	kWh/ye	ar		kg CO	2/kWh		kg CO2/yea	ır			
Space heating (main system 1)	(211) x			0.2	16	=	699.05	(261)			
Space heating (secondary)	(215) x			0.5	19	=	0	(263)			
Water heating	(219) x			0.2	16	=	477.08	(264)			
Space and water heating	(261) + (26	62) + (263) + ((264) =				1176.14	(265)			
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)			
Electricity for lighting	(232) x			0.5	19	=	153.5	(268)			
Total CO2, kg/year			sum o	of (265)(2	271) =		1368.56	(272)			

TER =

(273)

21.44

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:11:59*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 60.42m²Site Reference:Highgate Road - GREENPlot Reference:00 - B

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 22.43 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 19.42 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 65.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 54.0 kWh/m²

OK

2 Fabric U-values

Element Highest Average External wall 0.17 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.13 (max. 0.25) 0.13 (max. 0.70) OK Roof 0.13 (max. 0.20) 0.13 (max. 0.35) OK Openings 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	oK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
Based on:	-	
Overshading:	Average or unknown	
Windows facing: North East	6.56m ²	
Ventilation rate:	3.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

User Details:											
Assessor Name: Neil Ingham Stroma Number: STRO01094 Software Name: Stroma FSAP 2012 Software Version: 1.0											
Property Address: 00 - B Address:											
1. Overall dwelling dimensions:											
Area(m²) Av. Height(m) Vol	ume(m³)										
Ground floor 60.42 (1a) x 2.65 (2a) = 1	60.11 (3a)										
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 60.42 (4)											
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 1$	60.11 (5)										
2. Ventilation rate:											
main secondary other total m³ heating heating	oer hour										
Number of chimneys $0 + 0 = 0 \times 40 =$	0 (6a)										
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	0 (6b)										
Number of intermittent fans 2 x 10 =	20 (7a)										
Number of passive vents 0 x 10 =	0 (7b)										
Number of flueless gas fires 0 x 40 =	0 (7c)										
(/c)											
Air changes per hour											
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div (5) =$ 0.12 (8)											
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)	0 (9)										
Additional infiltration [(9)-1]x0.1 =	0 (10)										
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0 (11)										
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35											
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)										
If no draught lobby, enter 0.05, else enter 0	0 (13)										
Percentage of windows and doors draught stripped	0 (14)										
Window infiltration 0.25 - [0.2 x (14) ÷ 100] =	0 (15)										
Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =	0 (16)										
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5 (17)										
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.37 (18)										
Number of sides sheltered	0 (19)										
Shelter factor (20) = 1 - [0.075 x (19)] =	1 (20)										
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.37 (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 7											
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7											
Mind Foster (00s) - (00) - 4											
Wind Factor $(22a)m = (22)m \div 4$											

Adjusted infiltration rate (a	lowing for shelter s	and wind s	need) –	(21a) v	(22a)m					
0.48 0.47 0.		0.36	0.36	0.35	0.37	0.4	0.42	0.44]	
Calculate effective air chai	•	olicable ca	se	<u> </u>	!					
If mechanical ventilation									0	(23a)
If exhaust air heat pump using) = (23a)			0	(23b)
If balanced with heat recovery		-							0	(23c)
a) If balanced mechanic	1 1	1	- 	- 	í `	 		' ' '	÷ 100] ı	(0.4.)
(1)	0 0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanic		1		r ``	ŕ	r `			1	(0.41)
()	0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract	•	•				E v (22h	۸			
if $(22b)m < 0.5 \times (23)$	0, then $(240) = (200)$		0	C) = (221)	0	0	0	0	1	(24c)
d) If natural ventilation o										(= 10)
if (22b)m = 1, then (2	•					0.5]				
(24d)m= 0.61 0.61 0.	0.59 0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air change rate	- enter (24a) or (2	4b) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.61 0.61 0.	0.59 0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. Heat losses and heat lo	oss parameter:									
ELEMENT Gross	Openings	Net Ar	ea	U-valı	ue	AXU		k-value	9	AXk
area (m²)		A ,r	m²	W/m2	2K	(W/ł	<)	kJ/m²-		kJ/K
Doors		3.49	Х	1.2	=	4.188				(26)
Windows		6.56	x1.	/[1/(1.4)+	0.04] =	8.7				(27)
Floor		60.42	<u>x</u>	0.13	=	7.85459	9			(28)
Walls Type1 19.85	10.05	9.8	х	0.18	=	1.76				(29)
Walls Type2 51.2	0	51.2	Х	0.18	=	9.22				(29)
Roof 5.68	0	5.68	х	0.13	=	0.74			$\neg \ $	(30)
Total area of elements, m ²		137.1	5							(31)
Party wall		21.92	<u>x</u>	0	=	0				(32)
Party ceiling		54.74	司						7 F	(32b)
Internal wall **		85.22	<u></u>				Ī		7 7	(32c)
* for windows and roof windows, ** include the areas on both sides			ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	i 3.2	`
Fabric heat loss, W/K = S	•			(26)(30)) + (32) =				32.46	(33)
Heat capacity Cm = S(A x	,				((28).	(30) + (32	2) + (32a).	(32e) =	13752.9	
Thermal mass parameter (•	in kJ/m²K			Indica	itive Value:	Medium		250	(35)
For design assessments where the can be used instead of a detailed	ne details of the constru			ecisely the	e indicative	e values of	TMP in Ta	able 1f		` ′
Thermal bridges : S (L x Y)		Appendix I	<						10.25	(36)
if details of thermal bridging are r	_									\```
Total fabric heat loss					(33) +	(36) =			42.71	(37)
Ventilation heat loss calcul	ated monthly				(38)m	= 0.33 × (25)m x (5))		
Jan Feb N	lar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(00)													(00)
(38)m= 32.46	32.22	31.99	30.91	30.71	29.77	29.77	29.6	30.13	30.71	31.12	31.55		(38)
Heat transfer o			72.62	72.42	70.40	70.40	70.04	· · ·	= (37) + (37)		74.05		
(39)m= 75.16	74.93	74.7	73.62	73.42	72.48	72.48	72.31	72.84	73.42	73.83 Sum(39) ₁	74.25	73.62	(39)
Heat loss para	meter (H	ILP), W/	m²K						= (39)m ÷		12 / 12-	73.02	(00)
(40)m= 1.24	1.24	1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.22	1.23		_
Number of day	s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.22	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ener	gy requi	rement:								kWh/ye	ar:	
Assumed occu	nanov I	NI.											(40)
if TFA > 13.9), N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9))2)] + 0.0	0013 x (ΓFA -13.		99		(42)
if TFA £ 13.9 Annual averag	•	ater usac	ae in litre	s per da	ıv Vd.av	erage =	(25 x N)	+ 36		81	.55		(43)
Reduce the annua	l average	hot water	usage by	5% if the a	lwelling is	designed t			e target o		.00		(12)
not more that 125						<i>'</i>							
Jan Hot water usage ir	Feb	Mar day for ea	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		,					. /	79.91	02.10	86.44	90.7		
(44)m= 89.7	86.44	83.18	79.91	76.65	73.39	73.39	76.65		83.18	m(44) ₁₁₂ =	89.7	978.54	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600			· /	L	370.04	()
(45)m= 133.02	116.34	120.05	104.67	100.43	86.66	80.31	92.15	93.25	108.68	118.63	128.82		
If instantaneous w	otor booti	na ot noint	of upo (no	, hat water	· otorogo)	antar O in	havea (16		Γotal = Su	m(45) ₁₁₂ =	=	1283.02	(45)
If instantaneous w													(40)
(46)m= 19.95 Water storage	17.45 loss:	18.01	15.7	15.06	13	12.05	13.82	13.99	16.3	17.79	19.32		(46)
Storage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	cludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		eclared l	oss facto	or is kno	wn (kWh	ı/dav).				1	39		(48)
Temperature fa), 10 mil	("aay).					.54		(49)
Energy lost fro				ear			(48) x (49)	=			75		(50)
b) If manufact	urer's de	eclared o	ylinder l	oss fact									()
Hot water stora	•			e 2 (kWl	h/litre/da	ıy)					0		(51)
If community h	•		011 4.3								0		(52)
Temperature fa			2b							-	0		(52)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (_						·			75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)r	n				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	¢Н	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

		•								
Primary circuit loss (annual) from Table 3	0	(58)								
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	-1-1)									
(modified by factor from Table H5 if there is solar water heating and a cylinder thermo (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26		(59)								
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26	(39)								
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		•								
(61)m= 0 0 0 0 0 0 0 0 0	0 0	(61)								
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	(46)m + (57)m +	(59)m + (61)m								
(62)m= 179.62 158.43 166.65 149.76 147.02 131.76 126.9 138.75 138.35 155.27	163.72 175.42	(62)								
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)										
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)										
(63)m= 0 0 0 0 0 0 0 0 0	0 0	(63)								
Output from water heater										
(64)m= 179.62 158.43 166.65 149.76 147.02 131.76 126.9 138.75 138.35 155.27	163.72 175.42									
Output from water heater	r (annual) ₁₁₂	1831.64 (64)								
Heat gains from water heating, kWh/month 0.25 $^{'}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m	+ (57)m + (59)m]								
(65)m= 81.51 72.35 77.19 70.88 70.67 64.89 63.98 67.92 67.08 73.41	75.52 80.11	(65)								
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is fr	om community h	eating								
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= 99.67 99.67 99.67 99.67 99.67 99.67 99.67 99.67 99.67 99.67	99.67 99.67	(66)								
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5										
(67)m= 17.6 15.63 12.71 9.62 7.19 6.07 6.56 8.53 11.45 14.54	16.97 18.09	(67)								
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	l	1								
(68)m= 174 175.81 171.26 161.57 149.35 137.85 130.18 128.37 132.92 142.61	154.84 166.33	(68)								
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	<u> </u>	1								
(69)m= 32.97 32.97 32.97 32.97 32.97 32.97 32.97 32.97 32.97 32.97 32.97 32.97	32.97 32.97	(69)								
Pumps and fans gains (Table 5a)										
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3	(70)								
		1								
Losses e.g. evaporation (negative values) (Table 5) (71)m=	-79.74 -79.74	(71)								
	-13.14	(, ,)								
Water heating gains (Table 5) (72)m= 109.55 107.67 103.76 98.44 94.99 90.12 85.99 91.29 93.17 98.67	104.89 107.67	(72)								
		(72)								
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (70)m$		(72)								
(73)m= 357.06 355.01 343.63 325.54 307.43 289.95 278.63 284.09 293.44 311.72	332.59 347.99	(73)								
Solar gains:Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicab	le orientation									
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)										
	1									
		22.62 (75) 46.04 (75)								
Northeast 0.9x 0.77 x 6.56 x 22.97 x 0.63 x	0.7	40.04								

_																	_
Northeast _{0.9x}	0.77	X	6.5	56	X	4	1.38	X		0.63)		0.7		=	82.96	(75)
Northeast _{0.9x}	0.77	X	6.5	56	X	6	7.96	x		0.63)		0.7		=	136.24	(75)
Northeast _{0.9x}	0.77	X	6.5	56	X	9	1.35	X		0.63)		0.7		=	183.13	(75)
Northeast _{0.9x}	0.77	X	6.5	56	x	9	7.38	X		0.63	×		0.7		=	195.24	(75)
Northeast _{0.9x}	0.77	X	6.5	56	X	9	91.1	x		0.63)		0.7		=	182.64	(75)
Northeast _{0.9x}	0.77	X	6.5	56	x	7.	2.63	x		0.63	<u> </u>	Ē	0.7		=	145.6	(75)
Northeast 0.9x	0.77	x	6.5	56	x	5	0.42	x		0.63	<u> </u>	Ē	0.7		=	101.08	(75)
Northeast _{0.9x}	0.77	x	6.5	56	x	2	8.07	x		0.63	= ,	Ē	0.7		=	56.27	(75)
Northeast _{0.9x}	0.77	X	6.5	56	x	1	14.2	x		0.63	<u> </u>	Ē	0.7		=	28.46	(75)
Northeast 0.9x	0.77	x	6.5	56	x	9	9.21	x		0.63	–	Ē	0.7		=	18.47	(75)
<u>-</u>																	
Solar gains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)	m					
(83)m= 22.62	46.04	82.96	136.24	183.13	1	95.24	182.64	145	5.6	101.08	56.	27	28.46	18.4	7		(83)
Total gains – i	nternal a	nd sola	(84)m =	= (73)m	+ (8	33)m ,	, watts						•				
(84)m= 379.68	401.06	426.59	461.78	490.56	48	35.19	461.28	429	.69	394.52	367	.99	361.05	366.4	17		(84)
7. Mean inter	nal temp	erature	(heating	season)												
Temperature						area f	rom Tab	ole 9.	. Th	1 (°C)						21	(85)
Utilisation fac	•	•			-			,	,	. (-)					ļ		」` ′
Jan	Feb	Mar	Apr	May	È	Jun	Jul	A	ug	Sep		ct	Nov	De	c		
(86)m= 1	1	0.99	0.98	0.93	┢	0.81	0.65	0.7	- 	0.91	0.9		1	1	_		(86)
` '				L	مار		no 2 to 7		ا حاد	. 00)	<u> </u>		<u> </u>				
Mean interna (87)m= 19.66	19.77	19.99	20.33	20.65	т —	w ste	20.97	20.5		20.78	20.	38	19.98	19.6	5		(87)
			<u> </u>	ļ					!		20.		19.90	19.0			(01)
Temperature	1		T T		Т			ı							. 1		(00)
(88)m= 19.88	19.89	19.89	19.91	19.91	1	9.92	19.92	19.	92	19.92	19.	91	19.9	19.9	9		(88)
Utilisation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)									
(89)m= 1	1	0.99	0.97	0.9).72	0.51	0.5	57	0.86	0.9	8	0.99	1			(89)
Mean interna	l temper	ature in	the rest	of dwell	ing	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c)					
(90)m= 18.11	18.27	18.6	19.09	19.55	1	9.84	19.91	19.	.9	19.72	19.	18	18.58	18.1			(90)
			•					-	•	f	LA =	Livin	g area ÷ (4	4) =		0.6	(91)
Mean interna	l temper	ature (fo	r the wh	ole dwe	llind	က) = fl	A x T1	+ (1	– fl	A) x T2					,		_
(92)m= 19.04	19.17	19.44	19.83	20.21	_	0.47	20.55	20.	$\overline{}$	20.36	19	.9	19.42	19.0	3		(92)
Apply adjustr	nent to th		ı ı interna	L I temper	<u>ı </u>	re fro	m Table	4e.	—ц whe		L opria	te	l	<u> </u>			
(93)m= 19.04	19.17	19.44	19.83	20.21	1	0.47	20.55	20.		20.36	19		19.42	19.0	3		(93)
8. Space hea	iting requ	uirement															
Set Ti to the				re obtair	ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,r	n=(76)m an	d re-c	alc	ulate	
the utilisation												Ì					
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	0	ct	Nov	De	C		
Utilisation fac	tor for g	ains, hm	1:	r	_					1				1			
(94)m= 1	0.99	0.99	0.97	0.91	().77	0.6	0.6	6	0.88	0.9	8	0.99	1			(94)
Useful gains,					_					-							
(95)m= 378.09	398.63	421.62	447.54	446.98	_	74.06	274.83	281	.48	348.28	359	.08	358.44	365.	18		(95)
Monthly aver					_		40-			1							(00)
(96)m= 4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.	.4	14.1	10	.υ	7.1	4.2			(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]														
	1108.2	1069.22	966.28	805.02	625.04	425.69	286.21	299.19	455.95	683.09	909.79	1101.43		(97)
` '		g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	24 x [(97	ı)m – (95)m] x (4	1)m			
(98)m=	543.2	450.63	405.23	257.39	132.48	0	0	0	0	241.06	396.97	547.77		
_								Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	2974.73	(98)
Space	heating	g require	ement in	kWh/m²	² /year							Ī	49.23	(99)
9a. Ene	ergy req	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	heatir	_	ot from o	ooondor	v/ournalo	montory	ovetem					ſ		7(201)
	_		at from m			mentary	-	(202) = 1 -	- (201) =			l I	1	(201)
	•			-	` '				, ,	(203)] =			1	(204)
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = Efficiency of main space heating system 1											l I	93.5	(206)	
Efficiency of secondary/supplementary heating system, %											0	(208)		
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒` ar
Space			ement (c	<u> </u>				[9					, -	
	543.2	450.63	405.23	257.39	132.48	0	0	0	0	241.06	396.97	547.77		
(211)m	= {[(98])m x (20	4)] } x 1	00 ÷ (20)6)									(211)
L	580.96	481.96	433.4	275.28	141.69	0	0	0	0	257.82	424.57	585.85		_
Total (kWh/year) =Sum(211) _{15,1012} = 3181.53 (211)														
•	Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)													
= {[(90) (215)m=	0	0	00 + (20	0	0	0	0	0	0	0	0	0		
` ′ L			l					Tota	I II (kWh/yea	ar) =Sum(2	1 215) _{15,1012}	<u></u>	0	(215)
Water I	heating	I										L		_
Output			ter (calc					l	· · · · · ·	T	l	· 1		
Efficien	179.62	158.43	166.65	149.76	147.02	131.76	126.9	138.75	138.35	155.27	163.72	175.42	70.0	(216)
(217)m=	87.58	ater hea	87.1	86.25	84.54	79.8	79.8	79.8	79.8	85.98	87.09	87.65	79.8	(217)
` ′ L			kWh/mo	<u> </u>	04.04	70.0	70.0	7 0.0	7 0.0	00.00	07.00	07.00		(=)
(219)m	= (64)	m x 100) ÷ (217)	m							1			
(219)m=	205.08	181.16	191.34	173.64	173.92	165.11	159.02	173.87	173.36	180.58	187.99	200.14		_
A	14-4-1-							rota	ıl = Sum(2		MA/In /	_ [2165.22	(219)
Annual Space I		fuel use	ed, main	svstem	1					K	Wh/year	, [kWh/year 3181.53	٦
·	_	fuel use		-,								l [2165.22	_
	•		ans and	electric	keen-ho	t						l	2103.22	J
		g pump		Cicotiio	коор по	•						20		(230c)
		•										30		
		an-assis		.\	_			oum.	of (220a)	(220a) -		45		(230e)
	•		above, I	kvvn/yea	ır			sum	of (230a).	(230g) =	·	[75 	(231)
Electric	•											إ	310.83	(232)
Total de	Total delivered energy for all uses $(211)(221) + (231) + (232)(237b) = 5732.59$													

12a. CO2 emissions – Individual heating systems	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	687.21 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	467.69 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1154.9 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519	161.32 (268)
Total CO2, kg/year	sum	n of (265)(271) =	1355.15 (272)
TER =			22.43 (273)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:11:28*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 59.22m²Site Reference:Highgate Road - GREENPlot Reference:00 - C

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 21.78 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.95 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 63.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 52.3 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.17 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.13 (max. 0.25) 0.13 (max. 0.70) OK Roof 0.13 (max. 0.20) 0.13 (max. 0.35) OK Openings 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	oK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	9.01m²	
Ventilation rate:	2.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:							
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				0010943 on: 1.0.5.50		
Property Address: 00 - C Address:										
1. Overall dwelling dime	ensions:									
3		Are	a(m²)		Av. He	ight(m)		Volume(m	³)	
Ground floor		į	59.22	(1a) x	2	2.65	(2a) =	156.93	(3a)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (59.22	(4)					<u> </u>	
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	156.93	(5)	
2. Ventilation rate:										
	main seconda heating heating	ry	other		total			m³ per hoι	ır	
Number of chimneys	0 + 0	+ [0	=	0	X 4	40 =	0	(6a)	
Number of open flues	0 + 0	<u> </u>	0	Ī - Ē	0	x2	20 =	0	(6b)	
Number of intermittent fa	ins				2	x '	10 =	20	(7a)	
Number of passive vents	;			Ē	0	x -	10 =	0	(7b)	
Number of flueless gas fi	ires			F	0	x	40 =	0	(7c)	
				L						
							Air ch	nanges per he	our 	
	ys, flues and fans = (6a)+(6b)+(ontinus fr	20		÷ (5) =	0.13	(8)	
Number of storeys in the	peen carried out or is intended, proced he dwelling (ns)	ea 10 (17),	otrierwise	onunue ir	om (9) to	(10)		0	(9)	
Additional infiltration	3 ()					[(9)	-1]x0.1 =	0	(10)	
	.25 for steel or timber frame o			•	ruction			0	(11)	
if both types of wall are p deducting areas of openi	resent, use the value corresponding t ngs): if equal user 0.35	o the grea	ter wall are	a (after						
•	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)	
If no draught lobby, en	ter 0.05, else enter 0							0	(13)	
-	s and doors draught stripped							0	(14)	
Window infiltration			0.25 - [0.2	. ,	-	. (15) -		0	(15)	
Infiltration rate	q50, expressed in cubic metro	se nar h	(8) + (10)				area	0	(16)	
•	lity value, then $(18) = [(17) \div 20] +$	•		•	elle oi e	rivelope	aica	0.38	(17)	
•	es if a pressurisation test has been do				is being u	sed		0.00	(\ -'/	
Number of sides sheltered	ed		(00) 4	10 07F ·· //	10)1			0	(19)	
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			1	(20)	
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (10) X (20) =				0.38	(21)	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]		
Monthly average wind sp	1 ' 1 ' 1	1	1 3		1	1 -		J		
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]		
Wind Faster (00s) (0	2)	-			•	-	-	•		
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	1		
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	1 0.95	0.32	'	1.00	1.12	1.10	J		

Adjusted infiltr	ation rate	e (allowi	ina for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.48	0.47	0.46	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.42	0.44]	
Calculate effe		•	rate for t	he appli	cable ca	se							
If mechanic			andiv N. (C	93h) — (93 <i>a</i>	a) v Emy (auation (VEVV otho	muiaa (22h	n)			0	(23a)
If exhaust air h									i) = (23a)			0	(23b)
a) If balance		-	-	_					2h\m ⊥ (22h) v [1 (226)	0 : 1001	(23c)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0] - 100j	(24a)
b) If balance			ļ	<u> </u>								J	,
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h	nouse ext	tract ver	tilation o	r positiv	/e input	ı ventilatio	n from o	utside	<u> </u>	<u> </u>	<u> </u>	J	
,	n < 0.5 x			•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r	ventilation $n = 1$, the			•					0.5]				
(24d)m= 0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air	change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	d) in box	x (25)	-	-	-	-	
(25)m= 0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6]	(25)
3. Heat losse	s and he	at loss i	paramet	er:									
ELEMENT	Gros area	ss	Openin		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m².		A X k kJ/K
Doors		` ,			2.94	x	1.2		3.528	<u></u>			(26)
Windows					9.01	x1.	/[1/(1.4)+	0.04] =	11.95	言			(27)
Floor					59.22	2 x	0.13	─ = i	7.6986	<u> </u>			(28)
Walls Type1	23.4	7	11.9	5	11.52	<u>x</u>	0.18	₹ -i	2.07	₹ i		7 F	(29)
Walls Type2	35.2	6	0	一	35.26	x	0.18	₹ -i	6.35	Ħ i		7 F	(29)
Roof	6.91	1	0		6.91	x	0.13	Ħ =i	0.9	₹ i		7 F	(30)
Total area of e	elements	, m²			124.8	6	•						(31)
Party wall					26	x	0		0				(32)
Party ceiling					52.3		•					7 F	(32b)
Internal wall *	ŧ				101.8	1				Ī		7 F	(32c)
* for windows and ** include the are						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	n 3.2	
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30)) + (32) =				32.4	9 (33)
Heat capacity	Cm = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	13038	.48 (34)
Thermal mass	parame	ter (TMF	= Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design asses can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						10.1	8 (36)
if details of therm		are not kn	own (36) =	= 0.05 x (3	31)								
Total fabric he								. ,	(36) =	.		42.6	7 (37)
Ventilation he			· ·	<u> </u>	1	11	1	- ` ` ` 		(25)m x (5)	1 _	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	j	

						,	,						
(38)m= 31.89	31.66	31.43	30.36	30.16	29.22	29.22	29.05	29.58	30.16	30.56	30.99		(38)
Heat transfer co	oefficier	nt, W/K				•	•	(39)m	= (37) + (38)m			
(39)m= 74.56	74.33	74.1	73.03	72.83	71.9	71.9	71.72	72.26	72.83	73.24	73.66		_
Heat loss parar	neter (F	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ (4)	12 /12=	73.03	(39)
(40)m= 1.26	1.26	1.25	1.23	1.23	1.21	1.21	1.21	1.22	1.23	1.24	1.24		_
Number of days	s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.23	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
										!	•		
4. Water heati	ng ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occup	ooney l	NI.											(40)
if TFA > 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		.96		(42)
Annual average	•	ater usaç	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		80).74		(43)
Reduce the annual not more that 125 l	-				-	-	to achieve	a water us	se target o	f			
		·			_	<u> </u>	Λ	Con	0-4	Nov	Daa		
Jan Hot water usage in	Feb litres per	Mar day for ea	Apr ach month	May $Vd, m = fa$	Jun	Jul Table 1c x	Aug <i>(4</i> 3)	Sep	Oct	Nov	Dec		
(44)m= 88.81	85.58	82.35	79.12	75.89	72.66	72.66	75.89	79.12	82.35	85.58	88.81		
(11)	00.00	02.00	70.12	70.00	72.00	72.00	70.00			m(44) ₁₁₂ =	<u> </u>	968.86	(44)
Energy content of I	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		 `
(45)m= 131.71	115.19	118.87	103.63	99.44	85.81	79.51	91.24	92.33	107.6	117.46	127.55		
If instantaneous wa	ator hoatii	na at noint	of use (no	hot water	· storage)	enter () in	hoves (46		Γotal = Su	m(45) ₁₁₂ =	=	1270.32	(45)
	17.28	17.83	15.54			1	, ,		16.14	17.60	10.12		(46)
(46)m= 19.76 Water storage I		17.83	15.54	14.92	12.87	11.93	13.69	13.85	16.14	17.62	19.13		(40)
Storage volume	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community he	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage I a) If manufactu		aclared l	nee fact	or ie kna	wn (k\//k	v(qəv).					20		(48)
Temperature fa) 13 KHO	vvii (icvvi	ı, day).					.54		(49)
Energy lost from				ear			(48) x (49)	=			.75		(50)
b) If manufactu		-	-		or is not		(- / (- /				.10		(00)
Hot water stora	-			e 2 (kWl	h/litre/da	ıy)					0		(51)
If community he Volume factor f	_		on 4.3								0		(50)
Temperature fa			2b								0		(52) (53)
Energy lost from				ear			(47) x (51)	x (52) x (!	53) =		0		(54)
Enter (50) or (5		-	, 100011/y	Jui			(11) X (01)	/ X (02) X (30, –	-	.75		(55)
Water storage I	oss cal	culated f	or each	month			((56)m = (55) × (41)r	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicated	d solar sto	rage, (57)ı	m = (56)m		H11)] ÷ (5	0), else (5	7)m = (56)	m where (m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

		•
Primary circuit loss (annual) from Table 3	0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	-4-4)	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermo (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26	 	(59)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26	(39)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		•
(61)m= 0 0 0 0 0 0 0 0 0	0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + 0.000$	(46)m + (57)m +	(59)m + (61)m
(62)m= 178.3 157.28 165.46 148.72 146.03 130.9 126.11 137.84 137.42 154.2	162.55 174.14	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution of the contr	ion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		•
(63)m= 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater		
(64)m= 178.3 157.28 165.46 148.72 146.03 130.9 126.11 137.84 137.42 154.2	162.55 174.14	
Output from water heater	r (annual) ₁₁₂	1818.94 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m	+ (57)m + (59)m]
(65)m= 81.07 71.97 76.8 70.53 70.34 64.6 63.71 67.61 66.77 73.05	75.13 79.69	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is fr	om community h	eating
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= 97.97 97.97 97.97 97.97 97.97 97.97 97.97 97.97 97.97 97.97	97.97 97.97	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	<u> </u>	,
(67)m= 16.07 14.27 11.6 8.79 6.57 5.54 5.99 7.79 10.45 13.27	15.49 16.51	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	l l	1
(68)m= 170.98 172.75 168.28 158.76 146.75 135.45 127.91 126.14 130.61 140.12	152.14 163.43	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5		
(69)m= 32.8 32.8 32.8 32.8 32.8 32.8 32.8 32.8	32.8 32.8	(69)
Pumps and fans gains (Table 5a)	02.0 02.0	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3	(70)
		1 (70)
Losses e.g. evaporation (negative values) (Table 5) (71)m=	-78.38 -78.38	(71)
	-78.38 -78.38	(71)
Water heating gains (Table 5)	10101 10711	(72)
(72)m= 108.96 107.1 103.22 97.96 94.54 89.73 85.64 90.88 92.74 98.19	104.34 107.11	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (70)m$		(
(73)m= 351.4 349.51 338.5 320.9 303.25 286.12 274.93 280.19 289.19 306.98	327.36 342.44	(73)
6. Solar gains:	la ariantatian	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicab		Oning
Orientation: Access Factor Area Flux g_ Table 6d m² Table 6a Table 6b Table 6b	FF able 6c	Gains (W)
Northeast 0.9x	0.7 =	31.07 (75)
Northeast 0.9x 0.77 x 9.01 x 22.97 x 0.63 x	0.7	63.24 (75)

Northeast _{0.9x}	0.77	х	9.0)1	x	4	1.38	X		0.63	x	0.7	=	113.94	(75)
Northeast _{0.9x}	0.77	х	9.0)1	x	6	7.96	x		0.63	x [0.7	=	187.12	(75)
Northeast _{0.9x}	0.77	х	9.0)1	x	9	1.35	x		0.63	x	0.7	=	251.53	(75)
Northeast _{0.9x}	0.77	х	9.0)1	x	9	7.38	X		0.63	x [0.7	=	268.16	(75)
Northeast _{0.9x}	0.77	x	9.0)1	x	9	91.1	x		0.63	_ x [0.7		250.85	(75)
Northeast _{0.9x}	0.77	х	9.0)1	x	7	2.63	x		0.63	= x	0.7		199.98	(75)
Northeast 0.9x	0.77	х	9.0)1	x	5	0.42	х		0.63	x	0.7	=	138.84	(75)
Northeast _{0.9x}	0.77	x	9.0)1	x	2	8.07	x		0.63	_ x [0.7		77.29	(75)
Northeast _{0.9x}	0.77	х	9.0)1	x	1	14.2	x		0.63	x	0.7	=	39.09	(75)
Northeast 0.9x	0.77	х	9.0)1	x	9	9.21	X		0.63	x [0.7	=	25.37	(75)
_				_	-										_
Solar gains in	watts, ca	alculated	d for eac	h month				(83)m	ı = Sı	ım(74)m .	(82)m				
(83)m= 31.07	63.24	113.94	187.12	251.53	1	88.16	250.85	199.		138.84	77.29	39.09	25.37		(83)
Total gains – i	nternal a	and sola	r (84)m =	- (73)m	<u> </u>		watts						<u> </u>		
(84)m= 382.46	412.75	452.44	508.02	554.77	·	4.27	525.78	480.	.18	428.03	384.26	366.46	367.81		(84)
7. Mean inter	rnal tamr	oroturo	(hooting	coacon	1										
Temperature			,		<i>'</i>	aroa f	rom Tak	olo O	Th	1 (00)				21	(85)
•	Ū	٠.			•			JIE 3,		1 (0)				21	(00)
Utilisation fac					È	. 1		١ ٨.	ا ما	Son	Oct	Nov	Doo		
(86)m= 1	Feb 1	Mar 0.99	Apr 0.97	0.9	-	Jun).74	Jul 0.58	0.6	-	Sep 0.88	Oct 0.98	0.99	Dec 1		(86)
(80)111=	<u> </u>	0.99	0.97	0.9		7.74	0.56	0.0	,5	0.00	0.96	0.99	<u> </u>		(00)
Mean interna	l temper	ature in	living ar	ea T1 (fo	ollo	w ste	ps 3 to 7	7 in T	able	9c)		_			
(87)m= 19.66	19.78	20.02	20.39	20.72	20	0.92	20.98	20.9	97	20.81	20.4	19.98	19.64		(87)
Temperature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	able 9), Th	n2 (°C)					
(88)m= 19.87	19.88	19.88	19.89	19.9	19	9.91	19.91	19.9	91	19.9	19.9	19.89	19.89		(88)
Utilisation fac	tor for a	ains for	rest of d	wellina.	h2.	m (se	e Table	9a)				•	•	•	
(89)m= 1	,	0.99	0.96	0.86	_	0.65	0.45	0.5	51	0.82	0.97	0.99	1		(89)
Mean interna	l tompor	atura in	the rest	of dwall	ina	——— То (fa	ollow etc	nc 2	+o 7	in Tabl	0.00)				
(90)m= 18.1	18.27	18.64	19.17	19.62	Ť	9.86	19.9	19.		19.75	19.2	18.58	18.08		(90)
(50)111= 10.1	10.27	10.04	13.17	13.02	<u> </u>	0.00	10.0	10.	.~			ng area ÷ (ļ	0.45	(91)
											L/ (- L/V)	rig aroa . (., –	0.45	(31)
Mean interna								`					1	Ī	
(92)m= 18.8	18.95	19.26	19.72	20.11	_	0.34	20.39	20.3		20.23	19.74	19.21	18.79		(92)
Apply adjustr	1				_			-						1	<i>(</i>)
(93)m= 18.8	18.95	19.26	19.72	20.11	20	0.34	20.39	20.3	38	20.23	19.74	19.21	18.79		(93)
8. Space hea															
Set Ti to the					ned	at ste	ep 11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the utilisation	1			i e		la	l. d	Ι		Can	Oat	Nev	Daa	1	
Jan Utilisation for	Feb	Mar	Apr	May		Jun	Jul	Al	ug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	0.98	0.95	0.86	_	0.69	0.51	0.5	7	0.84	0.97	0.99	1		(94)
` '		<u> </u>	<u> </u>	l		,.09	0.51	0.5	''	0.04	0.91	0.99	<u> </u>		(0.)
Useful gains, (95)m= 380.54	409.52	0, VV = (9) $0.444.95$	4)m x (8- 483.88	4)m 479.81	21	81.5	266.7	275.	₆₁ T	359.97	371.9	363.19	366.28		(95)
Monthly aver							200.7	1 213.	.01	JJ3.31	311.9	303.19	300.20		(00)
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.	4	14.1	10.6	7.1	4.2		(96)
(00)	L	L	L	L	<u> </u>		. 5.0	1	.		. 0.0	1	<u> </u>		(=-)

Heat loss rat	e for me	an intern	al temp	aratura	lm \//-	-[(30)m	v [(03)m	_ (96)m	1				
(97)m= 1081.08		945.61	789.93	612.71	412.53	272.36	285.53	442.62	665.81	886.93	1074.37		(97)
Space heatir	<u> </u>	ement fo	r each n	nonth, k\	Vh/mont	th = 0.02	24 x [(97	ı)m – (95	i ()m] x (4	1)m			
(98)m= 521.2	426.64	372.49	220.35	98.88	0	0	0	0	218.67	377.09	526.82		
							Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	2762.14	(98)
Space heatir	ng require	ement in	kWh/m²	²/year								46.64	(99)
9a. Energy re	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heati	_			/							i		7(004)
Fraction of s					ementary	-		(201) -				0	(201)
Fraction of s			-	` '			(202) = 1	, ,	(202)1			1	(202)
Fraction of to		_	-				(204) = (2	02) x [1 –	(203)] =		ļ	1	(204)
Efficiency of	-		• .			0.4						93.5	(206)
	Efficiency of secondary/supplementary heating system, %											0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatir	1g require 426.64	372.49	220.35	98.88	0	0	0	0	218.67	377.09	526.82		
(211)m = {[(98		<u> </u>	<u> </u>	<u> </u>					210.07	011.00	020.02		(211)
557.43	456.3	398.39	235.67	105.75	0	0	0	0	233.87	403.31	563.45		(211)
	1	1			l		Tota	I II (kWh/yea	ar) =Sum(2	1 211) _{15,1012}	<u></u>	2954.16	(211)
Space heating fuel (secondary), kWh/month											_		
$= \{[(98)m \times (2)]\}$	01)] } x 1	00 ÷ (20	8)									ı	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water heatin	•	tor (oolo	ulotod o	hova)									
Output from v	157.28	165.46	148.72	146.03	130.9	126.11	137.84	137.42	154.2	162.55	174.14		
Efficiency of v	vater hea	ater	<u>!</u>	Į	l	<u>I</u>	Į	Į	<u>l</u>	<u>!</u>	!	79.8	(216)
(217)m= 87.51	87.35	86.92	85.86	83.8	79.8	79.8	79.8	79.8	85.75	86.99	87.58		(217)
Fuel for water	-				•		•	•	•	•	•		
(219)m = (64) (219)m = 203.75	T	0 ÷ (217) 190.37	m 173.21	174.26	164.03	158.03	172.73	172.21	179.83	186.87	198.83		
(210)111- 200.70	100.00	130.37	170.21	174.20	104.05	100.00	ļ	I = Sum(2		100.07	130.03	2154.18	(219)
Annual totals	S									Wh/year	ا ر	kWh/year	
Space heating		ed, main	system	1						•		2954.16	
Water heating	fuel use	ed									İ	2154.18	Ī
Electricity for	pumps, f	ans and	electric	keep-ho	t						•		
central heati	ng pump	:									30		(230c)
boiler with a fan-assisted flue									45		(230e)		
Total electrici	y for the	above, I	kWh/yea	ır			sum	of (230a).	(230g) =	:		75	(231)
Electricity for	lighting										ĺ	283.72	(232)
Total delivere	d energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				5467.06	(338)

12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year		
Space heating (main system 1)	(211) x	0.216	638.1 (261)		
Space heating (secondary)	(215) x	0.519 =	0 (263)		
Water heating	(219) x	0.216 =	465.3 (264)		
Space and water heating	(261) + (262) + (263) + (264) =		1103.4 (265)		
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)		
Electricity for lighting	(232) x	0.519 =	147.25 (268)		
Total CO2, kg/year	sum	of (265)(271) =	1289.58 (272)		
TER =			21.78 (273)		

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:11:01

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 64.41m²

Site Reference: Highgate Road - GREEN

Plot Reference: 00 - D

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

20.27 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.58 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 57.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 48.2 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) **OK** Floor 0.13 (max. 0.25) 0.13 (max. 0.70) OK Roof 0.13 (max. 0.20) 0.13 (max. 0.35) OK Openings 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

71 am ananan Babta		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	5.09m²	
Windows facing: South East	6.72m ²	
Ventilation rate:	3.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
•	U VV/III-K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				0010943 on: 1.0.5.50	
Address :	F	Property	Address	00 - D					
1. Overall dwelling dime	ensions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor		(64.41	(1a) x	2	2.65	(2a) =	170.69	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (64.41	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	170.69	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hoι	ır
Number of chimneys	0 + 0	+ [0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī - Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ins				2	x '	10 =	20	(7a)
Number of passive vents	;			Ē	0	x -	10 =	0	(7b)
Number of flueless gas fi	ires			F	0	x	40 =	0	(7c)
				L					
							Air ch	nanges per he	our
	ys, flues and fans = (6a)+(6b)+(ontinus fr	20		÷ (5) =	0.12	(8)
Number of storeys in the	peen carried out or is intended, procee he dwelling (ns)	ea 10 (17),	otrierwise	onunue ir	om (9) to	(10)		0	(9)
Additional infiltration	3 ()					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t ngs): if equal user 0.35	o the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (15) -		0	(15)
Infiltration rate	q50, expressed in cubic metre	se nar h	(8) + (10)				area	0	(16)
•	lity value, then $(18) = [(17) \div 20] + (18)$	•		•	elle oi e	rivelope	aica	0.37	(17)
•	es if a pressurisation test has been do				is being u	sed		0.0.	(\ -'/
Number of sides sheltered	ed		(00) 4	10 07F ·· //	10)1			0	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			1	(20)
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (10	/ X (20) =				0.37	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp	1 ' 1 ' 1		<u> </u>	•	•	1		J	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Faster (00s) (0	2)	-	•		•	-	•	•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	1	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	1 0.95	0.32	'	1.00	1.12	1.10	J	

Adjusted infiltration	rate (allow	ina for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.47 0.4	`	0.4	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43]	
Calculate effective	•	rate for t	he appli	cable ca	se	!	!			•		
If mechanical ver		andiv NL (C	12h) (22a	a) Franc (a	navotion (N	VIEVV otho	muiaa (22h) (220)			0	
If exhaust air heat pu) = (23a)			0	(23b)
If balanced with heat	-	-	_					21.) (001) [4 (00.)	0	(23c)
a) If balanced me	cnanicai ve	entilation 0	with nea	at recove	ery (MVI	TR) (248	$\frac{a)m = (2)}{0}$	2b)m + ($\frac{230) \times [}{0}$	$\frac{1 - (23c)}{1}$) ÷ 100]]	(24a)
(1)											J	(244)
b) If balanced me	chanicai ve	entilation 0	without 0	neat red		0 (24)	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	20)m + (. 0	230)	0	1	(24b)
c) If whole house	ļ	ļ	ļ	<u> </u>			<u> </u>			0	J	(215)
if (22b)m < 0			•	•				.5 × (23b	o)			
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural venti	ation or wh	nole hous	e positiv	ve input	ventilatio	on from	loft	<u>!</u>	<u>!</u>	<u>!</u>	J	
if (22b)m = 1			•	•				0.5]			_	
(24d)m = 0.61 0.6	1 0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24d)
Effective air chan	ge rate - ei	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.61 0.6	1 0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59]	(25)
3. Heat losses and	I heat loss	paramet	er:									
	iross ea (m²)	Openin		Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²-		A X k kJ/K
Doors	` ,							•	•			
Doolo				2.61	X	1.2	=	3.132				(26)
Windows Type 1				5.09		1.2 /[1/(1.4)+	!	3.132 6.75				(26) (27)
					x1,		0.04] =					, ,
Windows Type 1				5.09	x1,	/[1/(1.4)+	0.04] =	6.75			7 F	(27)
Windows Type 1 Windows Type 2 Floor	45.34	14.4	2	5.09	x10 x10 x	/[1/(1.4)+ /[1/(1.4)+	0.04] =	6.75 8.91 8.37330	1 [∃ F	(27) (27) (28)
Windows Type 1 Windows Type 2 Floor Walls Type1			2	5.09 6.72 64.41 30.92	x1. x1. x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.13	0.04] =	6.75 8.91 8.37330 5.57	1 [(27) (27) (28) (29)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2	4.69	0	2	5.09 6.72 64.41 30.92 4.69	x1. x1. x x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	0.04] =	6.75 8.91 8.37330 5.57 0.84	1 [(27) (27) (28) (29) (29)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof	4.69 6.8		2	5.09 6.72 64.41 30.92 4.69 6.8	x1. x1. x x x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.13	0.04] =	6.75 8.91 8.37330 5.57	1 [(27) (27) (28) (29) (29) (30)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme	4.69 6.8	0	2	5.09 6.72 64.41 30.92 4.69 6.8	x1. x1. x x x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	0.04] = 0.04] = 0.04] = = = =	6.75 8.91 8.37330 5.57 0.84 0.88				(27) (27) (28) (29) (29) (30) (31)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme	4.69 6.8	0	2	5.09 6.72 64.41 30.92 4.69 6.8 121.2	x1. x1. x x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18	0.04] =	6.75 8.91 8.37330 5.57 0.84				(27) (27) (28) (29) (29) (30) (31) (32)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling	4.69 6.8	0	2	5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16	x1, x1, x1, x1, x1, x2, x2, x3, x4, x4, x4, x4, x4, x4, x4, x4, x4, x4	/[1/(1.4)+ /[1/(1.4)+ 0.13 0.18 0.18	0.04] = 0.04] = 0.04] = = = =	6.75 8.91 8.37330 5.57 0.84 0.88				(27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling Internal wall **	4.69 6.8 nts, m ²	0		5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16 57.61	x1. x1. x x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ / 0.13 0.18 0.18 0.13	0.04] = 0.04] = = = = =	6.75 8.91 8.37330 5.57 0.84 0.88		paragraph		(27) (27) (28) (29) (29) (30) (31) (32)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling	4.69 6.8 nts, m²	0 0	indow U-va	5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05	x1. x1. x x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ / 0.13 0.18 0.18 0.13	0.04] = 0.04] = = = = =	6.75 8.91 8.37330 5.57 0.84 0.88		paragraph		(27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling Internal wall ** * for windows and roof v	4.69 6.8 nts, m²	0 0	indow U-va	5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05	x1 x1 x1 x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ / 0.13 0.18 0.18 0.13	- 0.04] = - 0.04] = - 0.04] = - = - = - =	6.75 8.91 8.37330 5.57 0.84 0.88		paragraph] [] [] [] [] 34.4	(27) (27) (28) (29) (30) (31) (32) (32b)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling Internal wall ** * for windows and roof water include the areas on the second wall with the second wall wall wall with the second wall wall wall wall wall wall wall wal	4.69 6.8 nts, m² vindows, use expoth sides of in	0 0	indow U-va	5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05	x1 x1 x1 x x x x x x x x x x x x x x x	0.13 0.18 0.13 0.13	- 0.04] = - 0.04] = - 0.04] = - =	6.75 8.91 8.37330 5.57 0.84 0.88	as given in			(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling Internal wall ** * for windows and roof water include the areas on the search of the sea	4.69 6.8 nts, m² vindows, use exporth sides of interpretation (K = S (A x k))	0 0 effective winternal wal	indow U-va	5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calculatitions	x1 x1 x1 x x x x x x x x x x x x x x x	0.13 0.18 0.13 0.13	= 0.04] = 0.04] = = 0.04] = = = = = = = =	6.75 8.91 8.37330 5.57 0.84 0.88	as given in [2] + (32a).		34.4	(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c) 46 (33) 2.85 (34)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling Internal wall ** * for windows and roof v ** include the areas on b Fabric heat loss, W Heat capacity Cm =	4.69 6.8 nts, m² indows, use elepth sides of interpretation (TMI) swhere the decided where the decided are the	o o o o o o o o o o o o o o o o o o o	indow U-ve ls and pan	5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calculatitions	x1 x1 x1 x1 x x x x x x x x x x x x x x	0.13 0.18 0.13 0.13 0.18 0.10 0.13	= 0.04] = 0.04] = = = = = = = = = =	6.75 8.91 8.37330 5.57 0.84 0.88 0	as <i>given in</i> 2) + (32a). : Medium	(32e) =	34.4 13952	(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c) 46 (33) 2.85 (34)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling Internal wall ** * for windows and roof v ** include the areas on be Fabric heat loss, W Heat capacity Cm = Thermal mass para For design assessments	4.69 6.8 nts, m² windows, use exports sides of in the sides of in the sides of in the sides of	effective winternal wall U) P = Cm - etails of the culation.	indow U-vals and pand	5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calculations	x1. x1. x1. x1. x1. x2. x x. x. x4. x. x4. x4. x4. x4. x4. x4.	0.13 0.18 0.13 0.13 0.18 0.10 0.13	= 0.04] = 0.04] = = = = = = = = = =	6.75 8.91 8.37330 5.57 0.84 0.88 0	as <i>given in</i> 2) + (32a). : Medium	(32e) =	34.4 13952	(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c) (32c)
Windows Type 1 Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of eleme Party wall Party ceiling Internal wall ** * for windows and roof v ** include the areas on b Fabric heat loss, W Heat capacity Cm = Thermal mass para For design assessments can be used instead of a	4.69 6.8 Ints, m² windows, use of interpretation of interpretati	effective winternal walk U) P = Cm - etails of the culation.	TFA) ir construct	5.09 6.72 64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calculatitions	x1. x1. x1. x1. x1. x2. x x. x. x4. x. x4. x4. x4. x4. x4. x4.	0.13 0.18 0.13 0.18 0.13 0.19 0.10 0.13	= 0.04] = = 0.04] = = = = = = = = = =	6.75 8.91 8.37330 5.57 0.84 0.88 0	as <i>given in</i> 2) + (32a). : Medium	(32e) =	34.4 13952 256	(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c) 46 (33) (2.85 (34) (0 (35)

Ventila	ition hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	34.34	34.1	33.86	32.76	32.55	31.59	31.59	31.41	31.96	32.55	32.97	33.41		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	80.32	80.08	79.84	78.74	78.53	77.57	77.57	77.4	77.94	78.53	78.95	79.39		
Heat Ic	oss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	78.74	(39)
(40)m=	1.25	1.24	1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.23	1.23		_
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.22	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ene	rgy requi	irement:								kWh/ye	ar:	
Assum	ed occu	ipancy, l	N								2	.1		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.				
			ater usag									.15		(43)
		_	hot water person per			_	_	o acnieve	a water us	se target o	Ī			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea	<u> </u>					Оер	Oct	1407	Dec		
(44)m=	92.57	89.2	85.83	82.47	79.1	75.74	75.74	79.1	82.47	85.83	89.2	92.57		
` '			<u> </u>					<u> </u>		Γotal = Su	m(44) ₁₁₂ =		1009.81	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	137.27	120.06	123.89	108.01	103.64	89.43	82.87	95.1	96.23	112.15	122.42	132.94		_
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	• [1324.02	(45)
(46)m=	20.59	18.01	18.58	16.2	15.55	13.41	12.43	14.26	14.43	16.82	18.36	19.94		(46)
	storage		منام برام منا		. lo o \ \	WILLDO		م ماطفاند						(47)
_		` ,	includin	•			•		ime ves	sei		150		(47)
Otherw	•	stored	nd no ta		•			` '	ers) ente	er '0' in (47)			
	•		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Tempe	erature fa	actor fro	m Table	2b							0.	54		(49)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(48) x (49)	=		0.	75		(50)
•			eclared o	-										
			factor free section		e 2 (kWl	h/litre/da	ıy)					0		(51)
	e factor	_		011 4.3								0		(52)
			m Table	2b								0		(53)
•			· storage		ear			(47) x (51)	x (52) x (53) =		0		(54)
		54) in (5	-					, ,	•			75		(55)
⊨nter	` ,													
	` ,	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	m				

If cylinder conta	ains dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5 ⁻	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.3	3 21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circ	uit loss (ar	nual) fro	m Table	 e 3							0		(58)
Primary circ	,	•			59)m = ((58) ÷ 36	55 × (41)	m				l	
(modified	by factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.2	6 21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss	calculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	equired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 183.8	162.15	170.49	153.1	150.23	134.52	129.47	141.69	141.32	158.75	167.51	179.54		(62)
Solar DHW inp	ut calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additio	nal lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 183.8	162.15	170.49	153.1	150.23	134.52	129.47	141.69	141.32	158.75	167.51	179.54		
	•						Outp	out from wa	ater heate	r (annual) ₁	12	1872.64	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m]	
(65)m= 82.9	2 73.59	78.47	71.99	71.74	65.81	64.83	68.9	68.07	74.57	76.78	81.48		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga				,									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 105.1	6 105.16	105.16	105.16	105.16	105.16	105.16	105.16	105.16	105.16	105.16	105.16		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5				l	
(67)m= 16.7	14.83	12.06	9.13	6.83	5.76	6.23	8.09	10.86	13.79	16.1	17.16		(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5			l	
(68)m= 183.9	<u> </u>	181.02	170.78	157.85	145.71	137.59	135.68	140.49	150.73	163.65	175.8		(68)
Cooking gai	ns (calcula	ated in A	ppendix	L. equat	ion L15	or L15a	, also se	ee Table	5				
(69)m= 33.5	_`	33.52	33.52	33.52	33.52	33.52	33.52	33.52	33.52	33.52	33.52		(69)
Pumps and	fans gains	(Table 5	 5a)									l	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							l	
(71)m= -84.1		-84.13	-84.13	-84.13	-84.13	-84.13	-84.13	-84.13	-84.13	-84.13	-84.13		(71)
Water heating	ng gains (T	rable 5)	!			!		!	ļ.			l	
(72)m= 111.4	 	105.47	99.98	96.42	91.4	87.14	92.6	94.54	100.22	106.64	109.51		(72)
Total intern					(66)	l .		L ⊦ (69)m + (l .	1)m + (72)	m		
(73)m= 369.6	_	356.1	337.44	318.65	300.42	288.5	293.93	303.45	322.3	343.94	360.03		(73)
6. Solar ga													, ,
Solar gains a		using sola	r flux from	Table 6a	and associ	iated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orientation:		_	Area		Flu			g_		FF		Gains	
	Table 6d		m²		Tal	ole 6a	Т	able 6b	T	able 6c		(W)	

Northeast _{0.9x}	0.77	x	5.0	9	x	1	1.28] x	0.63	×	Г	0.7	\neg	=	17.55	(75)
Northeast _{0.9x}	0.77	= x	5.0	==	x		2.97]]	0.63	$=$ $_{x}$	\vdash	0.7	\dashv	=	35.73	(75)
Northeast _{0.9x}	0.77	x	5.0		x	_	1.38]]	0.63	x	\vdash	0.7	号	=	64.37	(75)
Northeast _{0.9x}	0.77	x	5.0		x		7.96)] x	0.63	= x	H	0.7	〓	=	105.71	(75)
Northeast _{0.9x}	0.77	x	5.0	9	x	_	1.35)] x	0.63	x	F	0.7	〓	=	142.1	(75)
Northeast _{0.9x}	0.77	x	5.0	9	X	9	7.38	X	0.63	×	F	0.7	Ħ	=	151.49	(75)
Northeast _{0.9x}	0.77	x	5.0	9	X	- (91.1	x	0.63	x		0.7	Ħ	=	141.71	(75)
Northeast _{0.9x}	0.77	×	5.0	9	X	7	2.63	x	0.63	x		0.7		=	112.98	(75)
Northeast _{0.9x}	0.77	x	5.0	9	x	5	0.42	x	0.63	×		0.7		=	78.43	(75)
Northeast 0.9x	0.77	x	5.0	9	x	2	8.07	x	0.63	×		0.7		=	43.66	(75)
Northeast _{0.9x}	0.77	x	5.0	9	x	_	14.2	x	0.63	×		0.7		=	22.08	(75)
Northeast _{0.9x}	0.77	x	5.0	9	x	9	9.21	x	0.63	×		0.7		=	14.33	(75)
Southeast _{0.9x}	0.77	x	6.7	2	x	3	6.79	x	0.63	×		0.7		=	75.56	(77)
Southeast _{0.9x}	0.77	x	6.7	2	x	6	2.67	x	0.63	×		0.7		=	128.71	(77)
Southeast _{0.9x}	0.77	X	6.7	2	X	8	5.75	X	0.63	×		0.7		=	176.11	(77)
Southeast _{0.9x}	0.77	x	6.7	2	X	10	06.25	x	0.63	×		0.7		=	218.21	(77)
Southeast _{0.9x}	0.77	X	6.7	2	X	1	19.01	x	0.63	x		0.7		=	244.41	(77)
Southeast 0.9x	0.77	X	6.7	2	X	1	18.15	X	0.63	x		0.7		=	242.65	(77)
Southeast 0.9x	0.77	x	6.7	2	X	1	13.91	X	0.63	×		0.7		=	233.94	(77)
Southeast _{0.9x}	0.77	X	6.7	2	X	10	04.39	X	0.63	X		0.7		=	214.39	(77)
Southeast _{0.9x}	0.77	X	6.7	2	X	9	2.85	X	0.63	X		0.7		=	190.69	(77)
Southeast _{0.9x}	0.77	X	6.7	2	X	6	9.27	X	0.63	x		0.7		=	142.26	(77)
Southeast _{0.9x}	0.77	X	6.7	2	X	4	4.07	X	0.63	X		0.7		=	90.51	(77)
Southeast _{0.9x}	0.77	X	6.7	2	X	3	1.49	X	0.63	X		0.7		=	64.67	(77)
Solar gains in						0444	275.05	ì΄	n = Sum(74)m	1 ` ´		440.50	70			(92)
(83)m= 93.12 Total gains – i		240.48 d solar	323.92 (84)m =	386.51 (73)m		94.14 83)m	375.65 watts	327	.36 269.12	185.	92	112.59	79	1		(83)
(84)m= 462.73		596.57	661.36	705.16	<u> </u>	94.55	664.16	621	.29 572.57	508.	21 T	456.53	439.	03		(84)
7. Mean inter	<u> </u>															
7. Mean Inter						area f	from Tak	9 <u>م</u> ام	Th1 (°C)						21	(85)
Utilisation fac	Ū	٠.			•			JIC 5	, 1111 (0)						21	
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Α	ug Sep	00	et	Nov	De	ec		
(86)m= 1	0.99	0.98	0.94	0.84	+	0.67	0.5	0.5		0.9	$\overline{}$	0.99	1			(86)
Mean interna	l temperat	ture in	living ar	a T1 (follo	w ste	ns 3 to 7	7 in T	ahle 9c)	!						
(87)m= 19.74		20.18	20.52	20.8	$\overline{}$	20.95	20.99	20.		20.5	3	20.07	19.7	'1		(87)
Temperature	during he	ating n	eriods ir	rest o	f du	ellina	from Ta	hle (Th2 (°C)	·						
(88)m= 19.88		19.89	19.9	19.9	_	9.92	19.92	19.		19.	• T	19.9	19.8	39		(88)
Utilisation fac	<u> </u>								<u> </u>	-						
(89)m= 0.99	0.99	0.97	0.92	0.79	\neg	0.57	0.38	(9a) 0.4	13 0.72	0.9	₄ T	0.99	1			(89)
` ′	<u> </u>															. ,
Mean interna	i temperat	ure In	ine rest	oi awe	ııııg	12 (f	JIIOW STE	ps 3	io i iii iad	ne ac)						

(90)m= 18.22	18.47	18.86	19.36	19.72	19.89	19.91	19.91	19.83	19.37	18.72	18.19		(90)
								f	fLA = Livin	g area ÷ (4	4) =	0.63	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwel	lling) = fl	_A × T1	+ (1 – fL	A) × T2					
(92)m= 19.18	19.38	19.69	20.09	20.4	20.56	20.59	20.59	20.49	20.1	19.57	19.15		(92)
Apply adjusti	ment to the	ne mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
(93)m= 19.18	19.38	19.69	20.09	20.4	20.56	20.59	20.59	20.49	20.1	19.57	19.15		(93)
8. Space hea	ating requ	uirement											
Set Ti to the			•		ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation								_			I _ 1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac				0.04	0.00	0.40	0.54	0.77	0.04	0.00	0.00		(04)
(94)m= 0.99	0.99	0.97	0.92	0.81	0.63	0.46	0.51	0.77	0.94	0.99	0.99		(94)
Useful gains (95)m= 459.47	524.79	578.34	609.82	574.23	438.61	305.6	317.49	438.8	479.41	450.23	436.58		(95)
(95)m= 459.47 Monthly aver						303.0	317.49	430.0	479.41	430.23	430.36		(33)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat									<u> </u>	7.1	7.2		(00)
(97)m= 1195.07	1	1053.22	881.3	683.47	462.34	309.76	324.24	498.45	746.03	984.84	1187.02		(97)
Space heatir									l				, ,
(98)m= 547.28	426.41	353.31	195.47	81.28	0	0	0	0	198.37	384.92	558.33		
(00)=							Tota	l per vear	(kWh/vear	·) = Sum(9	8)1.59.12 =	2745.37	(98)
	<u> </u>	emont in	k\\/h/m2	2/voor			Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2745.37	(98)
Space heatir	ng require			•					(kWh/year	r) = Sum(9	8) _{15,912} =	2745.37 42.62	(98) (99)
Space heatir	ng require quiremer			•	ystems i	ncluding			(kWh/year) = Sum(9	8) _{15,912} =		= ' '
Space heatir 9a. Energy re Space heati	ng require quiremer ng:	nts – Indi	vidual h	eating sy					(kWh/year	r) = Sum(9	8) _{15,912} =	42.62	(99)
Space heatir 9a. Energy res Space heati Fraction of s	ng require quiremen ng: pace hea	nts – Indi	vidual h	eating sy		system	micro-C	CHP)	(kWh/year) = Sum(9	8) _{15,912} =	42.62	(99)
Space heatir 9a. Energy re Space heati Fraction of space of space heati Fraction of space heati	ng require quiremen ng: pace hea	nts – Indi	vidual h econdary	eating sy y/supple em(s)		system	micro-C (202) = 1	CHP) - (201) =) = Sum(9	8)15,912 =	42.62	(201
Space heatir 9a. Energy res Space heati Fraction of s	ng require quiremen ng: pace hea	nts – Indi	vidual h econdary	eating sy y/supple em(s)		system	micro-C (202) = 1	CHP)) = Sum(9	8)15,912 =	42.62	(201)
Space heatir 9a. Energy re Space heati Fraction of space of space heati Fraction of space heati	ng require quiremen ng: pace hea pace hea pace heatin	nts - Indi at from so at from m	ividual h econdary nain syst main sys	eating sy y/supple em(s) stem 1		system	micro-C (202) = 1	CHP) - (201) =) = Sum(9	8)15,912 =	42.62 0 1	(99) (201 (202 (204
Space heatir 9a. Energy re Space heati Fraction of s Fraction of s Fraction of to	ng require quiremen ng: pace hea pace hea patal heatin main spa	nts – Indi at from se at from m ag from ace heat	vidual hecondary nain systemain syst	eating sy y/supple em(s) stem 1	mentary	system	micro-C (202) = 1	CHP) - (201) =) = Sum(9	8)15,912 =	42.62 0 1	(99) (201 (202 (204 (206
Space heating space heating space heating fraction of space fraction of the space heating space heating fraction of the space heating space he	ng require quiremen ng: pace hea pace hea patal heatin main spa	nts – Indi at from se at from m ag from ace heat	vidual hecondary nain systemain syst	eating sy y/supple em(s) stem 1	mentary	system	micro-C (202) = 1	CHP) - (201) =) = Sum(9	8) _{15,912} =	42.62 0 1 1 93.5	(99) (201 (202 (204 (206 (208
Space heating space heating space heating fraction of space fraction of the space heating space heating fraction of the space heating space he	ng requirements ng: pace head pace head patal heatin main spa seconda	nts – Indi at from so at from m ag from ace heat ry/supplo	vidual hecondary nain systemain systementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 · (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =			0 1 1 93.5	(99) (201 (202 (204 (206 (208
Space heatir 9a. Energy re Space heati Fraction of s Fraction of to Efficiency of Jan	ng requirements ng: pace head pace head patal heatin main spa seconda	nts – Indi at from so at from m ag from ace heat ry/supplo	vidual hecondary nain systemain systementar Apr	eating sy y/supple em(s) stem 1 em 1 y heating	mentary g system Jun	system	micro-C (202) = 1 · (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =			0 1 1 93.5	(99) (201 (202 (204 (206 (208
Space heating space heating space heating fraction of space heating fraction of the space heating sp	ng requirements ng: pace head pace h	at from so at from m ace heat ry/supplo Mar ement (c 353.31	econdary nain systemain systematar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 81.28	mentary g system Jun	system n, % Jul	micro-C (202) = 1 · (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =	Nov	Dec	0 1 1 93.5	(99) (201 (202 (204 (206 (208
Space heating space heating space heating fraction of space heating fraction of the space heating sp	ng requirements ng: pace head pace h	at from so at from m ace heat ry/supplo Mar ement (c 353.31	econdary nain systemain systematar Apr alculatee	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 81.28	mentary g system Jun	system n, % Jul	micro-C (202) = 1 · (204) = (2	CHP) - (201) = 02) × [1 -	(203)] =	Nov	Dec	0 1 1 93.5	(99) (201 (202 (204 (206 (208
Space heating space heating space heating fraction of space heating spac	ng requirements ng: pace head pace h	at from so at from m ace heat ry/supple Mar ement (c 353.31 4)] } x 1	econdary nain systemain systementar Apr alculatee 195.47 00 ÷ (20	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 81.28	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 · (204) = (2 Aug	CHP) - (201) = 02) × [1 -	(203)] = Oct 198.37	Nov 384.92	Dec 558.33	0 1 1 93.5	(201 (202 (204 (206 (208 ear
Space heating space heating space heating fraction of space heating fraction of the space heating sp	ng requirements ng: pace head pace h	at from so at from m ace heat ry/supplo Mar ement (c 353.31 4)] } x 1	econdary nain systemain systementar Apr alculatee 195.47 00 ÷ (20 209.06	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 81.28	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 · (204) = (2 Aug	CHP) - (201) = 02) × [1 -	(203)] = Oct 198.37	Nov 384.92	Dec 558.33	0 1 1 93.5 0 kWh/ye	(201 (202 (204 (206 (208 ear
Space heating space heating space heating fraction of space fraction of the space heating space heat	ng requirements pace head	at from some set from many from ment (company from ment (company from ment (company from ment fr	econdary nain systemain systematrar Apr alculated 195.47 00 ÷ (20 209.06	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 81.28	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 · (204) = (2 Aug	CHP) - (201) = 02) × [1 -	(203)] = Oct 198.37	Nov 384.92	Dec 558.33	0 1 1 93.5 0 kWh/ye	(201 (202 (204 (206 (208 ear
Space heating 9a. Energy respective space heating Fraction of space fraction of to space heating Space heating 547.28 (211)m = {[(98)	ng requirements pace head	at from some set from many from ment (company from ment (company from ment (company from ment fr	econdary nain systemain systematrar Apr alculated 195.47 00 ÷ (20 209.06	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 81.28	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 · (204) = (2 Aug	CHP) - (201) = 02) × [1 -	(203)] = Oct 198.37	Nov 384.92	Dec 558.33	0 1 1 93.5 0 kWh/ye	(201) (202) (204) (206) (208) ear
Space heating 9a. Energy respective space heating Fraction of space fraction of to space heating Space heating 547.28 (211)m = {[(98)	ng requirements pace head to be a conda Feb ag require 426.41 B)m x (20 456.06 ag fuel (second) } x 1	t from so t from mage heat ry/supplement (c 353.31 4)] } x 1 377.87	econdary nain systemain systematar Apr alculater 195.47 00 ÷ (20 209.06	eating sy y/supple em(s) stem 1 em 1 yy heating May d above) 81.28 06) 86.93	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 · (204) = (2 Aug 0 Tota	CHP) - (201) = 02) × [1 - Sep 0	(203)] = Oct 198.37 212.16 ar) = Sum(2	Nov 384.92 411.67 211) _{15,1012}	558.33 597.14	0 1 1 93.5 0 kWh/ye	(99) (201 (202 (204 (206 (208 ear
Space heating 9a. Energy respective space heating Fraction of space heating Fraction of the space heating Space heating 547.28 (211)m = {[(98) m x (20) m m m m m m m m m m m m m m m m m m m	ng requirements ng: pace head pace h	t from so t from mage heat ry/supplement (c 353.31 4)] } x 1 377.87	econdary nain systemain systematar Apr alculater 195.47 00 ÷ (20 209.06	eating sy y/supple em(s) stem 1 em 1 yy heating May d above) 81.28 06) 86.93	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 · (204) = (2 Aug 0 Tota	CHP) - (201) = 02) × [1 - Sep 0 I (kWh/yea	(203)] = Oct 198.37 212.16 ar) = Sum(2	Nov 384.92 411.67 211) _{15,1012}	558.33 597.14	42.62 0 1 1 93.5 0 kWh/ye	(99) (201 (202 (204 (206 (208 ear
Space heating 9a. Energy respectively Space heating Fraction of some some some some some some some some	ng requirement of the property	t from some secondary of the condary	econdary nain systemain systemain systementar Apr alculated 195.47 00 ÷ (20 209.06 y), kWh/8) 0	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 81.28 06) 86.93 month	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 · (204) = (2 Aug 0 Tota	CHP) - (201) = 02) × [1 - Sep 0 I (kWh/yea	(203)] = Oct 198.37 212.16 ar) = Sum(2	Nov 384.92 411.67 211) _{15,1012}	558.33 597.14	42.62 0 1 1 93.5 0 kWh/ye	(99) (201) (202) (204) (206) (208) ear
Space heating 9a. Energy respect of space heating fraction of space heating fraction of the space heating fraction from the space heating fraction	ng requirement of the property	t from some secondary of the condary	econdary nain systemain systemain systementar Apr alculated 195.47 00 ÷ (20 209.06 y), kWh/8) 0	eating sy y/supple em(s) stem 1 em 1 y heating May d above) 81.28 06) 86.93 month	g system Jun 0	system n, % Jul 0	micro-C (202) = 1 · (204) = (2 Aug 0 Tota	CHP) - (201) = 02) × [1 - Sep 0 I (kWh/yea	(203)] = Oct 198.37 212.16 ar) = Sum(2	Nov 384.92 411.67 211) _{15,1012}	558.33 597.14	42.62 0 1 1 93.5 0 kWh/ye	(99) (201) (202) (204) (206) (208)

	1							()
` '	79.8 79.8	79.8	79.8	85.41	86.96	87.64		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
` '	68.58 162.24	177.56	177.1	185.86	192.62	204.85		
	•	Total	= Sum(2	19a) ₁₁₂ =			2220.81	(219)
Annual totals				k\	Wh/year	•	kWh/year	-
Space heating fuel used, main system 1							2936.22	
Water heating fuel used							2220.81	
Electricity for pumps, fans and electric keep-hot								_
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							294.9	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232).	(237b)	=				5526.93	(338)
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
	Energy kWh/year			Emiss kg CO		tor	Emissions kg CO2/yea	r
Space heating (main system 1)					2/kWh	tor =		r](261)
Space heating (main system 1) Space heating (secondary)	kWh/year			kg CO	2/kWh		kg CO2/yea	-
	kWh/year			kg CO	2/kWh	=	kg CO2/yea	(261)
Space heating (secondary)	kWh/year (211) x (215) x	+ (263) + (2	264) =	0.2 0.5	2/kWh	= =	kg CO2/yea	(261)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	+ (263) + (2	264) =	0.2 0.5	2/kWh	= =	kg CO2/yea 634.22 0 479.69	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262)	+ (263) + (2	264) =	0.2 0.5 0.2	2/kWh 16 19 16	=	kg CO2/yea 634.22 0 479.69 1113.92	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) (231) x	+ (263) + (:		0.2 0.5 0.5	2/kWh 16 19 16	= = = = = = = = = = = = = = = = = = = =	kg CO2/yea 634.22 0 479.69 1113.92 38.93	(261) (263) (264) (265) (267)

TER =

(273)

20.27

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:10:32*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 61.88m²Site Reference:Highgate Road - GREENPlot Reference:00 - E

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 20.45 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.55 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 46.8 kWh/m²

OK

2 Fabric U-values

Element Highest Average External wall 0.16 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) **OK** Floor 0.13 (max. 0.25) 0.13 (max. 0.70) OK Roof 0.13 (max. 0.20) 0.13 (max. 0.35) OK Openings 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Law anaray lights		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	9.14m²	
Ventilation rate:	3.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m ² K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:							
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				RO010943 rsion: 1.0.5.50		
Address :	F	Property	Address	00 - E						
1. Overall dwelling dime	nsions:									
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)	
Ground floor		(61.88	(1a) x	2	2.65	(2a) =	163.98	(3a)	
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (61.88	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	163.98	(5)	
2. Ventilation rate:										
	main seconda heating heating	ry	other		total			m³ per hou	ır	
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)	
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)	
Number of intermittent fa	ns			Ī	2	x ′	10 =	20	(7a)	
Number of passive vents				Ī	0	x ²	10 =	0	(7b)	
Number of flueless gas fi	res			Ē	0	x	40 =	0	(7c)	
				L				_		
				_			Air ch	nanges per ho	our —	
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	20		÷ (5) =	0.12	(8)	
Number of storeys in the		iu io (17),	ourerwise (onunue n	om (9) to	(10)		0	(9)	
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)	
	.25 for steel or timber frame o			•	ruction			0	(11)	
if both types of wall are pr deducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after						
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)	
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)	
-	s and doors draught stripped							0	(14)	
Window infiltration			0.25 - [0.2	. ,	-			0	(15)	
Infiltration rate	250 amaza dia adia adia mata		(8) + (10)					0	(16)	
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	etre or e	envelope	area	5	(17)	
•	s if a pressurisation test has been do				is being u	sed		0.37	(10)	
Number of sides sheltere	d							0	(19)	
Shelter factor			(20) = 1 -		19)] =			1	(20)	
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.37	(21)	
Infiltration rate modified for		T	1 .			T		1		
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1		
(22)m= 5.1 5	7.0 4.4 4.3 3.8] 3.6	3.1	4	4.3	J 4.0	4.1			
Wind Factor (22a)m = (22	2)m ÷ 4							1		
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18			

Adjusted infilt	ration rat	e (allowi	ing for st	nelter ar	nd wind s	speed) =	(21a) x	(22a)m					
0.47	0.46	0.46	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44]	
Calculate effe		•	rate for t	he appli	cable ca	ise	•	•	•	•	•		(23a)
If exhaust air h			endix N. (2	(23a) = (23a	a) × Fmv (e	eguation (I	N5)) . othe	rwise (23b) = (23a)			0	 :
If balanced wit									, , ,			0	
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2:	2b)m + (23b) × [1 – (23c)		(3 3)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	o)m = (22	2b)m + (23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•					E v. (22h	~)			
(24c)m = 0	$m < 0.5 \times 10^{-6}$	0	0	0 = (231)		0	$C_0 = (22)$	0	0) 0	0	1	(24c)
d) If natural										<u> </u>]	(= 15)
	m = 1, the								0.5]			_	
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in bo	x (25)			,		
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area		Openin m	igs 1 ²	Net Ar A ,r		U-val W/m2		A X U (W/		k-valu kJ/m²·		A X k kJ/K
Doors					2.61	x	1.2	=	3.132				(26)
Windows					9.14	x1	/[1/(1.4)+	0.04] =	12.12				(27)
Floor					61.88	3 X	0.13	=	8.0444	. [(28)
Walls Type1	21.9	92	11.7	5	10.17	7 X	0.18	=	1.83				(29)
Walls Type2	27.9	99	0		27.99) x	0.18	=	5.04				(29)
Roof	24.9	98	0		24.98	3 X	0.13	=	3.25				(30)
Total area of	elements	, m²			136.7	7							(31)
Party wall					42.78	3 X	0	=	0				(32)
Party ceiling					36.89	9				[(32b)
Internal wall *	*				120.6	8				[(32c)
* for windows and ** include the are						lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	n 3.2	
Fabric heat lo							(26)(30)) + (32) =				33.4	11 (33)
Heat capacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	13439	
Thermal mass	s parame	ter (TMF	= Cm -	: TFA) iı	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design asses				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridg				using Ap	pendix l	K						11.4	11 (36)
if details of therm					-							L	
Total fabric he								(33) +	(36) =			44.8	32 (37)
Ventilation he	1	ı —	· ·	<u> </u>	T .	T .	T -	- ` ` ` 		(25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	

	•				,	,				,	•	•	
(38)m= 33.14	32.91	32.67	31.59	31.38	30.44	30.44	30.26	30.8	31.38	31.79	32.23		(38)
Heat transfer	coefficie	nt, W/K			_	_		(39)m	= (37) + (38)m	-		
(39)m= 77.96	77.73	77.49	76.41	76.2	75.26	75.26	75.08	75.62	76.2	76.62	77.05		_
Heat loss par	rameter (I	HLP), W	/m²K		_		-		Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	76.41	(39)
(40)m= 1.26	1.26	1.25	1.23	1.23	1.22	1.22	1.21	1.22	1.23	1.24	1.25		_
Number of da	ays in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.23	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•			•		•					•	
4. Water he	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ	runancv	N									00	1	(42)
if TFA > 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.03		(42)
Annual avera	ige hot wa		,	•		_	` ,				2.51		(43)
Reduce the ann not more that 12	•		• •		-	-	to achieve	a water us	se target o	f			
	- 		· .			<u> </u>	Λ	Con	0-4	Nov	Daa		
Jan Hot water usage		Mar r day for ea	Apr ach month	May $Vd, m = fa$	Jun ctor from 7	Jul Table 1c x	Aug <i>(4</i> 3)	Sep	Oct	Nov	Dec		
(44)m= 90.77		84.16	80.86	77.56	74.26	74.26	77.56	80.86	84.16	87.46	90.77		
(44)1112 30.77	07.40	04.10	00.00	77.00	74.20	7 4.20	77.00			m(44) ₁₁₂ :	L	990.16	(44)
Energy content	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600	kWh/mor	th (see Ta	ables 1b, 1	c, 1d)		
(45)m= 134.6	117.72	121.48	105.91	101.62	87.69	81.26	93.25	94.36	109.97	120.04	130.35		
If instantaneous	water heat	na ot noint	of upo (no	hot woto	r otorogo)	ontor O in	hoves (16		Γotal = Su	m(45) ₁₁₂ :	=	1298.26	(45)
If instantaneous	_	-							40.5	1004	10.55		(46)
(46)m= 20.19 Water storag	1	18.22	15.89	15.24	13.15	12.19	13.99	14.15	16.5	18.01	19.55		(46)
Storage volu) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)					1	
Otherwise if		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storag a) If manufa		oclarad I	occ foct	or ic kno	wo (k\\/k	2/d2v/):					00	İ	(40)
Temperature				JI IS KIIU	wii (Kvvi	i/uay).					.54		(48) (49)
Energy lost fi				ear			(48) x (49)	١ =			.5 4 .75		(50)
b) If manufa		_	-		or is not		(10) // (10)				.73		(30)
Hot water sto	•			e 2 (kW	h/litre/da	ay)					0		(51)
If community Volume factor	-		on 4.3									1	(50)
Temperature			2h							-	0		(52) (53)
Energy lost fi				oor			(47) x (51)	v (52) v (53) -				, ,
Enter (50) or		_	, KVVII/ yt	zai			(47) X (31)	/ X (32) X (55) =	-	0 .75		(54) (55)
Water storag	, , ,	•	for each	month			((56)m = (55) × (41)ı	m				(00)
(56)m= 23.33	_	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contain												l ix H	X7
(57)m= 23.33		23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
	•	•	-	-	•	•				•			

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) \div 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder the	ermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 23.26 23.26	3.26 22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 0 (61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m$	m + (46)m + (57)m + (59)m + (61)m
(62)m= 181.2 159.81 168.08 151 148.22 132.78 127.86 139.84 139.45 156	6.56 165.13 176.95 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar cont	tribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
(64)m= 181.2 159.81 168.08 151 148.22 132.78 127.86 139.84 139.45 156	6.56 165.13 176.95
Output from water h	neater (annual) ₁₁₂ 1846.88 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (61)m] + 0.8 \times [(47)m + (61)m] + 0.8 \times [(48)m + 0	6)m + (57)m + (59)m]
(65)m= 82.03 72.81 77.67 71.29 71.07 65.23 64.29 68.28 67.45 73.	3.84 75.99 80.62 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water	is from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep C	Oct Nov Dec
(66)m= 101.71 101.71 101.71 101.71 101.71 101.71 101.71 101.71 101.71 101.71 101.71 101.71	1.71 101.71 101.71 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 16.8 14.92 12.13 9.19 6.87 5.8 6.26 8.14 10.93 13.	3.88 16.19 17.26 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	5
(68)m= 177.66 179.51 174.86 164.97 152.49 140.75 132.91 131.07 135.71 14	5.6 158.09 169.82 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 33.17 33.17 33.17 33.17 33.17 33.17 33.17 33.17 33.17 33.17 33.17	3.17 33.17 (69)
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -81.37 -81.37 -81.37 -81.37 -81.37 -81.37 -81.37 -81.37 -81.37 -81.37 -81.37	1.37 -81.37 -81.37 (71)
Water heating gains (Table 5)	
(72)m= 110.26 108.35 104.39 99.01 95.52 90.6 86.42 91.78 93.68 99.	0.25 105.54 108.36 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m$	n + (71)m + (72)m
(73)m= 361.23 359.29 347.9 329.68 311.38 293.66 282.11 287.5 296.83 315	5.24 336.34 351.96 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the app	
Orientation: Access Factor Area Flux g_ Table 6d m ² Table 6a Table 6b	FF Gains Table 6c (W)
	x 0.7 = 102.78 (77)
Southeast 0.9x 0.77 x 9.14 x 62.67 x 0.63	x 0.7 = 175.07 (77)

Southeast _{0.9x}	0.77	X	9.1	4	x	8	5.75	X		0.63	X	0.7	=	239.53	(77)
Southeast _{0.9x}	0.77	X	9.′	4	x	10	06.25	X		0.63	X	0.7	=	296.79	(77)
Southeast _{0.9x}	0.77	X	9.′	4	x	11	19.01	X		0.63	X	0.7	=	332.43	(77)
Southeast _{0.9x}	0.77	X	9.′	4	x	11	18.15	X		0.63	X	0.7	=	330.03	(77)
Southeast _{0.9x}	0.77	X	9.′	4	x	11	13.91	X		0.63	X	0.7	=	318.18	(77)
Southeast _{0.9x}	0.77	X	9.′	4	x	10	04.39	X		0.63	x	0.7	=	291.59	(77)
Southeast 0.9x	0.77	X	9.′	4	x	9	2.85	X		0.63	x	0.7	=	259.36	(77)
Southeast _{0.9x}	0.77	X	9.1	4	x	6	9.27	X		0.63	x	0.7	=	193.49	(77)
Southeast _{0.9x}	0.77	X	9.′	4	x	4	4.07	X		0.63	x	0.7	=	123.1	(77)
Southeast 0.9x	0.77	X	9.	4	x	3	1.49	X		0.63	x	0.7	=	87.96	(77)
_					-										_
Solar gains in	watts, ca	alculated	I for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m= 102.78	175.07	239.53	296.79	332.43	_	30.03	318.18	291	.59	259.36	193.49	123.1	87.96		(83)
Total gains – i	nternal a	and solar	· (84)m =	= (73)m	+ (8	33)m ,	watts	!							
(84)m= 464.01	534.36	587.43	626.47	643.82	62	23.69	600.29	579	.09	556.2	508.73	459.44	439.92		(84)
7. Mean inter	rnal temr	perature	(heating	season)								,		
Temperature						area f	rom Tab	ole 9	Th	1 (°C)				21	(85)
Utilisation fac	_				_			J.O 0,	,	. (0)				21	
Jan	Feb	Mar	Apr	May	È	Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
(86)m= 0.99	0.99	0.98	0.94	0.86	-).71	0.54	0.5	-	0.8	0.95	0.99	1		(86)
, ,	Į	ļ		<u> </u>				<u> </u>							
Mean interna		ĭ		1	_			l	Т		20.54	1 20 00	10.70		(87)
(87)m= 19.75	19.92	20.18	20.5	20.77		0.94	20.99	20.9	98	20.88	20.54	20.09	19.72		(01)
Temperature	T	· ·	1	ı	т —	Ť		r	T					Ī	
(88)m= 19.87	19.88	19.88	19.89	19.89	19	9.91	19.91	19.9	91	19.9	19.89	19.89	19.88		(88)
Utilisation fac	ctor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)	_						
(89)m= 0.99	0.99	0.97	0.92	0.81	0).61	0.41	0.4	15	0.72	0.93	0.99	0.99		(89)
Mean interna	al temper	ature in	the rest	of dwell	ing	T2 (fc	ollow ste	ps 3	to 7	' in Tabl	e 9c)				
(90)m= 18.23	18.49	18.86	19.32	19.67	19	9.87	19.9	19.	.9	19.81	19.38	18.74	18.2		(90)
		!								f	LA = Liv	ing area ÷ (4) =	0.56	(91)
Mean interna	ıl tampar	ature (fo	r tha wh	ole dwe	lling	م/ _ fl	Λ ν Τ1	⊥ /1	_ fl	۸) ی T2					
(92)m= 19.08	19.29	19.6	19.98	20.29	_	0.47	20.51	20.		20.41	20.03	19.49	19.05		(92)
Apply adjustr		<u> </u>		l	<u> </u>										` '
(93)m= 19.08	19.29	19.6	19.98	20.29	_	0.47	20.51	20.		20.41	20.03		19.05		(93)
8. Space hea															
Set Ti to the				re obtair	ned	at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti.m=	-(76)m an	d re-calc	culate	
the utilisation										,	,	(* -)			
Jan	Feb	Mar	Apr	May	Γ,	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fac	ctor for g	ains, hm	1:											•	
(94)m= 0.99	0.98	0.97	0.92	0.83	0).66	0.48	0.5	52	0.76	0.93	0.98	0.99		(94)
Useful gains,	, hmGm	, W = (94	4)m x (8	4)m										•	
(95)m= 460.04	525.46	567.59	579.12	536.34	41	13.19	289.24	301	.19	421.97	475.46	451.72	436.93		(95)
Monthly aver	age exte	rnal tem	perature	from T	able	e 8								•	
(96)m= 4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.	.4	14.1	10.6	7.1	4.2		(96)
														-	

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]		
(97)m= 1152.33 1118.51 1015.02 846.62 654.45 441.5 294.18 308.29 477.43 718.56 949.46 1144.26		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		
(98)m= 515.06 398.53 332.89 192.6 87.87 0 0 0 180.86 358.37 526.26		
Total per year (kWh/year) = Sum(98) _{15,912} =	2592.45	(98)
Space heating requirement in kWh/m²/year	41.89	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)		
Space heating:		7(201)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) =	1	(201)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1	(204)
Efficiency of main space heating system 1	93.5	(206)
Efficiency of secondary/supplementary heating system, %	0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	kWh/yea	ar J
Space heating requirement (calculated above)	,	
515.06 398.53 332.89 192.6 87.87 0 0 0 0 180.86 358.37 526.26		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)		(211)
550.87 426.23 356.03 205.99 93.98 0 0 0 193.44 383.29 562.84		_
Total (kWh/year) =Sum(211) _{15,1012} =	2772.67	(211)
Space heating fuel (secondary), kWh/month		
$= \{[(98)m \times (201)]\} \times 100 \div (208)$ $(215)m = $		
Total (kWh/year) =Sum(215) _{15,1012} =	0	(215)
Water heating		」 ` ′
Output from water heater (calculated above)		
181.2 159.81 168.08 151 148.22 132.78 127.86 139.84 139.45 156.56 165.13 176.95		7
Efficiency of water heater	79.8	(216)
(217)m= 87.16 86.6 85.46 83.47 79.8 79.8 79.8 79.8 85.2 86.83 87.55		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m		
(219)m= 207.2 183.36 194.07 176.68 177.56 166.4 160.22 175.24 174.75 183.76 190.18 202.12		
Total = Sum(219a) ₁₁₂ =	2191.56	(219)
Annual totals kWh/year	kWh/year	_
Space heating fuel used, main system 1	2772.67	_
Water heating fuel used	2191.56	_
Electricity for pumps, fans and electric keep-hot		
central heating pump:		(230c)
boiler with a fan-assisted flue		(230e)
Total electricity for the above, kWh/year sum of (230a)(230g) =	75	(231)
Electricity for lighting	296.65	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =	5335.88	(338)

12a. CO2 emissions – Individual heating systems	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	598.9 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	473.38 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1072.27 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519	153.96 (268)
Total CO2, kg/year	sum	of (265)(271) =	1265.16 (272)
TER =			20.45 (273)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:10:05

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 48.96m² **Plot Reference:** 01 - A Site Reference : Highgate Road - GREEN

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 21.58 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.58 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 57.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 47.3 kWh/m²

OK 2 Fabric U-values

Element Highest Average

External wall 0.17 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK

Floor 0.13 (max. 0.25) OK 0.13 (max. 0.70)

Roof (no roof)

Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	5.45m ²	
Windows facing: South East	6.09m ²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	01 - A					
Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		4	48.96	(1a) x	2	2.65	(2a) =	129.74	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	48.96	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	129.74	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	x ′	10 =	20	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	20		÷ (5) =	0.15	(8)
Number of storeys in the		iu io (17),	ourerwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250 amaza dia adia adia mata		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	etre or e	envelope	area	5	(17)
•	s if a pressurisation test has been do				is being u	sed		0.4	(10)
Number of sides sheltere	d							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.4	(21)
Infiltration rate modified for		T	1 .			<u> </u>		1	
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0 4.4 4.3 3.8] 3.6	3.1	4	4.3	4.0	4.1		
Wind Factor (22a)m = (22	2)m ÷ 4							1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.52	0.51	0.5	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47	1	
Calculate effec	tive air	change i	rate for t	he appli	cable ca	se se	<u> </u>	<u> </u>	<u> </u>		1		
If mechanica												0	(23a)
If exhaust air he) = (23a)			0	(23b)
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	d mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)) ÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ı	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b	m = (22)	 	- 	T	7	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h if (22b)n				•					.5 × (23b	o)	_	_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n									0.5]				
(24d)m= 0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61]	(24d)
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25)
3. Heat losse	s and he	eat loss p	paramete	er:									
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k J/K
Windows Type	e 1				5.45	x1.	/[1/(1.4)+	0.04] =	7.23				(27)
Windows Type	2				6.09	x1	/[1/(1.4)+	0.04] =	8.07				(27)
Floor					48.96	x	0.13		6.36479	9			(28)
Walls Type1	35.	3	11.54	4	23.76	x	0.18	=	4.28	F i		7 F	(29)
Walls Type2	35.9	9	0		35.99) x	0.18	=	6.48	Fi i		7 F	(29)
Total area of e	lements	, m²			120.2	5							(31)
Party wall					14.89) x	0	=	0			$\neg \Box$	(32)
Party ceiling					48.96	<u> </u>						7	(32b)
Internal wall **					96.46							=	(32c)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given ir	n paragraph	h 3.2	`
Fabric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				32.42	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a)	(32e) =	10263.99	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	itive Value	: Medium		250	(35)
For design assess can be used inste				constructi	ion are no	t known pr	recisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						9.02	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	· (36) =			41.44	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5	5)		_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 27.09	26.87	26.65	25.64	25.45	24.56	24.56	24.4	24.9	25.45	25.83	26.24		(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 68.53	68.31	68.09	67.08	66.89	66	66	65.84	66.34	66.89	67.27	67.67		
Stroma FSAP 201	2 Version	1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39)	112 /12=	67.0 β ag	je 2 of ³ / ₉)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.4	1.4	1.39	1.37	1.37	1.35	1.35	1.34	1.36	1.37	1.37	1.38		
	<u> </u>			<u> </u>	<u> </u>	<u> </u>	<u> </u>		L Average =	Sum(40) ₁ .	12 /12=	1.37	(40)
Number of day	/s in mo	nth (Tabl	le 1a)							, ,	L		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		!											
1 Water beet	ting one	ravi koani	romonti								Is\A/b/ye	vori	
4. Water heat	ung ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13		66		(42)
Annual averag Reduce the annua	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.61		(43)
not more that 125	litres per	person per	day (all w	ater use, i	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	day for ea	ch month	Vd,m = fa	ctor from T	Table 1c x	(43)			•			
(44)m= 80.98	78.03	75.09	72.14	69.2	66.25	66.25	69.2	72.14	75.09	78.03	80.98		
								_	Total = Su	m(44) ₁₁₂ =	-	883.37	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		<u> </u>
(45)m= 120.08	105.03	108.38	94.49	90.66	78.23	72.5	83.19	84.18	98.11	107.09	116.29		
						•	•	_	Total = Su	m(45) ₁₁₂ =	-	1158.23	(45)
If instantaneous w	⁄ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)			•		
(46)m= 18.01	15.75	16.26	14.17	13.6	11.74	10.87	12.48	12.63	14.72	16.06	17.44		(46)
Water storage		•		•	•	•	•		•				
Storage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage		11 1		!	(1-) (//	. /-1					1		(10)
a) If manufact				or is kno	wn (kvvr	n/day):				1.	39		(48)
Temperature f										0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufactHot water stora			-										(E4)
If community h	-			6 Z (KVV	ii/iiti e/ua	iy <i>)</i>					0		(51)
Volume factor	-		311 4.0								0		(52)
Temperature fa			2b							—	0		(53)
Energy lost fro				-ar			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (_	, 10 VIII/ y C	Jui			(11)11(01)	,		-	75		(55)
Water storage	. , .	,	or each	month			((56)m = (55) × (41)ı	m	0.			()
					00.50	i	., , ,	, , ,	ı	00.50	00.00		(FC)
(56)m= 23.33 If cylinder contains	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	Sv. LL	(56)
	s dedicate	u solai sio	rage, (57)	11 = (36)111	x [(50) – (п i i)] ÷ (э	o), eise (s	7)111 = (56)	ın wnere (<u>г</u>	m Appendi	ΙΧΠ	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	loss cal	culated f	or each	month (59)m = ((58) ÷ 36	65 × (41)	m		<u> </u>			
(modified by	factor f	rom Tabl	le H5 if t	here is	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss	ooloulotod	for oach	month /	(61)m –	(60) · 2(SE (41	\m						
Combi loss (61)m= 0	0 0	0	0	0	00) + 3	05 x (41)	0	0	0	0	0		(61)
				<u> </u>			<u> </u>	<u> </u>			<u> </u>	(59)m + (61)m	` /
(62)m= 166.6		154.97	139.58	137.26	123.33	119.09	129.78		144.7	152.18	162.89		(62)
Solar DHW inp	ut calculated	l	endix G o	Appendix		l) (enter	U'o' if no sola	r contribut	tion to wate	r heating)		
(add additio											σ,		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter		-		-			-		-		
(64)m= 166.6	8 147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89		_
							Οι	tput from w	ater heate	r (annual) ₁	12	1706.85	(64)
Heat gains t	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 77.2	68.59	73.31	67.49	67.42	62.09	61.38	64.94	64.06	69.9	71.68	75.94		(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic g	ains (Table	e 5), Wat	ts									_	
Jai	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 82.9	8 82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 12.8	9 11.44	9.31	7.05	5.27	4.45	4.8	6.25	8.38	10.64	12.42	13.24		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5		-	•	
(68)m= 144.5	146.03	142.25	134.21	124.05	114.51	108.13	106.63	110.41	118.45	128.61	138.16		(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	-	-		
(69)m= 31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3		(69)
Pumps and	fans gains	(Table 5	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m= -66.3	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38		(71)
Water heati	ng gains (T	able 5)		-		-	-				-		
(72)m= 103.7	77 102.07	98.54	93.74	90.62	86.23	82.5	87.28	88.98	93.95	99.56	102.08		(72)
Total interr	al gains =	•			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m		
(73)m= 312.0	08 310.44	300.99	285.88	270.83	256.08	246.33	251.05	258.66	273.94	291.48	304.37		(73)
6. Solar ga													
Solar gains a		_	r flux from	Table 6a			tions to	convert to the	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ix ble 6a		g_ Table 6b	т	FF able 6c		Gains	
					ı a	DIE Ga	, –	Table ob	_ '	able 60		(W)	7
Southeast 0.9		X	6.0)9	X 3	36.79	_ x	0.63	x	0.7	=	68.48	(77)
Southeast 0.9		X	6.0)9	x 6	62.67	X	0.63	x	0.7	=	116.65	(77)
Southeast 0.9	0.77	X	6.0)9	X 8	35.75	X	0.63	x	0.7	=	159.6	(77)
Southeast 0.9		X	6.0)9	x 1	06.25	X	0.63	X	0.7	=	197.75	(77)
Southeast 0.9	× 0.77	X	6.0	9	x 1	19.01	X	0.63	x	0.7	=	221.5	(77)

					_		_						
Southeast 0.9x	0.77	X	6.0)9	x	118.15	X	0.63	X	0.7	=	219.9	(77)
Southeast 0.9x	0.77	X	6.0)9	x	113.91	X	0.63	X	0.7	=	212.01	(77)
Southeast 0.9x	0.77	X	6.0)9	x	104.39	x	0.63	X	0.7	=	194.29	(77)
Southeast 0.9x	0.77	X	6.0)9	x	92.85	x	0.63	X	0.7	=	172.81	(77)
Southeast 0.9x	0.77	X	6.0)9	x [69.27	x	0.63	X	0.7	_	128.92	(77)
Southeast 0.9x	0.77	x	6.0)9	x	44.07	x	0.63	x	0.7	_	82.02	(77)
Southeast 0.9x	0.77	x	6.0)9	x [31.49	x	0.63	x	0.7		58.6	(77)
Southwest _{0.9x}	0.77	x	5.4	15	x [36.79	Ī	0.63	x	0.7		61.28	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x [62.67]	0.63	X	0.7	_	104.39	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x [85.75]	0.63	x	0.7	=	142.83	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x [106.25]	0.63	X	0.7	_	176.97	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x [119.01		0.63	X	0.7	_	198.22	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x [118.15]	0.63	x	0.7	=	196.79	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x [113.91		0.63	X	0.7	_	189.73	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x [104.39]	0.63	x	0.7	=	173.87	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x [92.85]	0.63	X	0.7	_	154.65	(79)
Southwest _{0.9x}	0.77	x	5.4	15	χ	69.27]	0.63	x	0.7	=	115.37	(79)
Southwest _{0.9x}	0.77	x	5.4	15	χ	44.07]	0.63	x	0.7	=	73.4	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x [31.49]	0.63	X	0.7	_	52.45	(79)
Solar gains in v	watts, cal	culated	for eac	h month			(83)m	= Sum(74)m .	(82)m			_	
(83)m= 129.76	221.04	302.43	374.73	419.72	41	6.69 401.73	368	.16 327.47	244.29	155.43	111.05		(83)
Total gains – in	nternal an	d solar	(84)m =	= (73)m ·	+ (8	3)m , watts						_	
(84)m= 441.84	531.47	603.42	660.61	690.55	67	2.76 648.06	619	04 500 40	-40.00	1 440 04	1 445 40		
7 Moon interr								.21 586.13	518.23	3 446.91	415.42]	(84)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)											415.42		(84)
	· ·		`		<i></i>	area from Tal	ole 9		518.23	3 446.91	415.42	21	(84)
	during he	ating p	eriods ir	n the livi	ng a		ole 9		518.23	3 446.91	415.42	21	
Temperature	during he	ating p	eriods ir	n the livi	ng a				0ct		Dec	21	
Temperature	during he	ating p	eriods ir	n the livi	ng a	e Table 9a)		Th1 (°C)				21	
Temperature Utilisation fact	during he tor for gai Feb	ating points for line Mar	eriods ir iving are Apr 0.89	n the living the May	ng a	Jun Jul 0.6 0.44	A 0.4	Th1 (°C) ug Sep 8 0.7	Oct	Nov	Dec	21	(85)
Temperature Utilisation fact Jan (86)m= 0.99	during he tor for gai	ating points for line Mar	eriods ir iving are Apr 0.89	n the living the May	ng a (se	Jun Jul 0.6 0.44	A 0.4	Th1 (°C) ug Sep 8 0.7 Table 9c)	Oct	Nov 0.98	Dec	21	(85)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7	tor for gai Feb 0.98 temperat	ating pons for line Mar 0.95 ture in l	eriods ir iving are Apr 0.89 iving are 20.58	n the living the hand	ng a (se collow	ee Table 9a) Jun Jul 0.6 0.44 w steps 3 to 7 0.96 20.99	A 0.47 in T 20.	Th1 (°C) ug Sep .8 0.7 Table 9c) 99 20.92	Oct: 0.91	Nov 0.98	Dec 0.99	21	(85)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal	tor for gai Feb 0.98 temperat	ating pons for line Mar 0.95 ture in l	eriods ir iving are Apr 0.89 iving are 20.58	n the living the hand	ng a (se	ee Table 9a) Jun Jul 0.6 0.44 w steps 3 to 7 0.96 20.99	A 0.47 in T 20.	Th1 (°C) ug Sep 8 0.7 able 9c) 99 20.92 9, Th2 (°C)	Oct: 0.91	Nov 0.98 20.08	Dec 0.99	21	(85)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7 Temperature (88)m= 19.76	tor for gai Feb 0.98 temperate 19.93 during he	ns for ling points for ling po	eriods ir iving are Apr 0.89 iving are 20.58 eriods ir 19.79	m the living the sea, h1,m May 0.77 the a T1 (for 20.83 the rest of 19.79	ng a (se collow 20 dwe	ee Table 9a) Jun Jul 0.6 0.44 w steps 3 to 7 0.96 20.99 elling from Ta 9.8 19.8	A 0.47 in T 20.	Th1 (°C) ug Sep 8 0.7 able 9c) 99 20.92 9, Th2 (°C)	Oct 0.91 20.59	Nov 0.98 20.08	Dec 0.99	21	(85)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7 Temperature (88)m= 19.76 Utilisation fact	tor for gai Feb 0.98 temperat 19.93 during he 19.77 tor for gai	ns for line of the state of the	eriods ir iving are 0.89 iving are 20.58 eriods ir 19.79 est of d	n the living the sea, h1,mm May 0.77 ea T1 (for 20.83 n rest of 19.79 welling,	ng a (see	ee Table 9a) Jun Jul 0.6 0.44 v steps 3 to 7 0.96 20.99 elling from Ta 9.8 19.8 m (see Table	A 0.47 in T 20.42 able 9 19.42 9a)	Th1 (°C) ug Sep 8 0.7 Table 9c) 99 20.92 0, Th2 (°C) 81 19.8	Oct 0.91 20.59	Nov 0.98 20.08	Dec 0.99 19.67	21	(85) (86) (87) (88)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7 Temperature (88)m= 19.76 Utilisation fact (89)m= 0.99	tor for gaine temperate 19.93 during he 19.77 dor for gaine 0.97	ns for line of	eriods ir iving are 0.89 iving are 20.58 eriods ir 19.79 est of d	n the living the hand the living the hand the ha	(se C C C C C C C C C	ee Table 9a) Jun Jul 0.6 0.44 v steps 3 to 7 0.96 20.99 elling from Ta 9.8 19.8 m (see Table 0.5 0.32	A 0.47 in T 20.48 in 19.49 19.	Th1 (°C) ug Sep 8 0.7 Table 9c) 99 20.92 0, Th2 (°C) 81 19.8	Oct 0.91 20.59 19.79 0.88	Nov 0.98 20.08	Dec 0.99	21	(85)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7 Temperature (88)m= 19.76 Utilisation fact (89)m= 0.99 Mean internal	tor for gainer for gai	ns for line of	eriods in iving are 0.89 iving are 20.58 eriods in 19.79 est of di 0.85 the rest	n the living the livin	ng a (see	e Table 9a) Jun Jul 0.6 0.44 w steps 3 to 7 0.96 20.99 elling from Ta 9.8 19.8 m (see Table 0.5 0.32 T2 (follow ste	A 0.27 in T 20. able 9 19. 9a) 0.3	Th1 (°C) ug Sep 8 0.7 able 9c) 99 20.92 9, Th2 (°C) 81 19.8 6 0.61 to 7 in Tabl	Oct 0.91 20.59 19.79 0.88 e 9c)	Nov 0.98 20.08 19.78	Dec 0.99 19.67 19.78	21	(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7 Temperature (88)m= 19.76 Utilisation fact (89)m= 0.99	tor for gai Feb 0.98 temperat 19.93 during he 19.77 tor for gai 0.97	ns for line of	eriods ir iving are 0.89 iving are 20.58 eriods ir 19.79 est of d	n the living the hand the living the hand the ha	ng a (see	ee Table 9a) Jun Jul 0.6 0.44 v steps 3 to 7 0.96 20.99 elling from Ta 9.8 19.8 m (see Table 0.5 0.32	A 0.47 in T 20.48 in 19.49 19.	Th1 (°C) ug Sep 8 0.7 Table 9c) 99 20.92 0, Th2 (°C) 81 19.8 16 0.61 to 7 in Table 8 19.74	Oct 0.91 20.59 19.79 0.88 e 9c) 19.36	Nov 0.98 20.08 19.78 0.97	Dec 0.99 19.67 0.99 18.04		(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7 Temperature (88)m= 19.76 Utilisation fact (89)m= 0.99 Mean internal (90)m= 18.09	temperate 19.77 temperate 18.42	ns for ling points for ling points for rough 18.86	eriods in iving are 0.89 iving are 20.58 eriods in 19.79 est of di 0.85 the rest 19.34	n the living the livin	dwee	ee Table 9a) Jun Jul 0.6 0.44 w steps 3 to 7 0.96 20.99 elling from Ta 9.8 19.8 m (see Table 0.5 0.32 T2 (follow steps) 19.8	A 0.4 7 in T 20. able 9 19. 9a) 0.3	Th1 (°C) ug Sep 8 0.7 Table 9c) 99 20.92 9, Th2 (°C) 81 19.8 16 0.61 to 7 in Tabl 8 19.74	Oct 0.91 20.59 19.79 0.88 e 9c) 19.36	Nov 0.98 20.08 19.78	Dec 0.99 19.67 0.99 18.04	21	(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7 Temperature (88)m= 19.76 Utilisation fact (89)m= 0.99 Mean internal (90)m= 18.09 Mean internal	temperate 18.42 temperate 18.42	ns for line of	eriods in iving are 0.89 iving are 20.58 eriods in 19.79 est of do 0.85 the rest 19.34 r the wh	n the living the sea, h1,mm and may 0.77 ea T1 (for 20.83 and rest of 19.79 and 19.79 and may 19.64	ng a (see control	ee Table 9a) Jun Jul 0.6 0.44 w steps 3 to 7 0.96 20.99 elling from Ta 9.8 19.8 m (see Table 0.5 0.32 T2 (follow ste 9.78 19.8	A 0.4 7 in T 20. able 9 9a) 0.3 eps 3	Th1 (°C) ug Sep 8 0.7 fable 9c) 99 20.92 9, Th2 (°C) 81 19.8 16 0.61 to 7 in Tabl 8 19.74 f - fLA) × T2	Oct 0.91 20.59 19.79 0.88 e 9c) 19.36 LA = Liv	Nov 0.98 20.08 19.78 0.97 18.65 ring area ÷ (4	Dec 0.99 19.67 0.99 18.04 4) =		(85) (86) (87) (88) (89) (90) (91)
Temperature Utilisation fact Jan (86)m= 0.99 Mean internal (87)m= 19.7 Temperature (88)m= 19.76 Utilisation fact (89)m= 0.99 Mean internal (90)m= 18.09	temperate 19.42 temperate 19.17	ns for line of	eriods in iving are 0.89 iving are 20.58 eriods in 19.79 est of do 0.85 the rest 19.34 er the who 19.95	n the living the livin	dwee h2,r colling 19	ee Table 9a) Jun Jul 0.6 0.44 w steps 3 to 7 0.96 20.99 elling from Ta 9.8 19.8 m (see Table 0.5 0.32 T2 (follow ste 0.78 19.8 g) = fLA × T1 0.37 20.39	A 0.4 7 in T 20. able 9 9a) 0.3 19 + (1 20.	Th1 (°C) ug Sep 8 0.7 Table 9c) 99 20.92 9, Th2 (°C) 81 19.8 16 0.61 to 7 in Tabl 8 19.74 f	Oct 0.91 20.59 19.79 0.88 e 9c) 19.36 LA = Liv	Nov 0.98 20.08 19.78 0.97 18.65 ring area ÷ (4	Dec 0.99 19.67 0.99 18.04		(85) (86) (87) (88) (89)

(02)	40.00	10.17	40.54	40.05	20.00	20.27	20.20	00.00	20.22	40.07	40.00	40.05	1	(93)
(93)m=	18.89	19.17	19.54	19.95	20.23	20.37	20.39	20.39	20.32	19.97	19.36	18.85		(93)
			uirement				44 -4	Table O	41	4 T: /	70)	-11-	lete	
			or gains			ed at ste	ер ттог	rable 9	o, so tha	t 11,m=(rojin an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm					,					•	
(94)m=	0.98	0.97	0.93	0.86	0.73	0.55	0.38	0.42	0.65	0.88	0.97	0.99		(94)
Usefu	<u> </u>		W = (94)	`			T	,	T		1	1	•	
(95)m=		513.15	561.81	566.72	503.88	366.69	247.99	259.33	382.34	457.42	432.3	409.87		(95)
		age exte	rnal tem	perature			•	,					•	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat			i				-``	- ` 	– (96)m				•	
(97)m=	999.78	974.96	888.12	741.54	570.71	380.53	250.26	262.72	412.89	626.57	824.88	991.34		(97)
Space			ı	i	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		•	
(98)m=	420.62	310.34	242.77	125.87	49.73	0	0	0	0	125.85	282.66	432.61		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1990.45	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								40.65	(99)
9a En	erav rea	wiremer	nts – Indi	ividual h	eating sy	vstems i	ncluding	ı micro-C	:HP)					
	e heatir		no ma	Madain	oainig oʻ	y otorno r	rioraanig	, moro c	,					
-		•	at from s	econdar	v/supple	mentary	system						0	(201)
			at from m			,	•	(202) = 1	- (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
			ace heat	-									93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	alculate	d above))								
	420.62	310.34	242.77	125.87	49.73	0	0	0	0	125.85	282.66	432.61		
(211)m	n = {[(98)m x (20	(4)] } x 1	00 ÷ (20	06)		=	-	-		-	-	•	(211)
, ,	449.86	331.91	259.65	134.62	53.18	0	0	0	0	134.6	302.31	462.68		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u> </u>	2128.82	(211)
Space	e heatin	a fuel (s	econdar	v). kWh/	month									_
•		`	00 ÷ (20	• / ·										
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
							I	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u> </u>	0	(215)
Water	heating	I												_
	_		ter (calc	ulated a	bove)									
	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89		
Efficier	ncy of w	ater hea	iter										79.8	(216)
(217)m=	87.18	86.76	86.01	84.54	82.39	79.8	79.8	79.8	79.8	84.44	86.44	87.3		⊿ (217)
Fuel fo	r water	heating	kWh/mo	onth			<u> </u>				I .	ı	1	
		•) ÷ (217)											
(219)m=	191.18	169.56	180.19	165.1	166.59	154.54	149.24	162.64	162	171.36	176.05	186.59		_
								Tota	I = Sum(2	19a) ₁₁₂ =			2035.04	(219)
	al totals									k'	Wh/year	•	kWh/year	_
Space	heating	fuel use	ed, main	system	1								2128.82	
												'		

			,		_
Water heating fuel used				2035.04	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting				227.56	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4466.42	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x	0.216	=	459.83	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	439.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =			899.39	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
7 1 1 7					
Electricity for lighting	(232) x	0.519	=	118.1	(268)
		0.519 of (265)(271) =	=	118.1 1056.42	(268)

TER =

(273)

21.58

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:09:38

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.46m² **Plot Reference:** Site Reference : Highgate Road - GREEN 01 - B

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

20.26 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 17.51 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 44.5 kWh/m²

OK 2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK OK

Floor 0.13 (max. 0.25) 0.13 (max. 0.70)

Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	9.56m²	
Windows facing: North West	3.98m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :		Property	Address	: 01 - B					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor			53.46	(1a) x	2	.65	(2a) =	141.67	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) [53.46	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	141.67	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	_ = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	x ′	10 =	20	(7a)
Number of passive vents				Ī	0	x ²	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				<u>L</u>				_	
				_			Air ch	nanges per he	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, proced			oontinuo fi	20		÷ (5) =	0.14	(8)
Number of storeys in the		eu 10 (17),	ourer wise t	conunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 ()					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t pas): if equal user 0.35	o the grea	ter wall are	ea (after					
,	floor, enter 0.2 (unsealed) or (.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)
Infiltration rate	250 amaza dia adia adia ada		(8) + (10)					0	(16)
•	q50, expressed in cubic metrity value, then $(18) = [(17) \div 20] +$		•	•	ietre oi e	envelope	area	5	(17)
· ·	es if a pressurisation test has been do				is being u	sed		0.39	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.39	(21)
Infiltration rate modified f	- 1 	1	Δ	0	0-4	Nan	D.,	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
(5.0	<u> </u>	1	<u> </u>	I	I	I	I	
Wind Factor (22a)m = (22	· 						1	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltration rate (allowing for she	lter and wind	speed) =	(21a) x	(22a)m					
0.5 0.49 0.48 0.43	0.42 0.37	0.37	0.36	0.39	0.42	0.44	0.46]	
Calculate effective air change rate for the	e applicable ca	ase					1	J	
If mechanical ventilation:								0	(23
If exhaust air heat pump using Appendix N, (23b) = (23a)			0	(23
If balanced with heat recovery: efficiency in % a	llowing for in-use	factor (fron	n Table 4h)) =				0	(23
a) If balanced mechanical ventilation w	vith heat recov	ery (MVI	HR) (24a	m = (22)	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0 0 0 0	0 0	0	0	0	0	0	0		(24
b) If balanced mechanical ventilation w	vithout heat re	covery (N	ЛV) (24b)m = (22	2b)m + (2	23b)	_		
24b)m= 0 0 0 0	0 0	0	0	0	0	0	0		(24
c) If whole house extract ventilation or if $(22b)m < 0.5 \times (23b)$, then $(24c)$					5 × (23b)			
24c)m= 0 0 0 0	0 0	0	0	0	0	0	0]	(24
d) If natural ventilation or whole house if (22b)m = 1, then (24d)m = (22b)	•				0.5]			•	
24d)m= 0.62 0.62 0.61 0.59	0.59 0.57	0.57	0.57	0.58	0.59	0.6	0.61]	(24
Effective air change rate - enter (24a)	or (24b) or (24	c) or (24	d) in box	(25)			•		
25)m= 0.62 0.62 0.61 0.59	0.59 0.57	0.57	0.57	0.58	0.59	0.6	0.61		(2
3. Heat losses and heat loss parameter							•	•	
ELEMENT Gross Openings area (m²) m²			U-valı W/m2		A X U (W/I	<)	k-value		A X k kJ/K
Vindows Type 1	9.44	x1.	/[1/(1.4)+	0.04] =	12.52	Ì			(2
Vindows Type 2	3.93	x1,	/[1/(1.4)+	0.04] =	5.21	=			(2
Floor	53.4	=	0.13		6.9498	=			(2
Valls Type1 40.04 13.37	26.6	=	0.18	=	4.8	╡ ¦		3	(2
Valls Type2 12.16 0	12.1	=	0.18	╡┇	2.19	╡ ¦			(2)
Total area of elements, m ²			0.10		2.19				
·	105.6	=				— ,			(3
Party wall	27.8	=	0	=	0			Ⅎ ⊨	(32
Party ceiling	53.4	6						⊣	(3:
nternal wall **	102.0								(32
for windows and roof windows, use effective wind it include the areas on both sides of internal walls		lated using	ı formula 1.	/[(1/U-valu	ıe)+0.04] a	s given ir	n paragrapl	1 3.2	
Fabric heat loss, W/K = S (A x U)	arra paranorro		(26)(30)	+ (32) =				31.66	(3:
Heat capacity Cm = S(A x k)				((28)	.(30) + (32	2) + (32a)	(32e) =	10115.9	
Thermal mass parameter (TMP = Cm ÷	TFA) in k.l/m²k	(** /	tive Value:	, , ,	, ,	250	(3
For design assessments where the details of the co	•		ecisely the				able 1f	230	(0
an be used instead of a detailed calculation.									
hermal bridges : S (L x Y) calculated us	sing Appendix	K						8.81	(3
details of thermal bridging are not known (36) = 0 otal fabric heat loss	0.05 x (31)			(33) +	(36) =			40.47	(3
entilation heat loss calculated monthly				(38)m	= 0.33 × (25)m x (5	5)		
Jan Feb Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
	27.51 26.6	26.6	26.44	26.95	27.51	27.9	28.31	1	(3
Heat transfer coefficient, W/K				(39)m	= (37) + (3	 38)m	!		
				(-0)	(2.) . (-,		1	
39)m= 69.66 69.44 69.22 68.18	67.98 67.08	67.08	66.91	67.43	67.98	68.38	68.79		

Heat loss pa	rameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.3	1.3	1.29	1.28	1.27	1.25	1.25	1.25	1.26	1.27	1.28	1.29		
				ı	l	l	l		Average =	Sum(40) ₁	12 /12=	1.28	(40)
Number of da	-	nth (Tab	le 1a)					ı	1				
Jan	+	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water he	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occif TFA > 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		79		(42)
Annual avera Reduce the ann not more that 12	ual average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		5.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								*F					
(44)m= 84.44	81.37	78.3	75.23	72.16	69.09	69.09	72.16	75.23	78.3	81.37	84.44		
									Total = Su	m(44) ₁₁₂ =	= [921.15	(44)
Energy content	of hot water	used - cal	culated m	onthly = 4.	190 x Vd,ı	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		<u> </u>
(45)m= 125.22	2 109.52	113.01	98.53	94.54	81.58	75.6	86.75	87.78	102.3	111.67	121.27		_
If in atomton a qua	water beet	'na at naint	of upo /pa	hat water	r 040 ro mo l	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	= [1207.78	(45)
If instantaneous	i		·	ı			· · ·	, , , -	1	1			(40)
(46)m= 18.78 Water storag	1	16.95	14.78	14.18	12.24	11.34	13.01	13.17	15.35	16.75	18.19		(46)
Storage volu) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if	no stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storag													
a) If manufa				or is kno	wn (kWl	n/day):				1.	39		(48)
Temperature										0.	54		(49)
Energy lost f		•			or io not		(48) x (49)) =		0.	75		(50)
b) If manufaHot water sto			-								0		(51)
If community	•			- (-77					<u> </u>		(0.7)
Volume facto	or from Ta	ble 2a									0		(52)
Temperature	factor fro	m Table	2b								0		(53)
Energy lost f		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) o	r (54) in (55)								0.	75		(55)
Water storag	e loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder conta	ins dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circu	iit loss (ar	nnual) fro	m Table	<u></u>							0		(58)
Primary circu	•	•			59)m =	(58) ÷ 36	65 × (41)	m					
(modified b	by factor f	rom Tab	le H5 if t	here is	solar wa	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss	ooloulotod	for oach	month ((61)m -	(60) · 2(SE (41)	\m						
(61)m= 0	0 0	0	0	0	00) + 30	05 × (41)	0	0	0	0	0	1	(61)
		ļ					<u> </u>	<u> </u>				J (59)m + (61)m	(0.1)
(62)m= 171.8	<u> </u>	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	(59)111 + (61)1111	(62)
Solar DHW inp						<u> </u>						l	(- /
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ter				ļ.	Į.			l	l	ı	
(64)m= 171.8	-	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86]	
	_ '						Out	out from w	ater heate	r (annual)₁	12	1756.39	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 78.9	1 70.08	74.85	68.83	68.71	63.2	62.41	66.12	65.26	71.29	73.2	77.6	1	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	om com	munity h	reating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ains (Table	e 5), Wat	ts									_	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 89.6	1 89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 13.9	3 12.37	10.06	7.62	5.69	4.81	5.19	6.75	9.06	11.5	13.43	14.31		(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		-		
(68)m= 156.2	21 157.83	153.74	145.05	134.07	123.75	116.86	115.24	119.33	128.02	139	149.32		(68)
Cooking gai	ns (calcula	ated in A	opendix	L, equat	ion L15	or L15a), also s	ee Table	5	-	-		
(69)m= 31.9	6 31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96		(69)
Pumps and	fans gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (nega	ive valu	es) (Tab	le 5)	-	-		-	-	-		
(71)m= -71.6	8 -71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68		(71)
Water heating	ng gains (1	Table 5)											
(72)m= 106.0	06 104.29	100.61	95.6	92.35	87.78	83.89	88.87	90.64	95.82	101.67	104.3		(72)
Total intern	al gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	1)m + (72))m		
(73)m= 329.0	08 327.37	317.29	301.15	285	269.22	258.82	263.74	271.91	288.23	306.98	320.81		(73)
6. Solar ga	ins:												
Solar gains ar		Ü	r flux from	Table 6a			itions to co	onvert to th	ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a	7	g_ able 6b	т	FF able 6c		Gains	
					Tal	DIE Ga	, —	able ob	_ '	able 60		(W)	,
Southwest _{0.9}		X	9.4	14	x 3	36.79	<u> </u>	0.63	x	0.7	=	106.15	(79)
Southwest _{0.9}	•	X	9.4	14	x 6	62.67	<u> </u>	0.63	x	0.7	=	180.81	(79)
Southwest _{0.9}	• • • • • • • • • • • • • • • • • • • •	X	9.4	14	x8	35.75	! <u> </u>	0.63	x	0.7	=	247.4	(79)
Southwest _{0.9}		Х	9.4	14	x 1	06.25	ļ <u>L</u>	0.63	x	0.7	=	306.53	(79)
Southwest _{0.9}	x 0.77	X	9.4	14	x 1	19.01		0.63	x	0.7	=	343.34	(79)

_														
Southwest _{0.9x}	0.77	X	9.4	14	X	1	18.15		0.63	X	0.7	=	340.86	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	1	13.91		0.63	X	0.7	=	328.63	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	10	04.39		0.63	X	0.7	=	301.16	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	9	2.85		0.63	X	0.7	=	267.88	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	6	9.27		0.63	x	0.7	=	199.84	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	4	4.07		0.63	x	0.7	=	127.14	(79)
Southwest _{0.9x}	0.77	х	9.4	14	x	3	1.49		0.63	x	0.7	=	90.84	(79)
Northwest _{0.9x}	0.77	x	3.9)3	x	1	1.28	x	0.63	x	0.7	=	13.55	(81)
Northwest 0.9x	0.77	X	3.9)3	x	2	2.97	x	0.63	X	0.7	=	27.58	(81)
Northwest 0.9x	0.77	X	3.9)3	x	4	1.38	x	0.63	X	0.7	=	49.7	(81)
Northwest 0.9x	0.77	X	3.9)3	x	6	7.96	x	0.63	x	0.7	=	81.62	(81)
Northwest 0.9x	0.77	X	3.9)3	x	9	1.35	x	0.63	X	0.7	=	109.71	(81)
Northwest _{0.9x}	0.77	X	3.9)3	x	9	7.38	x	0.63	x	0.7	=	116.96	(81)
Northwest _{0.9x}	0.77	X	3.9)3	x	é	91.1	x	0.63	x	0.7	=	109.42	(81)
Northwest _{0.9x}	0.77	X	3.9)3	x	7	2.63	x	0.63	x	0.7	=	87.23	(81)
Northwest _{0.9x}	0.77	X	3.9)3	x	5	0.42	x	0.63	x	0.7	_	60.56	(81)
Northwest _{0.9x}	0.77	x	3.9)3	x	2	8.07	x	0.63	x	0.7	=	33.71	(81)
Northwest _{0.9x}	0.77	x	3.9)3	X	,	14.2	x	0.63	x	0.7	=	17.05	(81)
Northwest _{0.9x}	0.77	X	3.9)3	x	9	9.21	x	0.63	x	0.7	_	11.07	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m														
(83)m= 119.7		297.09	388.15	453.06		57.83	438.04	388	.39 328.43	233.5	5 144.19	101.91		(83)
Total gains – ii	nternal an	nd solar	(84)m =	= (73)m	+ (8	83)m	, watts						1	
(84)m= 448.78	535.77	614.39	689.3	738.05	72	27.04	696.87	652	44 000 04	I = 0 4 = 4	. 454.47	400 70		
7. Mean inter											3 451.17	422.72		(84)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)											3 451.17	422.72		(84)
remperature						area f	from Tab	ole 9,		521.78	3 451.17	422.72	21	(84)
Utilisation fac	during he	eating po	eriods ir	n the livi	ng			ole 9,		521.70	3 451.17	422.72	21	
•	during he	eating po	eriods ir	n the livi	ng i					521.78		Dec	21	
Utilisation fac	during he	eating points for li	eriods ir ving are	the livi a, h1,m	ng i	ee Ta	ble 9a)		Th1 (°C)				21	
Utilisation fac	during he stor for gai Feb	eating poins for li Mar 0.96	eriods ir ving are Apr 0.89	n the livi ea, h1,m May	ng (so	ee Ta Jun ^{0.57}	Jul 0.42	A:	Th1 (°C) ug Sep 6 0.71	Oct	Nov	Dec	21	(85)
Utilisation fac	during he stor for gai Feb 0.98	eating poins for li Mar 0.96	eriods ir ving are Apr 0.89	n the livi ea, h1,m May	ng (so	ee Ta Jun ^{0.57}	Jul 0.42	A:	Th1 (°C) ug Sep 6 0.71 Table 9c)	Oct	Nov 0.98	Dec	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean interna (87)m= 19.77	during he tor for gai	eating poins for line Mar 0.96 ture in l	eriods ir ving are Apr 0.89 iving are 20.63	n the livi ea, h1,m May 0.75 ea T1 (fo	ng (so	ee Ta Jun 0.57 w ste	Jul 0.42 ps 3 to 7 20.99	0.4 'in T	Th1 (°C) ug Sep 16 0.71 Table 9c) 199 20.93	Oct 0.92	Nov 0.98	Dec 0.99	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean interna	during he tor for gai	eating poins for line Mar 0.96 ture in l	eriods ir ving are Apr 0.89 iving are 20.63	n the livi ea, h1,m May 0.75 ea T1 (fo	ng (so	ee Ta Jun 0.57 w ste	Jul 0.42 ps 3 to 7 20.99	0.4 'in T	Th1 (°C) ug Sep 6 0.71 Table 9c) 99 20.93 9, Th2 (°C)	Oct 0.92	Nov 0.98	Dec 0.99	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean interna (87)m= 19.77 Temperature (88)m= 19.84	during he tor for gaing Feb 0.98 l temperate 19.99 during he	eating points for line Mar 0.96 ture in l 20.29 eating points 19.84	eriods ir ving are Apr 0.89 iving are 20.63 eriods ir 19.86	n the livi ea, h1,m May 0.75 ea T1 (for 20.87 n rest of	ng : (so ollo ollo dw	ee Ta Jun 0.57 w ste 0.97 relling 9.88	Jul 0.42 ps 3 to 7 20.99 from Ta	Ai 0.4 7 in T 20.9 ble 9	Th1 (°C) ug Sep 6 0.71 Table 9c) 99 20.93 9, Th2 (°C)	Oct 0.92	Nov 0.98	Dec 0.99	21	(85)
Utilisation factors Jan	during he tor for gaing Feb 0.98 I temperate 19.99 during he 19.84 etor for gaing	eating points for line Mar 0.96 ture in l 20.29 eating points for r	eriods ir ving are Apr 0.89 iving are 20.63 eriods ir 19.86 est of d	n the livi ea, h1,m May 0.75 ea T1 (for 20.87 or rest of 19.86 welling,	ng (so (so (so (so (so (so (so (so (so (so	ee Ta Jun 0.57 w ste 0.97 relling 9.88	Jul 0.42 ps 3 to 7 20.99 from Ta 19.88 ee Table	Ai 0.47 in T 20.53 ble 9 19.6	Th1 (°C) ug Sep 6 0.71 Table 9c) 99 20.93 0, Th2 (°C) 88 19.87	Oct 0.92 20.61	Nov 0.98	Dec 0.99 19.74	21	(85)
Utilisation factors Jan	during he tor for gainer for gain	eating points for line of ture in land 20.29 eating points for rough	eriods ir ving are Apr 0.89 iving are 20.63 eriods ir 19.86 est of do	n the livies, h1,m May 0.75 ea T1 (for 20.87 n rest of 19.86 welling, 0.69	ng (sollo ollo dw h2,	ee Ta Jun 0.57 w ste 0.97 relling 9.88 m (se 0.48	Jul 0.42 ps 3 to 7 20.99 from Ta 19.88 ee Table 0.31	Ai 0.4 7 in T 20.3 able 9 19.3 9a) 0.3	Th1 (°C) ug Sep 6 0.71 Table 9c) 99 20.93 0, Th2 (°C) 88 19.87	Oct 0.92 20.61 19.86	Nov 0.98 20.13	Dec 0.99	21	(85) (86) (87) (88)
Utilisation factors Jan	during he ctor for gainer Feb 0.98 l temperate 19.99 during he 19.84 ctor for gainer 19.98 l temperate 19.98 l temperate	eating points for line of ture in land 20.29 eating points for roughly ture in terms for roughly ture in the roughly ture in terms for roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly ture in the roughly	eriods ir ving are Apr 0.89 iving are 20.63 eriods ir 19.86 est of do 0.85 he rest	n the livies, h1,m May 0.75 ea T1 (for 20.87 n rest of 19.86 welling, 0.69 of dwell	ng (so olloo dw h2, olloo ing	y stee Ta Jun 0.57 w stee 0.97 y elling 9.88 m (see 0.48	Jul 0.42 ps 3 to 7 20.99 from Ta 19.88 ee Table 0.31 ollow ste	Ai 0.44 ' in T 20.9 19.0 9a) 0.3	Th1 (°C) ug Sep 6 0.71 Table 9c) 99 20.93 9, Th2 (°C) 88 19.87 6 0.62 to 7 in Tab	Oct 0.92 20.61 19.86 0.89 e 9c)	Nov 0.98 20.13 19.86	Dec 0.99 19.74 19.85	21	(85) (86) (87) (88) (89)
Utilisation factors Jan	during he tor for gainer for gain	eating points for line of ture in land 20.29 eating points for rough	eriods ir ving are Apr 0.89 iving are 20.63 eriods ir 19.86 est of do	n the livies, h1,m May 0.75 ea T1 (for 20.87 n rest of 19.86 welling, 0.69	ng (so olloo dw h2, olloo ing	ee Ta Jun 0.57 w ste 0.97 relling 9.88 m (se 0.48	Jul 0.42 ps 3 to 7 20.99 from Ta 19.88 ee Table 0.31	Ai 0.4 7 in T 20.3 able 9 19.3 9a) 0.3	Th1 (°C) ug Sep 6 0.71 Table 9c) 99 20.93 0, Th2 (°C) 88 19.87 to 7 in Tab 88 19.82	Oct 0.92 20.61 19.86 0.89 e 9c) 19.45	Nov 0.98 20.13 19.86 0.98	Dec 0.99 19.74 19.85 0.99		(85) (86) (87) (88) (89)
Utilisation factors Jan	during he ctor for gainer for gai	eating points for line 10.96 ture in language 19.84 ins for range 18.98	eriods ir ving are Apr 0.89 iving are 20.63 eriods ir 19.86 est of do 0.85 he rest 19.46	n the livies, h1,m May 0.75 ea T1 (for 20.87 n rest of 19.86 welling, 0.69 of dwell 19.75	ng : (Second of the second of	ee Ta Jun 0.57 w ste 0.97 relling 9.88 m (se 0.48 T2 (fo 9.86	Jul 0.42 ps 3 to 7 20.99 from Ta 19.88 ee Table 0.31 ollow ste 19.87	Ai 0.4 ' in T 20 ble § 19 9a) 0.3	Th1 (°C) ug Sep 6 0.71 Table 9c) 99 20.93 9, Th2 (°C) 88 19.87 6 0.62 to 7 in Tab 88 19.82	Oct 0.92 20.61 19.86 0.89 e 9c) 19.45	Nov 0.98 20.13 19.86	Dec 0.99 19.74 19.85 0.99	0.45	(85) (86) (87) (88) (89)
Utilisation factors Jan	during he ctor for gainer Feb 0.98 leading he 19.84 leading he 19.84 leading he 19.84 leading he 19.85 leadi	eating points for line of ture in land 19.84 ins for rough ture in table 18.98 ins for rough ture in table 18.98 ins for rough ture in table 18.98 ins for rough ture in table 18.98 ins for rough ture in table 18.98 ins for rough ture in table 18.98 ins for rough ture in table 18.98 ins for rough ture in table 18.98 ins for rough ture in table 18.98 ins for rough ture (for the rough t	eriods in ving are 0.89 iving are 20.63 eriods in 19.86 est of do 0.85 he rest 19.46	n the livies, h1,m May 0.75 ea T1 (for 20.87 n rest of 19.86 welling, 0.69 of dwell 19.75	ng : (see color of the color of	ee Ta Jun 0.57 w ste 0.97 velling 9.88 m (se 0.48 T2 (fo 9.86	Jul 0.42 ps 3 to 7 20.99 from Ta 19.88 ee Table 0.31 collow ste 19.87	Ai 0.4 ' in T 20.9 ble \$ 19.0 0.3 ps 3 19.0 + (1	Th1 (°C) ug Sep 6 0.71 fable 9c) 99 20.93 9, Th2 (°C) 88 19.87 6 0.62 to 7 in Tab 88 19.82 — fLA) × T2	Oct 0.92 20.61 19.86 0.89 le 9c) 19.45 fLA = Liv	Nov 0.98 20.13 19.86 0.98 18.77 ring area ÷ (4	Dec 0.99 19.74 19.85 0.99 18.2		(85) (86) (87) (88) (89) (90) (91)
Utilisation factors Jan	during he stor for gaing feb 0.98 I temperate 19.84 I temperate 18.55 I temperate 19.2	eating points for line of ture in language of the language of	eriods in ving are Apr 0.89 iving are 20.63 eriods in 19.86 est of do 0.85 he rest 19.46 r the whas 19.99	n the livies, h1,m May 0.75 ea T1 (for 20.87 n rest of 19.86 welling, 0.69 of dwell 19.75 ole dwell 20.25	ng : (solloolloolloolloolloolloolloolloollool	ee Ta Jun 0.57 w ste 0.97 relling 9.88 m (se 0.48 T2 (fo 9.86	ble 9a) Jul 0.42 ps 3 to 7 20.99 from Ta 19.88 ee Table 0.31 ollow ste 19.87 A × T1 20.38	Ai 0.4 7 in T 20 ble 9 19 9a) 0.3 19 + (1 20	Th1 (°C) ug Sep 6 0.71 Table 9c) 99 20.93 9, Th2 (°C) 88 19.87 6 0.62 to 7 in Tab 88 19.82 — fLA) × T2 38 20.32	Oct 0.92 20.61 19.86 0.89 19.45 FLA = Liv	Nov 0.98 20.13 19.86 0.98 18.77 ring area ÷ (4	Dec 0.99 19.74 19.85 0.99		(85) (86) (87) (88) (89)

			1	(00)
(93)m= 18.93 19.2 19.57 19.99 20.25 20.36 20.38 20.38 20.32	19.97 19.3	3 18.89		(93)
8. Space heating requirement	T: (70)		lata	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that the utilisation factor for gains using Table 9a	11,m=(76)m :	and re-caid	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct No	v Dec		
Utilisation factor for gains, hm:			1	
(94)m= 0.99 0.97 0.94 0.86 0.71 0.52 0.36 0.4 0.65	0.89 0.97	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m	1	_	1	(05)
	466.47 438.9	8 418.22		(95)
Monthly average external temperature from Table 8	40.0 7.4	1 40	1	(06)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1	10.6 7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W = $[(39)\text{m x}](93)\text{m}$ - $(96)\text{m}]$	637.19 839.9	8 1010.84	1	(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m]$		1010.04	J	(31)
	127.01 288.7	2 440.91	1	
Total per year (k		ļ	2006.86	(98)
	(Willyear) = Sun	1(90)15,912 =	2000.00	
Space heating requirement in kWh/m²/year			37.54	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)				
Space heating:				7
Fraction of space heat from secondary/supplementary system			0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$			1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (204)]$	203)] =		1	(204)
Efficiency of main space heating system 1			93.5	(206)
Efficiency of secondary/supplementary heating system, %			0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct No	v Dec	kWh/yea	ar
Space heating requirement (calculated above)				
428.97 317.48 244.22 118.48 41.06 0 0 0	127.01 288.7	2 440.91		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$				(211)
458.79 339.55 261.19 126.72 43.91 0 0 0 0	135.84 308.7	9 471.56		
Total (kWh/year)) =Sum(211) _{15,10})12	2146.37	(211)
Space heating fuel (secondary), kWh/month				_
$= \{[(98)m \times (201)] \} \times 100 \div (208)$				
(215)m= 0 0 0 0 0 0 0 0 0	0 0	0		_
Total (kWh/year)) =Sum(215) _{15,10})12	0	(215)
Water heating				_
Output from water heater (calculated above)			1	
171.82 151.6 159.61 143.62 141.13 126.67 122.19 133.34 132.88	148.9 156.7	6 167.86		_
Efficiency of water heater			79.8	(216)
(217)m= 87.16 86.74 85.95 84.31 81.98 79.8 79.8 79.8 79.8	84.39 86.42	2 87.27		(217)
Fuel for water heating, kWh/month				
$(219)m = (64)m \times 100 \div (217)m$ $(240)m = (64)m \times 100 \div (217)m$	176 42 104 2	102.24	1	
(219)m= 197.13 174.78 185.71 170.36 172.15 158.74 153.12 167.1 166.51 Total = Sum(219)	176.43 181.3	9 192.34	0005.70	7(040)
			2095.76	(219)
Annual totals Space heating fuel used, main system 1	kWh/ye	ed (kWh/year 2146.37	٦
			2170.07	J

Water heating fuel used				2095.76	٦					
· ·				2095.76	╛					
Electricity for pumps, fans and electric keep-hot				_						
central heating pump:			30		(230c)					
boiler with a fan-assisted flue			45]	(230e)					
Total electricity for the above, kWh/year	sum of (23	0a)(230g) =		75	(231)					
Electricity for lighting				245.94	(232)					
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 4563.07										
12a. CO2 emissions – Individual heating systems including micro-CHP										
	Energy kWh/year	Emission fa		Emissions kg CO2/yea						
Space heating (main system 1)	(211) x	0.216	=	463.62	(261)					
Space heating (secondary)	(215) x	0.519	=	0	(263)					
Water heating	(219) x	0.216	=	452.68	(264)					
Space and water heating	(261) + (262) + (263) + (264) =			916.3	(265)					
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)					
Electricity for lighting	(232) x	0.519	=	127.64	(268)					
Total CO2, kg/year	su	m of (265)(271) =		1082.87	(272)					

TER =

(273)

20.26

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:09:12

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 60.89m² **Plot Reference:** 01 - C Site Reference : Highgate Road - GREEN

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

20.63 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 18.18 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 59.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 50.4 kWh/m²

OK 2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK OK

Floor 0.13 (max. 0.25) 0.13 (max. 0.70)

Roof (no roof) Openings 1.40 (max. 2.00) 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.71m²	
Windows facing: North West	3.46m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:										
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50					
Property Address: 01 - C Address:													
1. Overall dwelling dime	ensions:												
5		Are	a(m²)		Av. He	ight(m)		Volume(m	³)				
Ground floor		6	60.89	(1a) x	2	2.65	(2a) =	161.36	(3a)				
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (60.89	(4)									
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	161.36	(5)				
2. Ventilation rate:													
	main seconda heating heating	ry	other		total			m³ per hou	ır				
Number of chimneys	0 + 0	+	0	=	0	X 4	40 =	0	(6a)				
Number of open flues	0 + 0	_ + _	0	Ī - Ē	0	x 2	20 =	0	(6b)				
Number of intermittent fa	ns			, <u> </u>	2	x ′	10 =	20	(7a)				
Number of passive vents				F	0	x -	10 =	0	(7b)				
Number of flueless gas fi	res			_ [0	x 4	40 =	0	(7c)				
-				L									
							Air ch	nanges per ho	our				
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$			[20		÷ (5) =	0.12	(8)				
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	ed to (17),	otherwise (continue tr	om (9) to	(16)		0	(9)				
Additional infiltration	g ()					[(9)-	-1]x0.1 =	0	(10)				
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)				
if both types of wall are prideducting areas of openir	resent, use the value corresponding t	o the grea	ter wall are	a (after									
,	iloor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)				
If no draught lobby, en	ter 0.05, else enter 0							0	(13)				
Percentage of windows	s and doors draught stripped							0	(14)				
Window infiltration			0.25 - [0.2	. ,	-			0	(15)				
Infiltration rate			(8) + (10)					0	(16)				
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$			•	etre of e	envelope	area	5	(17)				
•	s if a pressurisation test has been do				is being u	sed		0.37	(18)				
Number of sides sheltere		·	,	,	J			0	(19)				
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			1	(20)				
Infiltration rate incorporat	•		(21) = (18)) x (20) =				0.37	(21)				
Infiltration rate modified for	- 1 	1	1 .		Π_	1	I _	1					
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind sp	 	1 00	1 0.7		T 40	1 45	1.7	1					
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7						
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4							_					
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18						

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	_	_			
0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.37	0.4	0.42	0.44		
Calculate effe If mechanic		-	rate for t	пе арріі	саріе са	se						0	(23
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	wise (23b) = (23a)			0	(23
If balanced wit									, , ,			0	=\\-\(\)(2)
a) If balance	ed mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	ı)m = (22	2b)m + (23b) x [ا (23c) – 1		
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	ed mech	anical ve	ntilation	without	heat rec	overy (N	иV) (24b)m = (22	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ver	tilation o	or positiv	re input v	/entilatio	n from c	utside				l	
if (22b)r	n < 0.5 ×	(23b), t	hen (24	c) = (23b	o); otherv	vise (24	c) = (22b	o) m + 0.	.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r	ventilation			•	•				0.5]				
24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				l	
25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(2
2. Hoot loose	o and he	ot lose r	oromot	241									
3. Heat losse	s and ne	•	Openin		Net Ar	00	U-valı	10	AXU		k-value	Λ Λ	Χk
	area	-	m		A,r		W/m2		(W/I		kJ/m²-l		J/K
Vindows Type	e 1				11.97	x1	/[1/(1.4)+	0.04] =	15.87				(2
Vindows Type	e 2				3.26	x1.	/[1/(1.4)+	0.04] =	4.32				(2
loor					60.89	x	0.13	i	7.91569	9 [7	(2
Valls Type1	29.7	' 1	15.23	3	14.48	x	0.18	= i	2.61	₹ i		ī	<u> </u>
Valls Type2	13.5	52	0		13.52	2 x	0.18	=	2.43	Ħ i			<u> </u>
otal area of e	elements	, m²			104.1	2							 (3
Party wall					29.71	x	0		0	— [7	(3
Party ceiling					60.89	=				<u> </u> 		╡ ├─	<u> </u>
nternal wall *	ŧ				146.1	=							(3
for windows and	d roof wind	•			alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	paragraph	3.2	(°
* include the are				is and pari	titions		(26)(30)	+ (32) =			Ī	20.45	
abric heat los		•	U)				(20)(30)		(30) + (32	2) + (222)	(320) -	33.15	<u></u> (3
		,	0 – Cm :	TEA) in	\ \ \ \/m2\				tive Value	, , ,	(32e) =	10725.93	(3
hermal mass For design asses	•	•		•			acisaly the				ahle 1f	250	(3
an be used inste				CONSTRUCT	on are not	. Kilowii pi	colscry tric	maidanvo	, values of	TIVII III I	abic II		
hermal bridg	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						10.46	(3
details of therm		are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he								(33) +	(36) =			43.61	(3
entilation he	1				_	_			= 0.33 × (1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 32.68	32.44	32.21	31.13	30.93	29.98	29.98	29.81	30.35	30.93	31.34	31.76		(3
leat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m		ı	

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.25	1.25	1.25	1.23	1.22	1.21	1.21	1.21	1.21	1.22	1.23	1.24		
	!		<u>. </u>	!		!	!		Average =	Sum(40) ₁ .	12 /12=	1.23	(40)
Number of day	1	<u> </u>	<u> </u>							·			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		01		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target c		.86		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 90.04	86.77	83.5	80.22	76.95	73.67	73.67	76.95	80.22	83.5	86.77	90.04		
_						· _				m(44) ₁₁₂ =	L	982.3	(44)
Energy content of													
(45)m= 133.53	116.79	120.52	105.07	100.82	87	80.62	92.51	93.61	109.1	119.09	129.32		(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	<u> </u>	1287.96	(45)
(46)m= 20.03	17.52	18.08	15.76	15.12	13.05	12.09	13.88	14.04	16.36	17.86	19.4		(46)
Water storage	loss:			!				ļ		ļ.			
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	_			_			, ,		(0) ! - ((47)			
Otherwise if no Water storage		not wate	er (tnis ir	iciuaes i	nstantar	ieous co	iiod idmo	ers) ente	er o in (47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufact			-										
Hot water stor	•			ie Z (KVV	n/litre/da	ly)					0		(51)
Volume factor	_		011 1.0								0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	rstorage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)								0.	75		(55)
Water storage	loss cal	culated f	for each	month		_	((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	` '	, ,						
(modified by			ı —					<u> </u>		<u> </u>	00.00		(50)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
$\begin{array}{c c} \text{Combinoss o} \\ \hline \text{(61)m=} & 0 \end{array}$	balculated 0	or each	month (0 1)m =	(60) ÷ 30	05 × (41)	0	T 0	0	0	0	1	(61)
	<u> </u>						<u> </u>			ļ		(50) == : (64) ==	(01)
(62)m= 180.1	-i	167.11	150.16	147.41	132.09	127.21	139.1	138.7	155.69	164.18	(57)m + 175.92	(59)m + (61)m	(62)
` '								1				J	(02)
Solar DHW inputation (add addition									r contribut	ion to wate	er nealing)		
(63)m= 0	0	0	0	0	0) 300 Ap	0	T 0	0	0	0	1	(63)
Output from								1				J	(==)
(64)m= 180.1		167.11	150.16	147.41	132.09	127.21	139.1	138.7	155.69	164.18	175.92]	
	-1					<u> </u>	Out	put from w	ater heate	<u>ı</u> r (annual)₁	12	1836.57	(64)
Heat gains fi	rom water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)r	n] + 0.8 >	k [(46)m	+ (57)m	+ (59)m	.]	•
(65)m= 81.68		77.35	71.01	70.8	65	64.08	68.03	67.2	73.55	75.67	80.27	ĺ	(65)
include (5	7)m in cal	culation o	of (65)m	only if c	vlinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	<u> </u>				,						• •	J	
Metabolic ga													
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 100.3	3 100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 15.62	2 13.87	11.28	8.54	6.38	5.39	5.82	7.57	10.16	12.9	15.06	16.05		(67)
Appliances of	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5	•	•	•	
(68)m= 175.1	9 177	172.42	162.67	150.36	138.79	131.06	129.24	133.82	143.58	155.89	167.46		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•	•	•	
(69)m= 33.03	3 33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03		(69)
Pumps and f	fans gains	(Table 5	āa)							•			
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)		•		•	•	•	•	
(71)m= -80.2°	7 -80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27		(71)
Water heating	ng gains (7	rable 5)				•		•	•	•	•	•	
(72)m= 109.7	8 107.89	103.96	98.62	95.16	90.28	86.13	91.44	93.33	98.86	105.1	107.9		(72)
Total intern	al gains =				(66))m + (67)m	+ (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m		
(73)m= 356.6	8 354.86	343.77	325.93	308	290.56	279.11	284.36	293.42	311.43	332.14	347.5]	(73)
6. Solar gai	ins:							•					
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ -	_	FF		Gains	
	Table 6d		m²		ı aı	ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast 0.93		X	11.	97	x 1	1.28	x	0.63	x	0.7	=	41.28	(75)
Northeast 0.93	× 0.77	X	11.	97	x 2	22.97	x	0.63	x	0.7	=	84.02	(75)
Northeast 0.93	•	X	11.	97	X 4	11.38	х	0.63	x	0.7	=	151.37	(75)
Northeast 0.9		Х	11.	97	x 6	67.96	х	0.63	x	0.7	=	248.6	(75)
Northeast 0.93	× 0.77	X	11.	97	x g	91.35	X	0.63	x	0.7	=	334.16	(75)

		_					, ,		_ ,				_
Northeast _{0.9x}	0.77	X	11.	97	X	97.38	X	0.63	×	0.7	=	356.25	(75)
Northeast _{0.9x}	0.77	X	11.	97	X	91.1	X	0.63	X	0.7	=	333.27	(75)
Northeast _{0.9x}	0.77	X	11.	97	X	72.63	X	0.63	X	0.7	=	265.68	(75)
Northeast _{0.9x}	0.77	X	11.	97	X	50.42	X	0.63	X	0.7	=	184.45	(75)
Northeast _{0.9x}	0.77	X	11.	97	x	28.07	X	0.63	X	0.7	=	102.68	(75)
Northeast _{0.9x}	0.77	X	11.	97	X	14.2	X	0.63	X	0.7	=	51.93	(75)
Northeast 0.9x	0.77	X	11.	97	X	9.21	X	0.63	X	0.7	=	33.71	(75)
Northwest 0.9x	0.77	X	3.2	26	x	11.28	x	0.63	x	0.7	=	11.24	(81)
Northwest 0.9x	0.77	X	3.2	26	x	22.97	X	0.63	x	0.7	=	22.88	(81)
Northwest 0.9x	0.77	X	3.2	26	x	41.38	X	0.63	x	0.7	=	41.23	(81)
Northwest _{0.9x}	0.77	x	3.2	26	x	67.96	X	0.63	x	0.7	=	67.7	(81)
Northwest _{0.9x}	0.77	x	3.2	26	x	91.35	X	0.63	x	0.7	=	91.01	(81)
Northwest _{0.9x}	0.77	X	3.2	26	x	97.38	X	0.63	x	0.7	=	97.02	(81)
Northwest _{0.9x}	0.77	X	3.2	26	x	91.1	X	0.63	X	0.7	=	90.76	(81)
Northwest _{0.9x}	0.77	X	3.2	26	x	72.63	x	0.63	X	0.7	=	72.36	(81)
Northwest _{0.9x}	0.77	x	3.2	26	x	50.42	x	0.63	x	0.7	=	50.23	(81)
Northwest _{0.9x}	0.77	x	3.2	26	x	28.07	x	0.63	x	0.7	=	27.96	(81)
Northwest _{0.9x}	0.77	x	3.2	26	x	14.2	х	0.63	x	0.7	=	14.14	(81)
Northwest _{0.9x}	0.77	×	3.2	26	x	9.21	x	0.63	x	0.7	=	9.18	(81)
Solar gains in	watts, calcu	ulated	for eac	h month	ı <u>. </u>		(83)m	= Sum(74)m .	(82)m				
(83)m= 52.52	106.9 1	92.6	316.3	425.17	453.27	424.03	338.	.04 234.68	130.64	66.08	42.89		(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m	+ (83)m	, watts						•	
(84)m= 409.2	461.76 53	36.36	642.23	733.17	743.83	703.14	622	2.4 528.1	442.07	398.22	390.39		(84)
7. Mean inter	nal tempera	ature ((heating	season	1)								
Temperature	during hea	ting p	eriods ir	n the livi	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gain	s for l	iving are	ea, h1,m	(see T	able 9a)	_				'		
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.93	0.8	0.61	0.45	0.5	3 0.81	0.97	0.99	1		(86)
Mean interna	l temperatu	ıre in l	iving are	ea T1 (f	ollow st	eps 3 to 7	7 in T	able 9c)					
(87)m= 19.69	19.84 2	0.13	20.54	20.84	20.97	20.99	20.9	99 20.88	20.47	20.02	19.67		(87)
Temperature	during hea	ting p	eriods ir	n rest of	dwellin	g from Ta	able 9), Th2 (°C)	_	-	-		
(88)m= 19.88		9.88	19.9	19.9	19.91	19.91	19.9		19.9	19.9	19.89		(88)
Utilisation fac	tor for gain	s for r	est of d	welling	h2 m (s	ee Table	9a)	!		!			
(89)m= 1		0.98	0.91	0.74	0.51	0.35	0.4	1 0.73	0.95	0.99	1		(89)
	<u> </u>	!		!	ļ	!		<u>l</u>	!				
Mean interna (90)m= 18.15		8.79	19.37	19.75	19.89	19.91	19.9		19.3	18.64	18.13		(90)
(30)111- 10.13	10.57 1	0.19	10.01	19.75	19.09	13.31	19.3		<u> </u>	ing area ÷ (4	<u> </u>	0.40	(91)
	·												
	!								LA = LIV	ing area : (+) =	0.46	(31)
Mean interna		`			1	1	`	– fLA) × T2	•	,	•	0.46	
Mean interna (92)m= 18.85 Apply adjustr	19.04 1	9.41	19.91	20.25	20.39	20.41	20.	- fLA) × T2	19.84	19.27	18.83	0.46	(92)

(00)	40.05	40.04	10.44	40.04	20.05	20.20	20.44	20.4	20.2	40.04	40.07	40.00		(93)
(93)m=	18.85	19.04	19.41	19.91	20.25	20.39	20.41	20.4	20.3	19.84	19.27	18.83		(93)
			uirement				44 -4	Table O	41	4 T: /	70)	-11-	late	
			ernai ter or gains			ed at ste	ер ттог	rable 9i	o, so tha	t 11,m=(rojm an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm					,						
(94)m=	0.99	0.99	0.97	0.91	0.76	0.56	0.4	0.47	0.76	0.95	0.99	1		(94)
Usefu	ıl gains,	hmGm	W = (94)	4)m x (84			•						•	
(95)m=	406.81	456.8	521.69	585.39	560.65	413.1	278.24	289.86	403.93	421.46	393.85	388.55		(95)
		age exte	rnal tem	perature			•	,						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			i				-``	- ` 	– (96)m					
	1110.29		978.68	822.59	637.55	425.92	280.23	294.03	458.65	688.43	912.25	1103.02		(97)
Space			ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		1	
(98)m=	523.39	415.89	340	170.79	57.21	0	0	0	0	198.63	373.25	531.56		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2610.73	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								42.88	(99)
9a En	erav rea	wiremer	nts – Indi	ividual h	eating sy	/stems i	ncluding	micro-C	:HP)					
	e heatir		no ma	Madain	odurig oj	, otorrio r	noraanig	, moro c	,					
•		•	at from s	econdar	v/supple	mentary	system						0	(201)
	•		at from m			,	•	(202) = 1	- (201) =				1] (202)
	•		ng from	-	. ,			(204) = (2	02) × [1 – ((203)] =			1] (204)
			ace heat	-				, , ,	, .	`			93.5	(206)
	•	-	ry/suppl			n evetam	n %						0	(208)
Lillon			· · ·						Can	0-4	Nav	Daa		J` ′
Space	Jan	Feb	Mar ement (c	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	523.39		340	170.79	57.21	0	0	0	0	198.63	373.25	531.56		
(0.4.4)			<u> </u>			0			Ů	100.00	070.20	331.30		(5.4.)
(211)m			(4)] } x 1					Ι .		040.44		500.54	1	(211)
	559.78	444.8	363.64	182.66	61.19	0	0	O Tota	0	212.44	399.2	568.51		7(044)
								Tota	l (kWh/yea	ar) =Surri(2	Z I I) _{15,1012}	,	2792.22	(211)
•		•	econdar	• •	month									
			00 ÷ (20		0									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		7(0,45)
								rota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	,=	0	(215)
	heating													
Output	180.13		ter (calc			122.00	127.21	120.1	138.7	155 60	164 10	175.02		
Efficies		158.88	167.11	150.16	147.41	132.09	127.21	139.1	136.7	155.69	164.18	175.92	70.0	7(246)
	ncy of w		r										79.8	(216)
(217)m=	87.5	87.27	86.67	85.16	82.53	79.8	79.8	79.8	79.8	85.46	86.94	87.58		(217)
		•	kWh/mo (217) ÷ (
,	205.87	182.06	192.81	176.33	178.62	165.52	159.41	174.31	173.81	182.17	188.84	200.86		
. , .							<u> </u>	<u> </u>	I = Sum(21				2180.63	(219)
Annus	al totals								•		Wh/year		kWh/year	١(=٠٥)
		fuel use	ed, main	system	1					ĸ	, cai		2792.22	7
•	J			-										J

					٦
Water heating fuel used				2180.63	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				275.82	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			5323.67	(338)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	Enorgy	Emissies for	40"	Emissions	
	Energy kWh/year	Emission fac kg CO2/kWh	tor	kg CO2/yea	
Space heating (main system 1)	G ,		=		
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar ¬
	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	0.216 0.519	=	kg CO2/yea 603.12 0 471.02	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	= = =	kg CO2/yea 603.12 0 471.02	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= = =	kg CO2/yea 603.12 0 471.02 1074.14 38.93	(261) (263) (264) (265) (267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.519 0.519 0.519	= = =	kg CO2/yea 603.12 0 471.02 1074.14 38.93 143.15	(261) (263) (264) (265) (267) (268)

TER =

(273)

20.63

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:08:47*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 61.98m²Site Reference:Highgate Road - GREENPlot Reference: 01 - D

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 20.41 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.53 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.1 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 47.3 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.17 (max. 0.30) 0.18 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK
Floor 0.13 (max. 0.25) 0.13 (max. 0.70) OK

Floor 0.13 (max. 0.25) 0.13 (max. 0.70)

Roof (no roof)
Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Law anares lights		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.07m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012	— <u>03</u> CF L	Strom Softwa					0010943 on: 1.0.5.50	
	F	Property	Address	: 01 - D					
Address: 1. Overall dwelling dime	ensions:								
1. Overall awelling aime	niorio.	Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor				(1a) x		.65	(2a) =	164.25	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	61.98	(4)					
Dwelling volume				I (3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	164.25	(5)
2. Ventilation rate:								301120	
2. Ventuation rate.	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating bearing + 0	- + -	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	╡ + ト	0		0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				2	x 1	10 =	20	(7a)
Number of passive vents				F	0	x 1	10 =	0	(7b)
Number of flueless gas fi				L F	0	x 4	10 =	0	(7c)
J				L				<u> </u>	(* 5)
							Air ch	nanges per ho	our
•	ys, flues and fans = $(6a)+(6b)+(6b)$				20		÷ (5) =	0.12	(8)
If a pressurisation test has b Number of storeys in the	een carried out or is intended, procee	ed to (17),	otherwise of	continue fr	rom (9) to	(16)			¬(0)
Additional infiltration	ie dweiling (115)					[(9)-	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction	1()	•	0	(11)
if both types of wall are pu deducting areas of openin	resent, use the value corresponding t	o the grea	ter wall are	ea (after					
,	iloor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$		•	•	etre of e	envelope	area	0.37	(17)
•	es if a pressurisation test has been do				is being u	sed		0.37	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.37	(21)
Infiltration rate modified for	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp		Jui	Aug	Ј Зер	1 001	INOV	Dec	J	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
, , -	1 1 3 1 3.0	1	1	<u> </u>	1	<u> </u>	I	J	
Wind Factor (22a)m = (22	' 	1	T	T .	T	T		1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	

Adjusted infiltr		r `				` 	`	` '	T	T		ı	
0.47 Calculate effe	0.46 Ctive air	0.46 change i	0.41 rate for t	0.4 he appli	0.35 cable ca	0.35 S e	0.34	0.37	0.4	0.42	0.44		
If mechanic		-										0	(23a)
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		[0	(23b)
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =			[0	(23c)
a) If balance	ed mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b)m = (22	2b)m + (2	23b)		ı	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h if (22b)r		tract ven (23b), t		-	-				5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	ı	(24c)
d) If natural if (22b)r		on or wh en (24d)							0.5]				
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	ı	(24d
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	ı	(25)
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	re	AXU		k-value	• A	Χk
	area	(m²)	' m		A ,r	m²	W/m2	K	(W/I	<)	kJ/m²-k	(kJ	J/K
Windows					12.07	χ1,	/[1/(1.4)+	0.04] =	16				(27)
Floor					61.98	3 x	0.13	=	8.0574				(28)
Walls Type1	30.8	37	12.0	7	18.8	Х	0.18	=	3.38				(29)
Walls Type2	27.4	15	0		27.45	, x	0.18	= [4.94	\Box [(29)
Total area of e	elements	, m²			120.3	3							(31)
Party wall					31.67	y X	0	= [0				(32)
Party ceiling					61.89)				[(32b)
Internal wall **	•				95.03	3				[(32c)
* for windows and						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	3.2	
** include the are Fabric heat los				is and pari	titions		(26)(30)	+ (32) =			Γ		— (22)
Heat capacity		•	0)				(20)(00)		.(30) + (32	2) ± (32a)	(326) -	32.38	(33)
Thermal mass			P – Cm ≟	-TFΔ) in	n k I/m²K				tive Value	, , ,	(020) = [11560.62	(34)
For design asses	•	`		,			ecisely the				l able 1f	250	(33)
can be used inste							,						
Thermal bridg	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						9.43	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =		[41.82	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5))		_
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ı	
Jan			04.00	24.42	30.48	30.48	30.31	30.85	31.43	31.84	32.27	1	(38)
(38)m= 33.19	32.95	32.72	31.63	31.43	00.10					0	02.27	ı	` '
			31.63	31.43	00.10				= (37) + (37)	<u> </u>	02:21	l	,
(38)m= 33.19			73.45	73.25	72.3	72.3	72.12		<u> </u>	<u> </u>	74.09		

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)													
(40)m= 1.21	1.21	1.2	1.19	1.18	1.17	1.17	1.16	1.17	1.18	1.19	1.2		
(40)111= 1.21	1.21	12	1.10	1.10	1.17	1.17	1.10			Sum(40) ₁ .		1.19	(40)
Number of day	s in mo	nth (Tabl	e 1a)					,	rtvorage =	Cum(40)	12 / 12-	1.10	(,
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		!						ļ.	ļ.	!			
4 \\/\stan b = 0											1-10/1- /		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		04		(42)
Annual averag									se target o		.58		(43)
not more that 125	litres per	person per	day (all w	ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pei	r day for ea	ch month	Vd,m = fa	ctor from 7	Table 1c x	(43)			•			
(44)m= 90.84	87.53	84.23	80.93	77.62	74.32	74.32	77.62	80.93	84.23	87.53	90.84		
								-	Total = Su	m(44) ₁₁₂ =		990.95	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 134.71	117.82	121.58	105.99	101.7	87.76	81.32	93.32	94.44	110.06	120.13	130.46		
									Total = Su	m(45) ₁₁₂ =	-	1299.3	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 ₎) to (61)			•		
(46)m= 20.21	17.67	18.24	15.9	15.26	13.16	12.2	14	14.17	16.51	18.02	19.57		(46)
Water storage						•		•					
Storage volum	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	_			-			` '		(61.1/				
Otherwise if no		hot wate	er (this in	ıcludes ı	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage a) If manufact		aclared k	nee facto	or ie kno	wn (k\\/k	n/day/):					00		(48)
•				JI IS KIIO	vvii (Kvvi	ı/uay).					39		
Temperature fa							(15)			0.	54		(49)
Energy lost fro b) If manufact		_	-		or is not		(48) x (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	-			- (,					<u> </u>		(- /
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	L dedicate		rage, (57)ı					<u>I</u> 7)m = (56)	n where (m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
		0	0	0 1)111 =	00) - 30	0	0	T 0	0	0	0	1	(61)
	ļ						ļ			ļ		[(50)m + (61)m	(0.)
_	1.3 159.9	168.17	151.09	148.3	132.85	127.92	139.92		156.65	165.23	177.05	(59)m + (61)m]	(62)
(*)	nput calculated		<u> </u>	<u> </u>		L						J	(02)
	onal lines if								i contribut	ion to wate	er rieatirig)		
`	0 0	0	0	0	0	0	0	1 0	0	0	0]	(63)
	m water hea	ter	ļ	ļ		ļ	!	_	!			J	
	1.3 159.9	168.17	151.09	148.3	132.85	127.92	139.92	139.53	156.65	165.23	177.05]	
` '	I	<u> </u>	<u> </u>	<u> </u>		<u> </u>	Oı	 utput from w	t ater heate	<u>I</u> r (annual)₁	12	1847.91	(64)
Heat gains	from water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	-
	.07 72.84	77.7	71.32	71.09	65.25	64.32	68.31	67.47	73.87	76.02	80.65	ĺ	(65)
include ((57)m in cal	culation (of (65)m	only if c	vlinder i	s in the	dwellin	a or hot w	ater is f	rom com	munity h	ı neating	
	al gains (see				,			9			,	3	
	gains (Table			,									
	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 101	1.85 101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85		(66)
Lighting ga	ains (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 16	.02 14.23	11.57	8.76	6.55	5.53	5.97	7.77	10.42	13.23	15.45	16.47]	(67)
Appliances	s gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5	•		•	
(68)m= 177	7.91 179.76	175.11	165.2	152.7	140.95	133.1	131.25	135.9	145.81	158.31	170.06]	(68)
Cooking ga	ains (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	-		-	
(69)m= 33	.19 33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19		(69)
Pumps and	d fans gains	(Table 5	 5a)							-		-	
(70)m=	3 3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g	g. evaporatio	n (nega	tive valu	es) (Tab	le 5)	-			-		-	-	
(71)m= -81	.48 -81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48		(71)
Water hea	ting gains (1	able 5)	-	-		-	_	-	-	-	-	-	
(72)m= 11	0.3 108.4	104.44	99.05	95.55	90.63	86.45	91.81	93.71	99.29	105.58	108.41]	(72)
Total inter	rnal gains =		•	•	(66)	m + (67)m	n + (68)m	n + (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 360	0.79 358.94	347.67	329.57	311.36	293.66	282.08	287.38	3 296.6	314.89	335.89	351.49]	(73)
6. Solar g	jains:												
Solar gains	are calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to	convert to th	ne applicat	ole orientat	tion.		
Orientation	n: Access F		Area m²		Flu			g_ Table 6b	_	FF		Gains	
	Table 6d		1112		Tai	ble 6a	, –	Table 6b	_ '	able 6c		(W)	,
Northeast 0	****	X	12.	07	x 1	1.28	X	0.63	x	0.7	=	41.62	(75)
Northeast 0	• • • • • • • • • • • • • • • • • • • •	X	12.	07	X 2	22.97	X	0.63	x	0.7	=	84.72	(75)
Northeast 0		X	12.	07	X 4	1.38	x	0.63	x	0.7	=	152.64	(75)
Northeast 0		X	12.	07	x 6	67.96	x	0.63	x	0.7	=	250.67	(75)
Northeast 0	.9x 0.77	X	12.	07	x g	1.35	X	0.63	X	0.7	=	336.95	(75)

Northeast 0.9x 0.77	X	12.0	07	X	97.38	x		0.63	x	0.7	=	359.23	(75)
Northeast 0.9x 0.77	x	12.0	07	x	91.1	x		0.63	x	0.7	=	336.05	(75)
Northeast 0.9x 0.77	X	12.0	07	X	72.63	x		0.63	x	0.7	=	267.9	(75)
Northeast 0.9x 0.77	x	12.0	07	X	50.42	x		0.63	x	0.7	=	185.99	(75)
Northeast 0.9x 0.77	x	12.0	07	X .	28.07	x		0.63	x	0.7	=	103.53	(75)
Northeast _{0.9x} 0.77	x	12.0	07	х	14.2	x		0.63	x	0.7	=	52.37	(75)
Northeast 0.9x 0.77	X	12.0)7	x	9.21	x		0.63	×	0.7	=	33.99	(75)
Solar gains in watts, calcu	ulated	for each	n month		_	(83)m	ı = Sı	um(74)m .	(82)m		_		
(83)m= 41.62 84.72 15	52.64	250.67	336.95	359.23	336.05	267	7.9	185.99	103.53	52.37	33.99		(83)
Total gains – internal and	solar	(84)m =	: (73)m -	+ (83)m	, watts								
(84)m= 402.41 443.66 5	00.3	580.24	648.31	652.89	618.12	555	.28	482.59	418.42	388.26	385.48		(84)
7. Mean internal tempera	ature (heating	season)									
Temperature during hea	ting pe	eriods in	the livi	ng area	from Tal	ble 9,	, Th	1 (°C)				21	(85)
Utilisation factor for gain	s for li	ving are	a, h1,m	(see Ta	able 9a)						'		_
Jan Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m= 1 0.99 (0.99	0.95	0.85	0.67	0.51	0.5	58	0.85	0.98	0.99	1		(86)
Mean internal temperatu	ıre in li	ving are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able	= 9c)		-	-		
	0.12	20.49	20.8	20.96	20.99	20.9		20.86	20.47	20.04	19.71		(87)
Temperature during hea	ting no	riode in	roct of	dwallin	r from Tr	abla (
· · · · · · · · · · · · · · · · · · ·	9.92	19.93	19.93	19.95	19.95	19.9		19.94	19.93	19.93	19.92		(88)
` ' LL					<u> </u>				.0.00	1	10.02		` '
Utilisation factor for gain (89)m= 1 0.99 0	s for re	0.94	velling, 0.8	n2,m (s _{0.57}	ee Table	9a) 0.4	ıc T	0.77	0.96	0.99	1		(89)
` ,		!			<u> </u>	<u> </u>	!			0.99			(00)
Mean internal temperatu		r		`	1	ri —				ı			(2.2)
(90)m= 18.22 18.42	18.8	19.34	19.75	19.92	19.94	19.9	94	19.83	19.32	18.7	18.21		(90)
								T	LA = LIVII	ng area ÷ (4	4) =	0.41	(91)
Mean internal temperatu	re (for	the wh	ole dwe	lling) = 1	LA × T1	+ (1	– fL	A) x T2		_			
` '	9.34	19.82	20.18	20.35	20.37	20.		20.25	19.79	19.25	18.82		(92)
Apply adjustment to the		T T			1	1				<u> </u>			(20)
` '	9.34	19.82	20.18	20.35	20.37	20.	37	20.25	19.79	19.25	18.82		(93)
8. Space heating require					44 6		- 01	41		70)		1.4	
Set Ti to the mean interr the utilisation factor for g				ied at st	:ep 11 of	rabi	e 9b	o, so tha	t II,m=(76)m an	d re-calc	culate	
	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation factor for gain					1		3 1			1			
(94)m= 0.99 0.99 0	0.98	0.93	0.81	0.61	0.44	0.5	51	0.8	0.96	0.99	1		(94)
Useful gains, hmGm , W	' = (94))m x (84	1)m		•					•			
(95)m= 400.34 439.74 4	89.8	541.74	526.97	398.31	270.23	281	.13	385.42	402.15	384.55	383.86		(95)
Monthly average externa	al temp	erature	from Ta	able 8	-					-			
(96)m= 4.3 4.9	6.5	8.9	11.7	14.6	16.6	16.	.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean					1		_	<u> </u>		1	1		,·
` '		801.78	621.28	415.45	272.87	286		447.13	673.03	894.82	1083.36		(97)
Space heating requirem	-									T T	500 10		
(98)m= 513.48 413.37 34	47.75	187.23	70.16	0	0	0	'	0	201.54	367.4	520.43		

		Tota	ıl per year	(kWh/yeaı	r) = Sum(9	08) _{15,912} =	2621.35	(98)
Space heating requirement in kWh/m²/year							42.29	(99)
9a. Energy requirements – Individual heating systen	ns including	g micro-C	CHP)					
Space heating:						Г		_
Fraction of space heat from secondary/supplement	ary system		(224)				0	(201)
Fraction of space heat from main system(s)		(202) = 1	,	,		ļ	1	(202)
Fraction of total heating from main system 1		(204) = (2	02) × [1 –	(203)] =		ļ	1	(204)
Efficiency of main space heating system 1						ļ	93.5	(206)
Efficiency of secondary/supplementary heating sys	tem, %		,	,			0	(208)
Jan Feb Mar Apr May Ju	ın Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated above) 513.48 413.37 347.75 187.23 70.16 0		1 0	0	201.54	267.4	E20 42		
	0	0		201.54	367.4	520.43		(04.4)
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$ $549.17 442.11 371.92 200.24 75.04 0$	0	Ιο	0	215.55	392.94	556.61		(211)
0.00.			l (kWh/yea				2803.59	(211)
Space heating fuel (secondary), kWh/month						L		`
= {[(98)m x (201)] } x 100 ÷ (208)		_		_	_			
(215)m= 0 0 0 0 0	0	0	0	0	0	0		
		Tota	al (kWh/yea	ar) =Sum(2	215) _{15,101}	2=	0	(215)
Water heating								
Output from water heater (calculated above) 181.3	85 127.92	139.92	139.53	156.65	165.23	177.05		
Efficiency of water heater	<u> </u>						79.8	(216)
(217)m= 87.44 87.24 86.71 85.39 82.95 79.	8 79.8	79.8	79.8	85.49	86.89	87.52		(217)
Fuel for water heating, kWh/month	•		!					
(219) m = (64) m x $100 \div (217)$ m (219)m = 207.35 183.3 193.95 176.94 178.78 $166.$	48 160.3	175.33	174.85	183.25	190.16	202.3		
(213)111- 207.33 103.3 133.33 170.34 170.70 100.	100.5		I = Sum(2		190.10	202.3	2192.99	(219)
Annual totals					Wh/yea	լ r	kWh/yea	
Space heating fuel used, main system 1					,		2803.59	
Water heating fuel used						Ī	2192.99	
Electricity for pumps, fans and electric keep-hot						L		
central heating pump:						30		(2300
boiler with a fan-assisted flue						45		(230)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =		_ 45	75	(231)
Electricity for lighting			,,·	\ 3 /] آ	282.93	(232)
	21) + (222)	(227h)	_			[[=
Total delivered energy for all uses (211)(221) + (23	, , ,	` ′				L	5354.5	(338)
12a. CO2 emissions – Individual heating systems i	ncluding mi	icro-CHF	·					
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	

Space heating (main system 1)	(211) x	0.216	=	605.57	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	473.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1079.26	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	146.84	(268)
Total CO2, kg/year	sum	of (265)(271) =		1265.03	(272)

TER =

(273)

20.41

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:08:26*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 69.44m²

Site Reference: Highgate Road - GREEN

Plot Reference: 01 - E

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

16.69 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.29 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 33.7 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Windows facing: South West	2.92m ²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m ² K	
Community heating, heat from boilers – mains gas		

User Details:	
Assessor Name: Neil Ingham Stroma Number: STRO010943 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.	50
Property Address: 01 - E Address:	
1. Overall dwelling dimensions:	
Area(m²) Av. Height(m) Volum	e(m³)
Ground floor (1a) x (2.65 (2a) = 184.0	2 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 69.44 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 184.0$	2 (5)
2. Ventilation rate:	
main secondary other total m³ per heating heating	hour
Number of chimneys $0 + 0 + 0 = 0 \times 40 = 0$	(6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	(6b)
Number of intermittent fans 2 x 10 = 20	(7a)
Number of passive vents 0 x 10 = 0	(7b)
Number of flueless gas fires 0	(7c)
Air changes pe	r hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div (5) =$ 0.11	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)	(9)
Additional infiltration [(9)-1]x0.1 = 0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	(12)
If no draught lobby, enter 0.05, else enter 0	(13)
Percentage of windows and doors draught stripped 0	(14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$	(15)
Infiltration rate $ (8) + (10) + (11) + (12) + (13) + (15) = 0 $	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 5	(17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	(18)
Number of sides sheltered 0	(19)
Shelter factor $(20) = 1 - [0.075 \times (19)] = 1$	(20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.36$	(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 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	
Wind Factor $(22a)m = (22)m \div 4$	

djusted infiltration rate (allowin			` 	`	` 		1			
0.46 0.45 0.44 Calculate effective air change ra	0.39 0.39 ate for the appli	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
If mechanical ventilation:	ato for the appli	000,000							0	(2
If exhaust air heat pump using Apper	ndix N, (23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		j	0	(2
If balanced with heat recovery: efficient	ency in % allowing	for in-use f	actor (from	n Table 4h) =]	0	(2
a) If balanced mechanical ver	ntilation with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 - (23c)	÷ 100]	
(4a)m= 0 0 0	0 0	0	0	0	0	0	0	0		(2
b) If balanced mechanical ver	ntilation without	heat rec	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)			
(4b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(2
c) If whole house extract vent if $(22b)m < 0.5 \times (23b)$, the	•	•				5 × (23b))			
24c)m= 0 0 0	0 0	0	0	0	0	0	0	0		(2
d) If natural ventilation or who if (22b)m = 1, then (24d)n	•	•				0.5]				
24d)m= 0.6 0.6 0.6	0.58 0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(2
Effective air change rate - ent	ter (24a) or (24l	b) or (24	c) or (24	d) in box	(25)					
25)m= 0.6 0.6 0.6	0.58 0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(2
3. Heat losses and heat loss p	arameter:									
	Openings m²	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-k		X k J/K
indows Type 1		8.97		/[1/(1.4)+		11.89	$\stackrel{\prime}{\Box}$			(
/indows Type 2		2.92	x1,	/[1/(1.4)+	0.04] =	3.87				(:
/alls Type1 41.51	11.89	29.62	2 x	0.18	— լ՝	5.33	Ħ r		-) (2
/alls Type2 16.73	0	16.73	3 x	0.18	=	3.01	F i			(2
otal area of elements, m ²		58.24								
arty wall		40.43	3 x	0	=	0				(:
arty floor		69.44								
arty ceiling		69.44	=				Ī		i	
iternal wall **		136.2	<u>=</u>				Ī		1	
for windows and roof windows, use eff include the areas on both sides of int		alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] á	L as given in	paragraph	3.2	`
abric heat loss, W/K = S (A x L	J)			(26)(30)	+ (32) =				24.11	(
eat capacity Cm = S(A x k)					((28).	(30) + (32	2) + (32a).	(32e) =	10687.04	(
nermal mass parameter (TMP	= Cm ÷ TFA) ii	n kJ/m²K			Indica	tive Value	: Medium		250	<u> </u>
r design assessments where the deta n be used instead of a detailed calcul		tion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
nermal bridges : S (L x Y) calc		-	K					[6.83	(
details of thermal bridging are not kno stal fabric boot loss	wn(36) = 0.05 x(3)	31)			(33) 1	(26) -		Г		<u> </u>
otal fabric heat loss entilation heat loss calculated	monthly					$(36) =$ $= 0.33 \times ($	25)m v (F)	[30.94	(
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 36.71 36.47 36.22	35.09 34.88	33.89	33.89	33.7	34.27	34.88	35.31	35.76		(
, <u> </u>	0 1.00	1 -5.50	1 -5.50	I	<u> </u>	<u> </u>	<u> </u>	50		`
eat transfer coefficient, W/K 9)m= 67.65 67.4 67.16	66.03 65.82	64.83	64.83	64.64	(39)m 65.21	= (37) + (37) 65.82	66.25	66.69		
700 = 1 D/DO 1 D/4 1 D/1D 1	UD US I DS AZ	1 D4 6.3	1 D4 63	04.04	1 00 / 1	เบอ.ศ/	1 00.75	i nn ng l		

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.97	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96		
Number of day	re in mo	oth (Tabl	lo 10)					,	Average =	Sum(40) ₁	12 /12=	0.95	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
										•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13:		23		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the a	welling is	designed t			se target o		7.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ii	n litres per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)	-		!			
(44)m= 95.94	92.45	88.97	85.48	81.99	78.5	78.5	81.99	85.48	88.97	92.45	95.94		_
Energy content of	hot water	used - cal	culated mo	onthly = 4	190 x Vd r	n x nm x F	Tm / 3600			m(44) ₁₁₂ =	L	1046.65	(44)
(45)m= 142.28	124.44	128.41	111.95	107.42	92.7	85.9	98.57	99.74	116.24	126.89	137.79		
(10)111=	12	120.11	111.00	107.12	02.7	00.0	00.01			m(45) ₁₁₂ =		1372.32	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)		, ,	L		
(46)m= 21.34	18.67	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67		(46)
Water storage Storage volum		includin	a anv e	alar or M	/\//HRS	storage	within es	ama vas	امء		450		(47)
If community h	, ,		-			•		ATTIC VOO.	001		150		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost fro		_	-		or io not		(48) x (49)) =		0.	75		(50)
b) If manufactHot water stora			-								0		(51)
If community h	-			,		• /							
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	,					((50) (==> (44)		0.	75		(55)
Water storage						i	((56)m = (, , ,	ı	1			
(56)m= 23.33 If cylinder contains	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)ı	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Appendi	ix H	(56)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	3		<u> </u>			<u> </u>		0		(58)
Primary circuit	loss cal	culated f	or each	month (•	. ,	, ,						` '
(modified by						ı —			ı —	<u> </u>			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

On all land and later	1 ((04)	(00) 0	DE (44)	.						
Combi loss calculated $(61)m = \begin{bmatrix} 0 & 0 \end{bmatrix}$	o for each	montn ((61)m =	(60) ÷ 36	0 × (41))m 0	0	0	0	0		(61)
							<u> </u>		<u> </u>	ļ	(F0)m + (G1)m	(01)
Total heat required fo (62)m= 188.88 166.53	_	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	(59)111 + (61)111	(62)
Solar DHW input calculated						<u> </u>						(02)
(add additional lines in								ii continbut	ion to wate	er neating)		
(63)m = 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water he	 ater				<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>			, ,
(64)m= 188.88 166.53	_	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39		
`						<u> </u>	out from w	ater heate	I r (annual)₁	12	1920.94	(64)
Heat gains from wate	r heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	า] + 0.8 ว	x [(46)m	+ (57)m	+ (59)m	1	-
(65)m= 84.58 75.04	79.97	73.3	72.99	66.89	65.84	70.05	69.24	75.93	78.26	83.09	1	(65)
include (57)m in ca	culation (of (65)m	onlv if c	vlinder i	s in the	dwellina	or hot w	ater is fr	om com	munitv h	ı ıeatina	
5. Internal gains (se				,		J				• •	<u> </u>	
Metabolic gains (Tabl			,									
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 111.62 111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62		(66)
Lighting gains (calcula	ated in Ar	pendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5	•		•		
(67)m= 18 15.98	13	9.84	7.36	6.21	6.71	8.72	11.71	14.87	17.35	18.5		(67)
Appliances gains (cal	culated in	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m= 195.99 198.02	192.9	181.98	168.21	155.27	146.62	144.59	149.71	160.62	174.4	187.34		(68)
Cooking gains (calcul	ated in A	ppendix	L, equat	ion L15	or L15a), also se	ee Table	5		!		
(69)m= 34.16 34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16		(69)
Pumps and fans gain:	s (Table 5	Ба)				•		•	•	•		
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evaporati	on (negat	tive valu	es) (Tab	le 5)				•		•		
(71)m= -89.3 -89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3		(71)
Water heating gains (Table 5)					•		•		•	•	
(72)m= 113.69 111.67	107.49	101.8	98.11	92.91	88.49	94.15	96.16	102.05	108.7	111.68		(72)
Total internal gains	=			(66)	m + (67)m	n + (68)m +	+ (69)m +	(70)m + (7	1)m + (72))m	•	
(73)m= 387.16 385.17	372.87	353.12	333.17	313.88	301.31	306.95	317.07	337.03	359.93	377.01		(73)
6. Solar gains:												
Solar gains are calculated	_	r flux from	Table 6a	and assoc	iated equa	itions to co	nvert to th	ne applicat		tion.		
Orientation: Access		Area		Flu		-	g_ able 6b	_	FF		Gains	
Table 6	ı ———	m ²		Tai	ole 6a	, –	able ob		able 6c		(W)	7
Northeast 0.9x 0.77	7 X	8.9)7	x 1	1.28	X	0.63	x	0.7	=	30.93	(75)
Northeast _{0.9x} 0.77	7 X	8.9	97	X 2	2.97	X	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x 0.77	7 X	8.9	97	X 4	1.38	X	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x 0.77	7 X	8.9	97	× 6	57.96	X	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x 0.77	7 X	8.9	97	x 9	1.35	x	0.63	x	0.7	=	250.41	(75)

AL OF A		_			_		,		_				_
Northeast _{0.9x}	0.77	X	8.9	97	X	97.38	X	0.63	X	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	91.1	X	0.63	X	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	72.63	X	0.63	X	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	50.42	X	0.63	X	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	X	8.9	97	X	28.07	X	0.63	X	0.7	=	76.94	(75)
Northeast _{0.9x}	0.77	X	8.9	97	X	14.2	X	0.63	X	0.7	=	38.92	(75)
Northeast 0.9x	0.77	X	8.9	97	X	9.21	X	0.63	X	0.7	=	25.26	(75)
Southwest _{0.9x}	0.77	X	2.9	92	x	36.79]	0.63	X	0.7	=	32.83	(79)
Southwest _{0.9x}	0.77	X	2.9	92	x	62.67		0.63	X	0.7	=	55.93	(79)
Southwest _{0.9x}	0.77	X	2.9	92	x	85.75]	0.63	x	0.7	=	76.52	(79)
Southwest _{0.9x}	0.77	X	2.9	92	X ·	106.25		0.63	x	0.7	=	94.82	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x ·	119.01]	0.63	x	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x ·	118.15		0.63	x	0.7	=	105.44	(79)
Southwest _{0.9x}	0.77	X	2.9	92	x ·	113.91		0.63	х	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	X	2.9	92	x ·	104.39]	0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	92.85]	0.63	x	0.7	=	82.86	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	69.27	Ī	0.63	×	0.7		61.81	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	44.07	Ī	0.63	x	0.7		39.33	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	31.49	Ī	0.63	×	0.7	=	28.1	(79)
							_						
Solar gains in	watts, calc	ulated	for eac	h month			(83)m	n = Sum(74)m .	(82)m		i	1	
(83)m= 63.76		89.96	281.11	356.62	372.4	351.39	292	.25 221.08	138.7	78.25	53.36		(83)
Total gains – i			` '	<u> </u>	`	, watts							
(84)m= 450.92	504.05	1 CO OO I	634.22	689.78								7	
	304.03	62.83	034.22	009.70	686.28	652.7	599	9.2 538.15	475.78	3 438.18	430.36]	(84)
7. Mean inter					<u> </u>	652.7	599	9.2 538.15	475.7	3 438.18	430.36		(84)
7. Mean inter	rnal temper	rature ((heating	season)				475.7	3 438.18	430.36	21	(84)
Temperature Utilisation fac	rnal temper during hea ctor for gair	rature (ating pons ans for li	(heating eriods ir iving are	season the livil) ng area (see Ta	from Tal		, Th1 (°C)			430.36	21	
Temperature	rnal temper during hea ctor for gair Feb	rature (ating po	(heating eriods ir iving are Apr	season the livii) ng area	from Tal	ble 9	, Th1 (°C)	475.78		430.36 Dec	21	(85)
Temperature Utilisation fac	rnal temper during hea ctor for gair Feb	rature (ating pons ans for li	(heating eriods ir iving are	season the livil ea, h1,m) ng area (see Ta	from Tal	ble 9	, Th1 (°C)				21	
Temperature Utilisation fac	rnal temper during hea ctor for gair Feb	rature (ating pons for li Mar 0.98	(heating eriods ir iving are Apr 0.93	season the living ea, h1,m May	ng area (see Ta Jun 0.59	from Tal able 9a) Jul 0.44	ble 9	, Th1 (°C) ug Sep 19 0.77	Oct	Nov	Dec	21	(85)
Temperature Utilisation fac	nal temper during hea ctor for gair Feb 0.99	rature (ating pons for li Mar 0.98	(heating eriods ir iving are Apr 0.93	season the living ea, h1,m May	ng area (see Ta Jun 0.59	from Tal able 9a) Jul 0.44	ble 9	, Th1 (°C) ug Sep 19 0.77 Table 9c)	Oct	Nov 0.99	Dec	21	(85)
Temperature Utilisation fac Jan (86)m= 1 Mean interna	rnal temper during hea etor for gair Feb 0.99 It temperate 20.18	rature (ating points for li Mar 0.98 ure in l	(heating eriods ir iving are 0.93 iving are 20.71	season the livings, h1,m May 0.8 ea T1 (for 20.91	ng area (see Tall Jun 0.59 ollow ste	from Tal able 9a) Jul 0.44 eps 3 to 7	ble 9 A 0.4 7 in T	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95	Oct 0.96	Nov 0.99	Dec 1	21	(85)
Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 20.05	rnal temper during hea etor for gair Feb 0.99 lt temperate 20.18 2 during hea	rature (ating points for li Mar 0.98 ure in l	(heating eriods ir iving are 0.93 iving are 20.71	season the livings, h1,m May 0.8 ea T1 (for 20.91	ng area (see Tall Jun 0.59 ollow ste	from Tal able 9a) Jul 0.44 eps 3 to 7	ble 9 A 0.4 7 in T	s, Th1 (°C) ug Sep ug 0.77 able 9c) 1 20.95 9, Th2 (°C)	Oct 0.96	Nov 0.99	Dec 1	21	(85)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1	rnal temper during hea ctor for gair Feb 0.99 al temperate 20.18 20.11	rature (ating points for li Mar 0.98 ure in l 20.41 ating points 20.11	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of	Jun 0.59 ollow ste 20.99 dwelling 20.14	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14	ble 9 A 0.4 7 in T 2 able 9	s, Th1 (°C) ug Sep ug 0.77 able 9c) 1 20.95 9, Th2 (°C)	Oct 0.96	Nov 0.99	Dec 1 20.03	21	(85) (86) (87)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature	rnal temper during hea eter for gair Feb 0.99 It temperate 20.18 20.11 20.11	rature (ating points for li Mar 0.98 ure in l 20.41 ating points 20.11	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of	Jun 0.59 ollow ste 20.99 dwelling 20.14	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14	ble 9 A 0.4 7 in T 2 able 9	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13	Oct 0.96	Nov 0.99	Dec 1 20.03	21	(85) (86) (87)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1	rnal temper during heat tor for gair Feb 0.99 temperate 20.18 2 during heat 20.11 2 etor for gair 0.99	rature (ating points for li Mar 0.98 ure in li 20.41 ating points for ri 0.98	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of 20.13 welling, 0.75) ng area (see Ti Jun 0.59 cllow ste 20.99 dwelling 20.14 h2,m (s	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35	ble 9 A 0.4 7 in 1 2 20. 9a) 0.	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13	Oct 0.96 20.68 20.13	Nov 0.99 20.32	Dec 1 20.03 20.12	21	(85) (86) (87) (88)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact	rnal temper during heat temperate 20.18 20.11 20.11 20.99	rature (ating points for li Mar 0.98 ure in li 20.41 ating points for ri 0.98	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of 20.13 welling, 0.75) ng area (see Ti Jun 0.59 cllow ste 20.99 dwelling 20.14 h2,m (s	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35	ble 9 A 0.4 7 in 1 2 20. 9a) 0.	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 19, Th2 (°C) 14 20.13 4 0.7 1 to 7 in Table	Oct 0.96 20.68 20.13	Nov 0.99 20.32 20.12	Dec 1 20.03 20.12		(85) (86) (87) (88)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation	rnal temper during heat temperate 20.18 20.11 20.11 20.99	rature (ating pens for li Mar 0.98 ure in l 20.41 ating pens for r 0.98 ure in t	cheating eriods ir o.93 iving are 20.71 eriods ir 20.12 est of do.91 the rest	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of 20.13 welling, 0.75 of dwelling) ng area (see Ti Jun 0.59 cllow ste 20.99 dwelling 20.14 h2,m (s 0.52	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35 follow ste	ble 9 A 0.4 7 in 1 2 able 9 9a) 0.	g Sep 9 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 to 7 in Table 14 20.1	Oct 0.96 20.68 20.13 0.94 e 9c) 19.76	Nov 0.99 20.32 20.12	Dec 1 20.03 20.12 1 18.82	21	(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation (90)m= 18.84	rnal temper during heator for gair Feb 0.99 lt temperate 20.18 20.11 20.	rature (ating points for li Mar 0.98 ure in li 20.41 ating points for ri 0.98 ure in til 19.36	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91 the rest 19.79	season the living the) ng area (see Ti Jun 0.59 colors stee 20.99 dwelling 20.14 h2,m (see Ti 0.52 ng T2 (20.13	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35 follow ste 20.14	ble 9 A 0.4 7 in 1 2 20. 9a) 0.2 20.	g Sep 9 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 to 7 in Table 14 20.1	Oct 0.96 20.68 20.13 0.94 e 9c) 19.76	Nov 0.99 20.32 20.12 0.99	Dec 1 20.03 20.12 1 18.82		(85) (86) (87) (88) (89) (90)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation (90)m= 18.84 Mean internation	rnal temper during heat temperate 20.18 20.11 20.11 20.19 20.11 20	rature (ating pens for li Mar 0.98 ure in l 20.41 ating pens for r 0.98 ure in t 19.36 ure (for	cheating eriods ir o.93 iving are 20.71 eriods ir 20.12 est of do 0.91 che rest 19.79 r the wh	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of 20.13 welling, 0.75 of dwelling 20.05) ng area (see T Jun 0.59 ollow ste 20.99 dwelling 20.14 h2,m (s 0.52 ng T2 (20.13	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35 follow ste 20.14	A 0.4 7 in 1 2 able 9 0.4 0.4 7 in 2 20. 9a) 0.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	g Sep 9 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 1 to 7 in Table 14 20.1 - fLA) × T2	Oct 0.96 20.68 20.13 0.94 e 9c) 19.76 fLA = Liv	Nov 0.99 20.32 20.12 0.99 19.24 ving area ÷ (-	Dec 1 20.03 20.12 1 1 18.82 4) =		(85) (86) (87) (88) (89) (90) (91)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation (90)m= 18.84	rnal temper during heator for gair Feb 0.99 lt temperate 20.18 20.11 20.	rature (ating points for limited for limit	cheating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91 the rest 19.79 r the who 20.11	season the living the	ng area (see Tage of Jun 0.59) bllow ster 20.99 dwelling 20.14 h2,m (so 0.52) ng T2 (con 20.13)	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35 follow ste 20.14 fLA × T1 20.43	bble 9 A 0.4 7 in 1 2 20. 9a) 0.4 1 20.	g Sep 19 0.77 Table 9c) 1 20.95 19, Th2 (°C) 14 20.13 4 0.7 1 to 7 in Table 14 20.1 - fLA) × T2 43 20.39	Oct 0.96 20.68 20.13 0.94 e 9c) 19.76 LA = Liv 20.08	Nov 0.99 20.32 20.12 0.99 19.24 ving area ÷ (-	Dec 1 20.03 20.12 1 18.82		(85) (86) (87) (88) (89) (90)

											,		ı	
(93)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24		(93)
			uirement											
			ternal ter or gains	•		ed at ste	ep 11 of	Table 9	b, so tha	ıt Ti,m=(76)m an	d re-calc	culate	
uic at	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	<u> </u>	<u> </u>	l mag	СОР		1 1101	200		
(94)m=	0.99	0.99	0.97	0.91	0.76	0.54	0.38	0.43	0.72	0.94	0.99	1		(94)
Usefu	∟——ıl gains,	hmGm	, W = (9 ⁴	4)m x (84	4)m		<u>!</u>			<u>!</u>			l	
(95)m=	448.52	498.69	547.41	578.07	525.27	372.74	248.03	259.75	387.12	448.63	433.16	428.57		(95)
Month	nly aver	age exte	ernal tem	perature	from Ta	able 8		•			•	•		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	-	<u> </u>		
(97)m=	1011.55	979.19	888.07	739.88	568.97	377.65	248.52	260.77	410.09	623.73	828.81	1002.75		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		1	
(98)m=	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19		_
								Tota	l per year	(kWh/yea	r) = Sum(9	18) _{15,912} =	1986.58	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								28.61	(99)
9a. En	erav red	uiremer	nts – Indi	vidual h	eating s	vstems i	ncluding	micro-C	CHP)					
	e heatir	•				,			,					
-		•	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main svs	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	-									93.5	(206)
		•	ry/suppl	-		a evetom	o 0/ ₋						0	(208)
LIIICIC						· ·		Ι	0					」 ` ′
Space	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	418.9	322.9	ement (c	116.5	32.51) 0	0	0	0	130.27	284.86	427.19		
(0.4.4)								<u> </u>		100.27	204.00	427.13		(0.4.4)
(211)m	- ``	<u> </u>)4)] } x 1	<u> </u>				Ι ο		420.00	1 204 67	450.00		(211)
	448.02	345.34	271.07	124.6	34.78	0	0	0 Tota	0 II (kWh/yea	139.32	304.67	456.89	0404.00	7(214)
•				\ 1\A/I /				1016	ii (KVVII/yea	ar) =50m/	211) _{15,1012}	2	2124.68	(211)
•		•	econdar 00 ÷ (20	• •	month									
- \[(30) (215)m=	<u> </u>	0	00 + (20	0	0	0	0	0	0	0	0	0		
(210)				Ů					l (kWh/yea				0	(215)
Water	heating								` ,	, ,	715,101	_		
	_		ter (calc	ulated al	hove)									
o disposi	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39		
Efficier	ncy of w	ater hea	ater			ļ.	ļ.	!	ļ.	ļ.	!		79.8	(216)
(217)m=	86.88	86.55	85.8	84.03	81.48	79.8	79.8	79.8	79.8	84.23	86.15	86.98		(217)
		heatina.	kWh/mo	onth					ı	ı		1		
(219)m	1 = (64)	•) ÷ (217)					1			1		ı	
(219)m=	217.4	192.4	203.97	186.89	189.02	172.67	166.03	181.91	181.5	193.33	199.62	211.98		_
								Tota	I = Sum(2	19a) ₁₁₂ =			2296.71	(219)
	l totals									k'	Wh/yeaı	r	kWh/year	7
Space	neating	tuel use	ed, main	system	1								2124.68	╛

Water heating fuel used				2296.71	1
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				317.84	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4814.23	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy	Emission fac	ctor	Emissions	
	kWh/year	kg CO2/kWh		kg CO2/yea	ar
Space heating (main system 1)	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (main system 1) Space heating (secondary)	•		=		_
	(211) x	0.216		458.93	(261)
Space heating (secondary)	(211) x (215) x	0.216	=	458.93	(261) (263)
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216	=	458.93 0 496.09	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	=	458.93 0 496.09 955.02	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= =	458.93 0 496.09 955.02 38.93	(261) (263) (264) (265) (267)

TER =

(273)

16.69

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:08:04

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:**

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.61m² Site Reference :

Plot Reference: 01 - F Highgate Road - GREEN

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 16.77 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.35 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 34.0 kWh/m²

OK

2 Fabric U-values

Element Average Highest 0.18 (max. 0.70) External wall 0.18 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK**

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Windows facing: South West	2.92m ²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m ² K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Number: STRO010943 Software Version: Version: 1.0.5.50						
Address :	F	Property	Address	: 01 - F					
1. Overall dwelling dime	ensions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor			69.61	(1a) x	2	2.65	(2a) =	184.47	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	69.61	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	184.47	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- +	0	_ = _	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				2	x -	10 =	20	(7a)
Number of passive vents)			Ē	0	x ·	10 =	0	(7b)
Number of flueless gas fi	ires			F	0	x 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per he	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.11	(8)
Number of storeys in the	peen carried out or is intended, proced he dwelling (ns)	iu io (17),	ourer wise t	conunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t ngs): if equal user 0.35	o the grea	ter wall are	ea (after					
•	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (45)		0	(15)
Infiltration rate	q50, expressed in cubic metro	se nar h	(8) + (10)				area	0	(16)
•	lity value, then $(18) = [(17) \div 20] +$	•	•	•	ietie oi e	rivelope	aica	0.36	(17)
•	es if a pressurisation test has been do				is being u	sed		0.00	(\ -'/
Number of sides sheltered	ed		(20) 4	[0.0 7 F //	10)]			0	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			1	(20)
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (10) X (20) =				0.36	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	1 ' 1 ' 1	1	1 -3	1	1	1		<u> </u>	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Faster (00s) (0	2)	-	•	•	•	-	-	•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23	0.95	0.92	<u> </u>	1.08	1.12	1.18		
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	0.93	1 0.32	<u> </u>	1.00	1.12	1.10	I	

Adjusted infiltra		· ·				` 	`	<u> </u>	T	ı		1	
0.46 Calculate effec	0.45	0.44	0.39	0.39 he appli	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
If mechanica		-	ale ioi i	пе арріі	саые са	SE						0	(2:
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(2:
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(2:
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (2	2b)m + (23b) × [1 – (23c)	÷ 100]	`
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b)m = (22	2b)m + (23b)	•	•	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ven	tilation o	r positiv	e input v	ventilatio	n from c	utside	-	-	-		
if (22b)n	n < 0.5 ×	(23b), t	hen (24d	= (23b)); other	wise (24	c) = (22b) m + 0.	5 × (23b)		•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n				•	•				0.51				
24d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	l			l	
25)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
0.11.41										ı	L		
3. Heat losse					NI n.t. A m		I I l		A V 11		la combas		A V I-
LEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
Vindows Type	e 1	` ,			8.97	x1,	/[1/(1.4)+	0.04] =	11.89	,			(2
Vindows Type	2				2.92	x1,	/[1/(1.4)+	0.04] =	3.87	Ħ			(2
Valls Type1	41.5	i9	11.89	9	29.7	x	0.18	=	5.35	=		$\neg \Box$	(2
Valls Type2	18.4	1	0		18.41	X	0.18	-	3.31	F i		-	(2
otal area of e	lements	, m²			60								(3
Party wall					38.68	3 x	0		0				(3.
Party floor					69.61							=	(3.
Party ceiling					69.61					[-	(3
nternal wall **					136.2	=						-	(3:
for windows and		ows, use e	ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] á	L as given in	paragraph		(_
* include the area	as on both	sides of in	iternal wali	s and part	titions								
abric heat los		•	U)				(26)(30)	+ (32) =				24.42	(3
leat capacity		,							(30) + (32	, , ,	(32e) =	10725.79	(3
hermal mass	•	•		,					tive Value			250	(3
For design assess an be used inste				constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge				using Ap	pendix l	<						6.83	(3
details of therma					-								`
otal fabric he	at loss							(33) +	(36) =			31.26	(3
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 36.79	36.55	36.3	35.17	34.96	33.97	33.97	33.78	34.35	34.96	35.39	35.84		(3
leat transfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
89)m= 68.05	67.8	67.56	66.42	66.21	65.22	65.22	65.04	65.6	66.21	66.64	67.09	<u> </u>	
		4 0 5 50	0 4 D 0 00)		ww.stroma				Average =	Sum(39).	/12-	66.4₽ _a	10

Heat loss para	meter (l	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.98	0.97	0.97	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.96	0.96		
Number of day	s in ma	nth (Tab	lo 1a)	<u>!</u>		<u>!</u>	<u>!</u>	'	Average =	Sum(40) ₁ .	12 /12=	0.95	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		!		•		•	•	!		•			
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		24		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		7.32		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pei	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	!					
(44)m= 96.05	92.56	89.07	85.57	82.08	78.59	78.59	82.08	85.57	89.07	92.56	96.05		
Energy content of	hot water	used - cali	culated m	onthly = 4	190 x Vd r	n x nm x F)Tm / 3600			ım(44) ₁₁₂ = ables 1b 1		1047.84	(44)
(45)m= 142.44	124.58	128.56	112.08	107.54	92.8	85.99	98.68	99.86	116.37	127.03	137.95		
(10)=	121.00	120.00	112.00	107.01	02.0	00.00	00.00			ım(45) ₁₁₂ =	l l	1373.88	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)		, ,			
(46)m= 21.37	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69		(46)
Water storage Storage volum		\ includin	na anv si	alar or M	/\//HRS	etorana	within es	ama vas	امء		450		(47)
If community h	` '					•		arric ves	301		150		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost fro b) If manufact		_	-		or is not		(48) x (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	_		on 4.3										
Volume factor			01								0		(52)
Temperature fa											0		(53)
Energy lost fro Enter (50) or (_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Water storage	. , .	,	or each	month			((56)m - ((55) × (41)	m	0.	75		(55)
					20.50		·	1	ī	1 00 50	00.00		(56)
(56)m= 23.33 If cylinder contains	21.07 s dedicate	23.33 d solar sto	22.58 rage, (57)	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 (H11) is fro	23.33 m Append	ix H	(56)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table			•	•	•	•		0		(58)
Primary circuit	loss cal	culated f	for each	month (•	. ,	, ,						
(modified by							<u> </u>	<u> </u>		- 			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss ca	lculated	for each	month (′61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0	0	0	0	0	0	0) 0		0	0	0	0]	(61)
	uired for	water he	eating ca	Lalculated	L I for eac	h month	(62)ı	— n =	0.85 × (′45)m +	(46)m +	(57)m +	ו · (59)m + (61)m	
(62)m= 189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.	_	144.95	162.97	172.12	184.54]	(62)
Solar DHW input	<u> </u>	using App	endix G oı	Appendix	H (nega	ive quantit	y) (ent	——I er '0'	if no sola	r contribu	tion to wate	r heating)	1	
(add additiona												0,		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	1	(63)
Output from w	ater hea	ter				•	•					•	•	
(64)m= 189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.	.27	144.95	162.97	172.12	184.54]	
	•					•		Outp	ut from wa	ater heate	er (annual)	l12	1922.5	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	5 × (45)m	ı + (6	1)m	i] + 0.8 x	((46)m	+ (57)m	+ (59)m	n]	
(65)m= 84.64	75.09	80.02	73.34	73.03	66.93	65.87	70.0	09	69.28	75.97	78.31	83.14]	(65)
include (57)	m in calc	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing i	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):										
Metabolic gair	ns (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.	.83	111.83	111.83	111.83	111.83	1	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 d	r L9a), a	lso s	ee T	Table 5				•	
(67)m= 18.04	16.02	13.03	9.87	7.37	6.23	6.73	8.7	4	11.74	14.9	17.39	18.54]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 196.39	198.42	193.29	182.36	168.55	155.58	146.92	144.	.88	150.02	160.95	174.75	187.72]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5		•	•	
(69)m= 34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.	18	34.18	34.18	34.18	34.18]	(69)
Pumps and fa	ns gains	(Table 5	ōa)										•	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g. ev	/aporatio	n (negat	tive valu	es) (Tab	le 5)							-	-	
(71)m= -89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.	46	-89.46	-89.46	-89.46	-89.46]	(71)
Water heating	gains (T	able 5)		-							-	-	-	
(72)m= 113.76	111.74	107.55	101.86	98.16	92.96	88.53	94.	2	96.22	102.11	108.77	111.75]	(72)
Total internal	gains =				(66	5)m + (67)m	า + (68)m +	- (69)m + ((70)m + (7	71)m + (72))m	-	
(73)m= 387.74	385.74	373.42	353.63	333.64	314.32	301.73	307.	.38	317.52	337.51	360.46	377.56]	(73)
6. Solar gain	s:													
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations t	о со	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²		Flo	ux ible 6a		т.	g_ able 6b	т	FF able 6c		Gains	
_	Table 60					ible ba	, ,	- 1	able ob	_ '	able oc		(W)	7
Northeast _{0.9x}	0.77	X	8.9)7	X	11.28	X		0.63	×	0.7	=	30.93	(75)
Northeast 0.9x	0.77	X	8.9	97	Х	22.97	X		0.63	×	0.7	=	62.96	(75)
Northeast _{0.9x}	0.77	X	8.9	7	х	41.38	X		0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	х	8.9	7	x	67.96	X		0.63	x	0.7	=	186.29	(75)
Northeast _{0.9x}	0.77	X	8.9	97	X	91.35	X		0.63	X	0.7	=	250.41	(75)

		_			_		1		_				_
Northeast _{0.9x}	0.77	X	8.9	7	x	97.38	X	0.63	X	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	X	8.9)7	x	91.1	X	0.63	X	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	X	8.9	7	x	72.63	X	0.63	X	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	X	8.9	7	x	50.42	X	0.63	X	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	X	8.9)7	x	28.07	X	0.63	X	0.7	=	76.94	(75)
Northeast _{0.9x}	0.77	X	8.9)7	X	14.2	X	0.63	X	0.7	=	38.92	(75)
Northeast 0.9x	0.77	X	8.9	97	x	9.21	X	0.63	X	0.7	=	25.26	(75)
Southwest _{0.9x}	0.77	X	2.9)2	x	36.79]	0.63	X	0.7	=	32.83	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	62.67]	0.63	X	0.7	=	55.93	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	85.75]	0.63	x	0.7	=	76.52	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	106.25		0.63	x	0.7	=	94.82	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	119.01]	0.63	х	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	118.15]	0.63	x	0.7	=	105.44	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	113.91		0.63	х	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	104.39]	0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	92.85]	0.63	x	0.7	=	82.86	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	69.27	Ī	0.63	x	0.7		61.81	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	44.07	1	0.63	x	0.7		39.33	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	31.49	ĺ	0.63	x	0.7	=	28.1	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m= 63.76		89.96	281.11	356.62	372.4	351.39	292	- i ` ´ 	138.70	78.25	53.36]	(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m ·	+ (83)r	n , watts			<u> </u>		<u>!</u>	ı	
(84)m= 451.5	504.63 56	63.38	634.74	690.26	686.7	2 652 12					T	•	
(84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92													(84)
7. Mean internal temperature (heating season)													(84)
			,		<i></i>				476.2	7 438.71	430.92	21	_
Temperature	during hea	ting p	eriods ir	the livi	ng are	a from Tal			476.27	7 438.71	430.92	21	(84)
	during hea	ting p	eriods ir	the livinea, h1,m	ng are	a from Tal	ole 9	, Th1 (°C)	476.2		430.92	21	_
Temperature Utilisation fac	during hea tor for gain Feb	ting pos	eriods ir	the livi	ng area	a from Tal	ole 9	, Th1 (°C)	İ			21	_
Temperature Utilisation fac Jan (86)m= 1	during hea stor for gain Feb	ting possible state of the stat	eriods ir iving are Apr 0.93	n the livingea, h1,m May 0.8	(see Jun	a from Tal Fable 9a) Jul 0.44	ole 9	, Th1 (°C) ug Sep 19 0.77	Oct	Nov	Dec	21	(85)
Temperature Utilisation fac Jan (86)m= 1 Mean interna	during hea etor for gain Feb 0.99 (ting posting posting Mar 0.98 ure in l	eriods ir iving are Apr 0.93 iving are	n the living the living the man may 0.8 ea T1 (for	(see Jun 0.6	a from Tal Fable 9a) Jul 0.44 teps 3 to 7	ole 9	, Th1 (°C) ug Sep 19 0.77 Table 9c)	Oct 0.96	Nov 0.99	Dec 1	21	(85)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.04	during hea etor for gain Feb 0.99 (I temperatu 20.18 2	s for li Mar 0.98 ure in l	eriods ir iving are Apr 0.93 iving are 20.71	n the living the hand	Jun 0.6 ollow s	a from Tal Fable 9a) Jul 0.44 teps 3 to 7	ole 9 A 0.4 7 in T	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95	Oct	Nov 0.99	Dec	21	(85)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.04 Temperature	during hea stor for gain Feb 0.99 (I temperatu 20.18 2 during hea	s for li Mar 0.98 ure in l	eriods ir iving are Apr 0.93 iving are 20.71 eriods ir	n the living the hand	(see - Jun 0.6 bllow s 20.99 dwellin	a from Tal Fable 9a) Jul 0.44 teps 3 to 7 21	ole 9 A 0.4 7 in T 2 able 9	s, Th1 (°C) ug Sep ug 0.77 able 9c) 1 20.95 9, Th2 (°C)	Oct 0.96	Nov 0.99 20.31	Dec 1 20.03	21	(85) (86) (87)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.04 Temperature (88)m= 20.1	during head stor for gain Feb 0.99 0 1 temperature 20.18 2 during head 20.11 2	s for li Mar 0.98 ure in l 0.41 ting pe	eriods ir iving are Apr 0.93 iving are 20.71 eriods ir 20.12	n the living the hand may 0.8 ea T1 (for 20.91 en rest of 20.12	(see Jun 0.6 ollow s 20.99 dwellir 20.14	a from Tal Table 9a) Jul 0.44 teps 3 to 7 21 ng from Ta	ole 9 A 0.4 7 in T 2 able 9	s, Th1 (°C) ug Sep ug 0.77 able 9c) 1 20.95 9, Th2 (°C)	Oct 0.96	Nov 0.99 20.31	Dec 1	21	(85)
Temperature Utilisation fact Jan (86)m= 1 Mean interna (87)m= 20.04 Temperature (88)m= 20.1 Utilisation fact	during head tor for gain Feb 0.99 I temperatu 20.18 2 during head 20.11 2 ctor for gain	s for ling pools for ling pools ling pools ling pools for r	eriods ir iving are Apr 0.93 iving are 20.71 eriods ir 20.12	n the living the part of the living the part of the pa	(see Jun 0.6) J	a from Tal Fable 9a) Jul 0.44 teps 3 to 7 21 ng from Ta 20.14 see Table	Dole 9 A 0.4 7 in 1 2 able 9 20.	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13	Oct 0.96 20.68	Nov 0.99 20.31	Dec 1 20.03 20.11	21	(85) (86) (87) (88)
Temperature Utilisation factors Jan (86)m= 1 Mean internation (87)m= 20.04 Temperature (88)m= 20.1	during hear ctor for gain Feb 0.99 Control I temperatu 20.18 2 during hear 20.11 2 ctor for gain	s for li Mar 0.98 ure in l 0.41 ting pe	eriods ir iving are Apr 0.93 iving are 20.71 eriods ir 20.12	n the living the hand may 0.8 ea T1 (for 20.91 en rest of 20.12	(see Jun 0.6 ollow s 20.99 dwellir 20.14	a from Tal Table 9a) Jul 0.44 teps 3 to 7 21 ng from Ta	ole 9 A 0.4 7 in T 2 able 9	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13	Oct 0.96	Nov 0.99 20.31	Dec 1 20.03	21	(85) (86) (87)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.04 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation	during hear stor for gain Feb 0.99 Control I temperatu 20.18 20.11 20.11 20.11 20.19 Control C	s for ling possible in line in	eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do	n the living the hand the living the hand the ha	(see Jun 0.6) Jun 0.6) Jun 0.6) Jun 0.6) Jun 0.6 Jun	a from Tal Fable 9a) Jul 0.44 teps 3 to 7 21 ng from Ta 20.14 see Table 0.35	Dole 9 A 0.4 7 in 7 2 Able 9 20. 9a) 0.	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13	Oct 0.96 20.68 20.12	Nov 0.99 20.31	Dec 1 20.03 20.11	21	(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 1 Mean internat (87)m= 20.04 Temperature (88)m= 20.1 Utilisation fact (89)m= 1	during hear stor for gain Feb 0.99 Control I temperatu 20.18 20.11 20.11 20.11 20.19 Control I temperatu 0.99 Control I temperatu	s for ling possible in line in	eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do	n the living the hand the living the hand the ha	(see Jun 0.6) Jun 0.6) Jun 0.6) Jun 0.6) Jun 0.6 Jun	a from Tal Table 9a) Jul 0.44 teps 3 to 7 21 ng from Ta 20.14 see Table 0.35 (follow ste	Dole 9 A 0.4 7 in 7 2 Able 9 9a) 0.	g Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 to 7 in Table 14 20.09	Oct 0.96 20.68 20.12 0.94 le 9c) 19.75	Nov 0.99 20.31 20.12 0.99	Dec 1 20.03 20.11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	21	(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.04 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation	during hear stor for gain Feb 0.99 Control I temperatu 20.18 20.11 20.11 20.11 20.19 Control I temperatu 0.99 Control I temperatu	s for li Mar 0.98 ure in l 0.41 ting per 0.11 s for r 0.98 ure in t	eriods ir iving are Apr 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91 the rest	n the living the hand the living the hand the ha	(see - Jun 0.6 billow s 20.99 dwellin 0.52 ng T2	a from Tal Table 9a) Jul 0.44 teps 3 to 7 21 ng from Ta 20.14 see Table 0.35 (follow ste	A 0.47 in 1 2 20. 9a) 0. eps 3	g Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 to 7 in Table 14 20.09	Oct 0.96 20.68 20.12 0.94 le 9c) 19.75	Nov 0.99 20.31 20.12	Dec 1 20.03 20.11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.38	(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.04 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation	during hear stor for gain Feb 0.99 Control I temperature 20.18 20.11 20.11 20.11 10.99 Control I temperature 19.02 1	s for li Mar 0.98 ure in l 0.41 s for r 0.98 ure in t 9.35	eriods ir iving are Apr 0.93 iving are 20.71 eriods ir 20.12 est of de 0.91 the rest 19.78	n the living the livin	(see Jun 0.6 ollow s 20.99 dwellir 20.14 h2,m (0.52 ong T2 20.13	a from Tal Fable 9a) Jul 0.44 teps 3 to 7 21 ng from Ta 20.14 see Table 0.35 (follow stees 20.14)	oble 9 A 0.4 7 in 1 2 20. 9a) 0. 20.	g Sep 9 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 to 7 in Table 14 20.09	Oct 0.96 20.68 20.12 0.94 le 9c) 19.75	Nov 0.99 20.31 20.12 0.99	Dec 1 20.03 20.11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.04 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation (90)m= 18.83	during hear stor for gain Feb 0.99 Colored temperature 20.18 20.11	s for li Mar 0.98 ure in l 0.41 s for r 0.98 ure in t 9.35	eriods ir iving are Apr 0.93 iving are 20.71 eriods ir 20.12 est of de 0.91 the rest 19.78	n the living the livin	(see Jun 0.6 ollow s 20.99 dwellir 20.14 h2,m (0.52 ong T2 20.13	a from Tal Table 9a) Jul 0.44 teps 3 to 7 21 ng from Ta 20.14 see Table 0.35 (follow stees 20.14	oble 9 A 0.4 7 in 1 2 20. 9a) 0. 20.	y Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 19, Th2 (°C) 14 20.13 4 0.7 1 to 7 in Table 14 20.09 - fLA) × T2	Oct 0.96 20.68 20.12 0.94 le 9c) 19.75	Nov 0.99 20.31 20.12 0.99 19.23 ring area ÷ (-	Dec 1 20.03 20.11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		(85) (86) (87) (88) (89)

(02)	40.00	40.40	40.75	20.42	20.27	20.40	20.40	00.40	20.40	00.44	40.04	40.07		(93)
(93)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27		(93)
			uirement				44 -4	Table O	41	4 T: /	70)	- -	late	
			or gains			ed at ste	ер ттог	rable 9	o, so tha	t 11,m=(rojm an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	:										
(94)m=	0.99	0.99	0.97	0.91	0.77	0.55	0.39	0.44	0.72	0.94	0.99	1		(94)
Usefu			, W = (9 ²	<u> </u>			T	,	1		1	,	1	
(95)m=	449.14	499.38	548.31	579.82	528.59	376.65	251.51	263.23	390.23	449.79	433.81	429.17		(95)
	nly aver	age exte	rnal tem	perature			•	,				,		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
							-``	- ` 	– (96)m					
	1020.07		895.47	746.2	574.32	381.94	252.05	264.36	414.51	629.39	836	1011.25		(97)
Space			ı		nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	r	,	1	
(98)m=	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2021.06	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								29.03	(99)
9a En	erav rea	uiremer	nts – Indi	vidual h	eating sy	vstems i	ncluding	micro-C	'HPI					_
	e heatir		ito iriai	vidual II	caming 5	y Storris r	ricidaling	inicio c	<i>/</i>					
•		•	at from s	econdar	v/supple	mentarv	svstem						0	(201)
	•		at from m				•	(202) = 1	- (201) =				1	(202)
	•		ng from	-	. ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	-									93.5	(206)
	•	-	ry/supple	-		a svstem	າ. %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	⊒` ar
Space			ement (c	•				19	000				111111111111111111111111111111111111111	••
	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07		
(211)m) – {[(98	m x (20)4)] } x 1	00 ÷ (20	16)		ļ				!		l	(211)
(211)11	454.3	350.72	276.24	128.12	36.39	0	0	0	0	142.92	309.71	463.17		(=11)
									l (kWh/yea				2161.56	(211)
Cnaa	o bootin	a fuel /e	econdar	\ Id\/b/	manth					(/15,1012	2	2101.50	
•		`	00 ÷ (20	• , .	monun									
(215)m=		0	0 . (20	0	0	0	0	0	0	0	0	0		
(=:-)									l (kWh/yea		_	_	0	(215)
Motor	booting									, ,	715,1012			(= : =)
	heating		ter (calc	ulated al	hove)									
Output	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54		
Efficier	ncy of w												79.8	(216)
(217)m=		86.59	85.85	84.1	81.54	79.8	79.8	79.8	79.8	84.29	86.19	87.01	. 6.6	」`´´ (217)
, ,			kWh/mo		J 1.07	1 . 0.0	L . 0.0	L . 0.0	L . 0.0	0 1.20	L 30.10	1 37.37		` '/
		•	(217) ÷ (
	217.51	192.48	204.02	186.88	189.02	172.8	166.15	182.05	181.64	193.34	199.7	212.08		
							•	Tota	I = Sum(2	19a) ₁₁₂ =		•	2297.68	(219)
Annua	al totals									k\	Wh/year	, ,	kWh/year	
		fuel use	ed, main	system	1						•		2161.56]
														_

					_
Water heating fuel used				2297.68	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year		75	(231)		
Electricity for lighting	318.62	(232)			
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4852.86	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	_		_		
	Energy kWh/year	Emission factoring Kg CO2/kWh	ctor	Emissions kg CO2/yea	ır
Space heating (main system 1)			etor =		ar](261)
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	_
	kWh/year	kg CO2/kWh	=	kg CO2/yea	(261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 466.9 0 496.3	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= =	kg CO2/yea 466.9 0 496.3 963.2	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.519	= = =	kg CO2/yea 466.9 0 496.3 963.2 38.93	(261) (263) (264) (265) (267)

TER =

(273)

16.77

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:07:42*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 50.62m²Site Reference:Highgate Road - GREENPlot Reference:01 - G

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.64 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.45 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

48.0 kWh/m²

29.7 kWh (res)

Dwelling Fabric Energy Efficiency (DFEE) 38.7 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.17 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor)
Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		Heor	Details:						
Access an Name	Nailleabara	USEI		- M	L		CTDO	010010	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Contware Hame.	0.1011/d 1 0711 2012		y Address:		31011.		7 01010	7.0.0.00	
Address :		·							
1. Overall dwelling dime	ensions:								
Ground floor		Ar	ea(m²)	(10) ×		ight(m)	(2a) =	Volume(m ³	(3a)
	a) . (4 la) . (4 a) . (4 al) . (4 a) .	. (4.5)		(1a) x	2	65	(2a) =	134.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	F(1II)	50.62	(4)) (O.) (O.)	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	134.14	(5)
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	ır
Number of altimospess	heating he	ating		1 _ F			40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				L	2		10 =	20	(7a)
Number of passive vents	;				0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	vs. flues and fans = $(6a)$	+(6b)+(7a)+(7b)	+(7c) =	Г	20		÷ (5) =	0.15	(8)
•	peen carried out or is intended,			ontinue fr			. (0) –	0.13	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)
deducting areas of opening		maing to the gre	aler wall are	a (anter					
If suspended wooden f	floor, enter 0.2 (unsealed	d) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
ŭ	s and doors draught strip	oped						0	(14)
Window infiltration			0.25 - [0.2	, ,	_			0	(15)
Infiltration rate			(8) + (10)		, , ,	, ,		0	(16)
	q50, expressed in cubic	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	inty value, then $(10) = 1(17)$ as if a pressurisation test has b				is heina u	sad		0.4	(18)
Number of sides sheltere		och done or a c	legree an per	meability	is being a	3CU		0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	9)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.4	(21)
Infiltration rate modified f	or monthly wind speed						!		
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		
, ,,		3.30	1	-				J	

0.51	0.5	0.49	0.44	0.43	0.38	0.38	0.37	(22a)m _{0.4}	0.43	0.45	0.47		
Calculate effe			-		1		0.01	0.1	0.10	0.10	0.17		
If mechanic												0	(23
If exhaust air h		0		, ,	,	. ,	,, .	`) = (23a)			0	(23
If balanced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23
a) If balance	1					ery (MVI	HR) (24a	<u> </u>	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	1					- 	- ^ `	<u> </u>	 		1	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	nouse ex n < 0.5 ×			•	•				5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilatio	n or wh	ole hous	e positiv	/e input	L ventilatio	n from l	oft					
,	n = 1, the			•	•				0.5]				
24d)m= 0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25
3. Heat losse	es and he	eat loss r	paramete	er:									
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	re	AXU		k-value) A	λΧk
	area	(m²)	· m		A ,r	m²	W/m2	K	(W/I	<)	kJ/m²-l	< k	J/K
Vindows					8.97	x1,	/[1/(1.4)+	0.04] =	11.89				(27
Valls Type1	31.4	4	8.97		22.43	3 X	0.18	=	4.04				(29
Valls Type2	22.9	92	0		22.92	<u>x</u>	0.18	= [4.13				(29
otal area of e	elements	, m²			54.32	2							(3
Party wall					30.08	3 x	0	= [0				(32
Party floor					50.62	2							(32
arty ceiling					50.62	2				Ī			(3:
nternal wall **	ŧ				83.2					Ī			(3:
for windows and	l roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the are				s and part	titions								
	ss, W/K :	•	U)				(26)(30)	,				20.06	(3:
		'Ayk)							$(30) \pm (33)$	2) + (32a).	(32e) =	8366.8	(3
leat capacity		,			,			***	, , ,	, , ,			
leat capacity hermal mass	parame	ter (TMF		•				Indica	tive Value:	Medium		250	(3:
Heat capacity Thermal mass For design asses	s parame	ter (TMF	tails of the	•			ecisely the	Indica	tive Value:	Medium	able 1f	250	(3:
Fabric heat lost lost leat capacity hermal mass for design assest and be used instead for the lost lost lost lost lost lost lost lost	s parame sments wh	eter (TMF ere the de tailed calci	tails of the ulation.	constructi	ion are not	t known pr	ecisely the	Indica	tive Value:	Medium	able 1f	250 5.76	
Heat capacity Thermal mass For design asses an be used inste Thermal bridg	s parame sments wh ead of a de es: S (L	eter (TMF ere the de tailed calcu x Y) cal	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	Indica	tive Value:	Medium	able 1f		
leat capacity hermal mass or design asses an be used inste hermal bridg details of therma	s parame sments wh ead of a de es:S(L al bridging	eter (TMF ere the de tailed calcu x Y) cal	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	Indica indicative	tive Value:	Medium	able 1f		(3)
Heat capacity Thermal mass For design asses an be used inste	s parame sments wh ead of a de es : S (L al bridging eat loss	ter (TMF ere the de tailed calco x Y) calco are not kn	tails of the ulation. culated (own (36) =	constructions constructions constructions constructions constructed as the construction construc	ion are not pendix l	t known pr	ecisely the	Indicative	tive Value:	Medium TMP in Ta		5.76	(3:
Thermal mass For design assessan be used inste Thermal bridg f details of therma Total fabric he Ventilation hea	s parame sments wh ead of a de es : S (L al bridging eat loss	ter (TMF ere the de tailed calco x Y) calco are not kn	tails of the ulation. culated (own (36) =	constructions constructions constructions constructions constructed as the construction construc	ion are not pendix l	t known pr	ecisely the	Indicative	tive Values of values of (36) =	Medium TMP in Ta		5.76	(3)
Heat capacity Thermal mass For design assess an be used inste Thermal bridg Total fabric he Tentilation hea	s parame sments wh had of a dec es : S (L al bridging eat loss at loss ca	ere the de tailed calco x Y) cal- are not kn	tails of the ulation. culated u own (36) =	constructions and constructions are constructed as the construction of the constructio	ppendix h	t known pr		Indicative (33) + (38)m	tive Values of values of (36) = = 0.33 × (Medium TMP in Ta		5.76	(3)
Thermal mass For design assessan be used inste Thermal bridg Tetalis of thermal Total fabric her Ventilation her	s parame sments wh had of a deces: S (L had bridging eat loss at loss ca Feb 27.64	ere the de tailed calculare not kn	tails of the ulation. culated u own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix ł 1) Jun	t known pr	Aug	Indicative (33) + (38)m Sep 25.66	(36) = = 0.33 × (Medium TMP in Ta 25)m x (5) Nov 26.6	Dec	5.76	(3)

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.06	1.05	1.03	1.03	1.01	1.01	1.01	1.02	1.03	1.04	1.04		
()				<u> </u>		<u> </u>	<u> </u>			Sum(40) ₁ .		1.03	(40)
Number of day	s in mo	nth (Tab	le 1a)							(),			``
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
LI				!		!	Į.		ļ	•			
1 Motor boot	ina ono	ravi koani	romonti								Is\A/b/ye	NOT!	
4. Water heat	ing ene	rgy requi	rement.								kWh/ye	ar.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		71		(42)
Annual average Reduce the annual									se target o		.77		(43)
not more that 125									·				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres pe					Table 1c x			ļ				
(44)m= 82.25	79.26	76.27	73.28	70.29	67.3	67.3	70.29	73.28	76.27	79.26	82.25		
, ,				<u> </u>		<u> </u>	<u> </u>	<u> </u>		lm(44) ₁₁₂ =	l	897.28	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 121.98	106.68	110.09	95.97	92.09	79.47	73.64	84.5	85.51	99.65	108.78	118.13		
				1	l	ı	ı	-	rotal = Su	ım(45) ₁₁₂ =	=	1176.48	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)			'		_
(46)m= 18.3	16	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72		(46)
Water storage	loss:			!		!	!						
Storage volume	e (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	rcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage				:	(1-) (//	. /-							(45)
a) If manufacti				or is kno	wn (kvvr	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost fro		-	-				(48) x (49)) =		0.	75		(50)
b) If manufacteHot water stora			-										(51)
If community h	•			IC 2 (KVV)	11/11110/00	' y)					0		(31)
Volume factor	•										0		(52)
Temperature fa	actor fro	m Table	2b							_	0		(53)
Energy lost fro	m watei	r storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (_	,					, , , ,	•	-	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains												ix H	(00)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Duine am a sina sit	l /		T-1-1-			ļ	ļ	!	!				(58)
Primary circuit	•	•			50\m - 4	(EQ) + 26	SE v (44)	ım			0		(30)
Primary circuit (modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
(00)111- 20.20	۱.0۱	20.20	١٤.٦١	20.20	١٤.٠٦	20.20	20.20		20.20	22.01	20.20		(00)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m														
(61)m= 0	0	0	0	01)111 =	00) + 0	0 7 (41) 0		0	0	0	0	1	(61)
	<u> </u>												J · (59)m + (61)m	(-)
(62)m= 168.5	-i	156.68	141.07	138.69	124.56		131	_	130.6	146.25	153.87	164.72]	(62)
Solar DHW inpo			<u> </u>	<u> </u>		1	<u> </u>						<u></u>	` '
(add addition												-: ····································		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	7	(63)
Output from	water hea	ter	ı				•						_	
(64)m= 168.5	7 148.77	156.68	141.07	138.69	124.56	120.23	131	.1	130.6	146.25	153.87	164.72	1	
	Į.		ı	ı				Outp	ut from wa	ater heate	er (annual)	112	1725.1	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	1] + 0.8 >	([(46)m	+ (57)m	+ (59)m	 n]	
(65)m= 77.83	3 69.14	73.88	67.99	67.9	62.5	61.76	65.3	37	64.51	70.41	72.24	76.55]	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar	r Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 85.42	2 85.42	85.42	85.42	85.42	85.42	85.42	85.4	42	85.42	85.42	85.42	85.42]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso s	ee 7	Table 5				_	
(67)m= 13.59	12.07	9.81	7.43	5.55	4.69	5.07	6.5	9	8.84	11.22	13.1	13.97]	(67)
Appliances (gains (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	also	see Ta	ble 5			_	
(68)m= 148.8	4 150.39	146.5	138.21	127.75	117.92	111.35	109.	.81	113.7	121.99	132.45	142.28]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5	-	-	_	
(69)m= 31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.	54	31.54	31.54	31.54	31.54]	(69)
Pumps and	fans gains	(Table 5	5a)										_	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.3	3 -68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.	33	-68.33	-68.33	-68.33	-68.33]	(71)
Water heatir	ng gains (T	able 5)											_	
(72)m= 104.6	1 102.89	99.3	94.42	91.26	86.8	83.01	87.8	37	89.59	94.64	100.34	102.89]	(72)
Total intern	al gains =				(66	6)m + (67)m	า + (68)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 318.6	7 316.97	307.24	291.69	276.19	261.04	251.06	255.	.89	263.76	279.47	297.51	310.76		(73)
6. Solar ga														
Solar gains ar		Ü					ations 1	:0 CO		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		Т	g_ able 6b	т	FF able 6c		Gains (W)	
Northoast a a							1 1					_	. ,	1,75
Northeast 0.9		X			—	11.28	X		0.63	X	0.7	=	30.93	(75)
Northeast 0.9	<u> </u>	X			—	22.97] X]		0.63		0.7	=	62.96	(75)
Northeast 0.9	<u> </u>	X	8.9			41.38	X 1		0.63		0.7	=	113.43	[(75)
Northeast 0.9		X	8.9		-	67.96	X		0.63	_	0.7	=	186.29	[(75)] ₍₇₅₎
Northeast 0.9	× 0.77	X	8.9	97	X	91.35	X		0.63	X	0.7	=	250.41	(75)

Northeast 0.9x	0.77	×	8.9)7	X	97.38] x [(0.63	x	0.7	=	266.96	(75)
Northeast 0.9x	0.77	x	8.9)7	x	91.1] x [(0.63	x	0.7	=	249.74	(75)
Northeast 0.9x	0.77	x	8.9)7	x	72.63] x [(0.63	x	0.7	=	199.1	(75)
Northeast 0.9x	0.77	x	8.9)7	X .	50.42] x [0.63	x	0.7	=	138.22	(75)
Northeast 0.9x	0.77	X	8.9)7	x	28.07	x	(0.63	x	0.7	=	76.94	(75)
Northeast 0.9x	0.77	×	8.9)7	x	14.2	x	-	0.63	_ x _	0.7		38.92	(75)
Northeast 0.9x	0.77	Х	8.9)7	х	9.21	וֹ × וֹ	(0.63	_ x [0.7	=	25.26	(75)
							_							
Solar gains in	n watts, c	alculated	I for eacl	h month			(83)m	= Sun	m(74)m .	(82)m				
(83)m= 30.93	62.96	113.43	186.29	250.41	266.96	249.74	199.	.1	138.22	76.94	38.92	25.26		(83)
Total gains -	internal a	and solar	(84)m =	= (73)m	+ (83)m	, watts							•	
(84)m= 349.6	379.93	420.67	477.98	526.6	528	500.8	454.9	98	401.98	356.42	336.43	336.02		(84)
7. Mean inte	ernal temp	perature	(heating	season)									
Temperatur	e during h	neating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1	(°C)				21	(85)
Utilisation fa	actor for g	ains for l	living are	ea, h1,m	(see Ta	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.94	0.81	0.6	0.45	0.51	1	0.79	0.96	0.99	1		(86)
Mean intern	al temper	ature in	living ar	22 T1 (fo	ollow ste	ns 3 to -	7 in Ta	ahle	9c)					
(87)m= 19.97		20.32	20.65	20.89	20.98	21	20.9	-	20.93	20.62	20.25	19.95		(87)
					-l Ilia .		-1-1-0		. (00)			<u> </u>		
Temperatur (88)m= 20.03		20.04	20.06	20.06	20.07	20.07	20.0		2 (°C) 20.07	20.06	20.05	20.05		(88)
` ′					<u> </u>	ļ	<u> </u>	,6	20.07	20.06	20.05	20.05		(00)
Utilisation fa		1				1	T -				1		1	
(89)m= 0.99	0.99	0.98	0.92	0.76	0.52	0.35	0.41	1	0.72	0.95	0.99	1		(89)
Mean intern	al temper	ature in	the rest	of dwell	ng T2 (1	follow ste	eps 3	to 7	in Tabl	e 9c)	_			
(90)m= 18.66	18.84	19.18	19.66	19.96	20.06	20.07	20.0)8	20.01	19.63	19.09	18.66		(90)
									f	LA = Livir	ng area ÷ (4	4) =	0.49	(91)
Mean intern	al temper	ature (fo	r the wh	ole dwe	lling) = f	fLA × T1	+ (1 -	- fLA	() × T2					
(92)m= 19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.5	53	20.46	20.12	19.66	19.29		(92)
Apply adjus	tment to t	he mean	internal	temper	ature fro	om Table	e 4e, v	where	e appro	priate	•			
(93)m= 19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.5	53	20.46	20.12	19.66	19.29		(93)
8. Space he	ating req	uirement												
Set Ti to the					ed at st	tep 11 of	Table	e 9b,	so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisatio	1				l .		Ι.			0 1		_	1	
Jan		Mar	Apr	May	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Utilisation fa	0.99	0.97	0.92	0.78	0.56	0.4	0.46	e T	0.75	0.95	0.99	0.99		(94)
Useful gains					0.50	0.4	0.40	<u> </u>	0.75	0.93	0.99	0.99		(0.1)
(95)m= 347.34		409.84	438.96	408.92	296.5	200.02	208.7	76	301.18	337.88	332.19	334.24		(95)
Monthly ave						1 =00.02				007.100	1 0020	00		, ,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Heat loss ra						1]	I	I	1	
(97)m= 805.22	1	704.94	587.07	453.33	302.4	200.76	210.2	 -	327.5	495.13	658.33	797.1		(97)
Space heati	ng requir	ement fo	r each n	nonth, k	Wh/mon	$\frac{1}{1}$ th = 0.02	24 x [((97)n	n – (95)m] x (4	1)m		1	
(98)m= 340.66	3 270.21	219.55	106.64	33.04	0	0	0		0	116.99	234.82	344.37		
													-	

			Tota	ıl per year	(kWh/yea	r) = Sum(9	98) _{15,912} =	1666.28	(98)
Space heating requirement in kWh/m²/y	/ear							32.92	(99)
9a. Energy requirements – Individual hea	ating syste	ms includin	g micro-C	CHP)					
Space heating:	·						ı		7,000
Fraction of space heat from secondary/s		itary systen		(004)				0	(201)
Fraction of space heat from main syster	` ,		(202) = 1	,	(000)1			1	(202)
Fraction of total heating from main syste			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system								93.5	(206)
Efficiency of secondary/supplementary	heating sy	stem, %	_					0	(208)
Jan Feb Mar Apr		un Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated a 340.66 270.21 219.55 106.64	´ i			0	116.00	1 224 02	344.37		
	ı	0	0		116.99	234.82	344.37		(0.1.1)
$(211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $364.34 $) 0	0	0	125.13	251.14	368.31		(211)
304.54 209 254.02 114.03	33.33	<u>, </u>		l (kWh/yea				1782.12	(211)
Space heating fuel (secondary), kWh/m	onth				,	7 15, 10 1		1702.12	(,
$= \{[(98) \text{m x } (201)] \} \times 100 \div (208)$									
(215)m= 0 0 0 0	0 (0	0	0	0	0	0		
	-	-	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,101}	2=	0	(215)
Water heating									
Output from water heater (calculated about 168.57 148.77 156.68 141.07		1.56 120.23	131.1	130.6	146.25	153.87	164.72		
Efficiency of water heater	136.09	120.23	131.1	130.0	140.23	133.67	104.72	79.8	(216)
·	81.66 79	0.8 79.8	79.8	79.8	84.23	85.94	86.74	79.0	(217)
Fuel for water heating, kWh/month	01.00 70	70.0	7 0.0	7 0.0	04.20	00.04	00.74		(= : :)
(219) m = (64) m x $100 \div (217)$ m									
(219)m= 194.53 172.21 182.79 167.78	169.84 156	5.09 150.67		163.66	173.64	179.05	189.91		_
			Tota	ıl = Sum(2				2064.45	(219)
Annual totals Space heating fuel used, main system 1					k'	Wh/yea	r I	kWh/yea	r ¬
							[╡
Water heating fuel used								2064.45	
Electricity for pumps, fans and electric ke	eep-hot								
central heating pump:							30		(2300
boiler with a fan-assisted flue							45		(230
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =	:		75	(231)
Electricity for lighting								239.96	(232)
Total delivered energy for all uses (211).	(221) + (2	231) + (232)(237b)	=			ļ	4161.53	(338)
12a. CO2 emissions – Individual heating	g systems	includina m	icro-CHF)			l		
	_								
		Energy kWh/yea	-		Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	

Space heating (main system 1)	(211) x	0.216	384.94 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	445.92 (264)
Space and water heating	(261) + (262) + (263) + (264) =		830.86 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	124.54 (268)
Total CO2, kg/year	sum	of (265)(271) =	994.32 (272)

 $TER = 19.64 \tag{273}$

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:07:22

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.92m² Plot Reference: 01 - H Site Reference : Highgate Road - GREEN

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 17.67 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.46 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 38.8 kWh/m²

OK 2 Fabric U-values

Element Average

Highest 0.18 (max. 0.70) External wall 0.18 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK**

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	ОК
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	9.56m²	
Windows facing: South East	8.76m²	
Ventilation rate:	6.00	
10 Key features		
	2.0 m ³ /m ² h	
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					010943 on: 1.0.5.50	
Address :	F	Property	Address	: 01 - H					
1. Overall dwelling dime	ensions:								
3		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor			63.92	(1a) x	2	.65	(2a) =	169.39	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	63.92	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	169.39	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- +	0	_ = _	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				2	x ²	10 =	20	(7a)
Number of passive vents				Ē	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our
•	ys, flues and fans = (6a)+(6b)+(aantinua fi	20		÷ (5) =	0.12	(8)
Number of storeys in the	een carried out or is intended, proceence	ea 10 (17),	otrierwise (conunue ii	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	(45)		0	(15)
Infiltration rate	arro avanagad in aubia matu		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	ietre oi e	envelope	area	5	(17)
· ·	es if a pressurisation test has been do				is being u	sed		0.37	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.37	(21)
Infiltration rate modified f	- 1 	1	Δ	0	0-4	Nan	D.,	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
(1	1	<u> </u>	<u> </u>	I	l	I	
Wind Factor (22a)m = (22	' 		_					1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43]	
Calculate effe		change i	rate for t	he appli	l							<u> </u>	
If mechanic												0	(23a)
If exhaust air h) = (23a)			0	(23b)
If balanced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(23c)
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b)m = (22	2b)m + (23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)r	n < 0.5 ×			•					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r	ventilation								0.5]	-			
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•	•	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losse	s and he	at loss r	naramete	or.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		X k /K
Windows Type		` ,			8.34	_	/[1/(1.4)+		11.06	$\stackrel{\prime}{\Box}$			(27)
Windows Type					7.64	号 ,	/[1/(1.4)+	0.04] =	10.13	\exists			(27)
Walls Type1	61.0	19	15.98	<u>. </u>	45.11	=	0.18		8.12	╡┌			(29)
Walls Type2	3.8		0		3.86	=	0.18		0.69	륵 ¦		╡	(29)
Total area of e					64.95	=	0.10		0.00				(31)
Party wall	, ionnonic	,				=		[(32)
Party floor					37.5	×	0	= [0	L		╣	=
•					63.92	=				Ĺ		┥	(32a)
Party ceiling					63.92	=				Ĺ		╣	(32b)
Internal wall **					113.4		. (/F/4/					(32c)
* for windows and ** include the area						atea using	Tormula 1	/[(1/ U- vaiu	ie)+0.04] a	as given in	paragrapr	1 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				30	(33)
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	10121.33	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess				constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridg	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						7.91	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he									(36) =			37.91	(37)
Ventilation hea	i						_			(25)m x (5)	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 34.1	33.87	33.63	32.53	32.32	31.37	31.37	31.19	31.74	32.32	32.74	33.18		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m		1	
(39)m= 72.01	71.77	71.54	70.44	70.23	69.28	69.28	69.1	69.65	70.23	70.65	71.09		 .
Stroma FSAP 201	12 Version	: 1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com		,	Average =	Sum(39) ₁	12 /12=	70.4 ∮ age	2 of (3 7 9)

Heat loss para	ımeter (l	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.13	1.12	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11		
	<u>!</u>	<u>!</u>		<u> </u>		<u> </u>	<u> </u>	!	Average =	Sum(40) ₁	12 /12=	1.1	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13:		09		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		3.84		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 92.22	88.87	85.51	82.16	78.81	75.45	75.45	78.81	82.16	85.51	88.87	92.22		
									Total = Su	m(44) ₁₁₂ =	=	1006.06	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 136.76	119.61	123.43	107.61	103.25	89.1	82.56	94.74	95.88	111.73	121.97	132.45		
If instantaneous w	votor hooti	na ot noint	of upo (no	hot woto	· otorogol	ontor O in	havas (16		Total = Su	m(45) ₁₁₂ =	= [1319.1	(45)
			,	ı	, , , , , , , , , , , , , , , , , , ,		· · ·	, , , -	1	1	 1		(40)
(46)m= 20.51 Water storage	17.94	18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87		(46)
Storage volum) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	` '					_							()
Otherwise if no	-			_			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f										0.	54		(49)
Energy lost fro		•					(48) x (49)) =		0.	75		(50)
b) If manufactHot water store			-								0		(51)
If community h	-			(.,, o, ac	-97					<u> </u>		(01)
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)								0.	75		(55)
Water storage	loss cal	culated 1	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	x H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	 - 3							0		(58)
Primary circuit	,	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m													
(61)m= 0	0	0	0	0	00) + 30	0 7 (41)	0	0	0	0	0	1	(61)
							<u> </u>	<u> </u>		<u> </u>		J (59)m + (61)m	, ,
(62)m= 183.3	<u> </u>	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04]	(62)
Solar DHW inp												I	, ,
(add addition										.o to mate	5ag/		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ıter				ļ.	Į.	·!			l	1	
(64)m= 183.3		170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04]	
	'						Out	put from w	ater heate	r (annual)₁	12	1867.72	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m= 82.7	5 73.44	78.32	71.85	71.61	65.7	64.73	68.78	67.95	74.43	76.63	81.31		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ains (Table	e 5), Wat	ts									_	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 104.	5 104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 16.29	9 14.47	11.77	8.91	6.66	5.62	6.07	7.9	10.6	13.46	15.7	16.74		(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5	-	-		
(68)m= 182.7	71 184.61	179.83	169.66	156.82	144.75	136.69	134.8	139.57	149.75	162.58	174.65		(68)
Cooking gai	ns (calcula	ated in Ap	opendix	L, equat	ion L15	or L15a)), also s	ee Table	5			•	
(69)m= 33.4	5 33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45		(69)
Pumps and	fans gains	(Table 5	āa)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (negat	ive valu	es) (Tab	le 5)	-	-		-		-		
(71)m= -83.6	6 -83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6		(71)
Water heatir	ng gains (1	Table 5)		-		-	-	-	-	-	-		
(72)m= 111.2	22 109.29	105.26	99.8	96.25	91.25	87	92.44	94.38	100.04	106.43	109.29		(72)
Total intern	al gains =	:			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 367.5	365.71	354.21	335.72	317.08	298.97	287.12	292.49	301.9	320.59	342.07	358.04		(73)
6. Solar ga	ins:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		-	g_ Table 6b	_	FF		Gains	
	Table 6d		m²		Tai	ble 6a	. —	Table 6b	_ '	able 6c		(W)	_
Northeast 0.9		Х	8.3	34	x 1	1.28	х	0.63	x	0.7	=	28.76	(75)
Northeast 0.9		X	8.3	34	x 2	22.97	х	0.63	x	0.7	=	58.54	(75)
Northeast 0.9	<u> </u>	х	8.3	34	X 4	11.38	х	0.63	x	0.7	=	105.47	(75)
Northeast 0.9		X	8.3	34	x 6	67.96	х	0.63	x	0.7	=	173.21	(75)
Northeast 0.9	× 0.77	X	8.3	34	x 9	91.35	х	0.63	x	0.7	=	232.82	(75)

		_							_				_
Northeast _{0.9x}	0.77	X	8.3	34	X	97.38	X	0.63	X	0.7	=	248.21	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	91.1	x	0.63	X	0.7	=	232.2	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	72.63	×	0.63	X	0.7	=	185.11	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	50.42	X	0.63	X	0.7	=	128.51	(75)
Northeast _{0.9x}	0.77	X	8.3	34	x	28.07	X	0.63	x	0.7	=	71.54	(75)
Northeast _{0.9x}	0.77	x	8.3	34	x	14.2	X	0.63	x	0.7	=	36.19	(75)
Northeast _{0.9x}	0.77	х	8.3	34	x	9.21	X	0.63	x	0.7	=	23.49	(75)
Southeast _{0.9x}	0.77	x	7.6	64	х :	36.79	X	0.63	X	0.7	=	85.91	(77)
Southeast _{0.9x}	0.77	x	7.6	64	X	62.67	X	0.63	X	0.7	=	146.34	(77)
Southeast 0.9x	0.77	x	7.6	64	x	85.75	X	0.63	x	0.7	=	200.22	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	06.25	x	0.63	x	0.7	_	248.09	(77)
Southeast _{0.9x}	0.77	X	7.6	64	x 1	19.01	x	0.63	x	0.7	_	277.88	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	18.15	x	0.63	x	0.7	=	275.87	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	13.91	x	0.63	x	0.7		265.96	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	04.39	x	0.63	x	0.7		243.74	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	92.85	x	0.63	x	0.7	-	216.8	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	69.27	x	0.63	x	0.7		161.73	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x .	44.07	x	0.63	x	0.7		102.9	(77)
Southeast _{0.9x}	0.77	×	7.6	64	х =	31.49	x	0.63	x	0.7	-	73.52	(77)
Solar gains in	watts, calcu	ulated	for eac	h month	,	1	(83)m	= Sum(74)m .	(82)m		ı	1	
(83)m= 114.67		05.69	421.29	510.7	524.08	498.16	428.	85 345.31	233.27	7 139.08	97.01		(83)
Total gains – i				<u> </u>	<u> </u>							1	
(84)m= 482.24	570.59 6	59.9	757.01	827.78	823.06	785.28	721.	34 647.21	553.86	481.15	455.04		(84)
7. Mean inter	nal tempera	ature ((heating	season)								
Temperature	during hea	ting p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac				ea, h1,m	(see Ta	able 9a)				_		1	
Jan		Mar	Apr	May	Jun	Jul	Αι		Oct	-	Dec		
(86)m= 0.99	0.99	0.96	0.88	0.73	0.53	0.39	0.4	4 0.7	0.93	0.99	1		(86)
Mean interna	l temperatu	ıre in I	iving are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)		_			
(87)m= 19.93	20.12 2	0.41	20.73	20.92	20.99	21	21	20.95	20.68	20.25	19.9		(87)
Temperature	during hea	ting p	eriods ir	n rest of	dwelling	g from Ta	able 9), Th2 (°C)					
(88)m= 19.98	19.98 1	9.99	20	20	20.01	20.01	20.0	20.01	20	20	19.99		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,m (s	ee Table	9a)	-	-	-	-		
(89)m= 0.99		0.95	0.85	0.67	0.45	0.3	0.3	5 0.61	0.9	0.98	0.99		(89)
Mean interna	l temperatu	ıre in t	the rest	of dwelli	ing T2 (f	follow ste	ene 3	to 7 in Tahl	P 9c)		Į.		
(90)m= 18.57		9.25	19.7	19.93	20.01	20.01	20.0		19.65	19.05	18.54		(90)
()	1 .									ring area ÷ (4	<u> </u>	0.38	(91)
										•			 ` ′
Mass ! - (4 a maio = = *	/f .		ا- مام	II:\ '	1 A . T4	. /4	41 A\ TO					
Mean interna	 	`				1	1 `		20.04	10.5	10.06	1	(02)
Mean interna (92)m= 19.09 Apply adjustr	19.34 1	9.69	20.09	20.31	20.38	20.39	20.3	39 20.35	20.04		19.06		(92)

			-								1			
` ′		19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06		(93)
8. Space														
Set Ti to the utilisa				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio					iviay	Juli	Jui	L	Зер	Oct	INOV	Dec		
	.99	0.98	0.95	0.86	0.69	0.48	0.33	0.38	0.64	0.9	0.98	0.99		(94)
Useful ga		mGm .	W = (94	I)m x (84	4)m			<u> </u>	l		<u> </u>			
	1	558.2	624.35	647.45	567.74	395.74	261.85	274.51	415.81	500.89	471.24	451.67		(95)
Monthly :	averag	e exte	rnal tem	perature	from Ta	able 8		!	!		<u> </u>			
(96)m= 4	1.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss	s rate f	or mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 106	65.09 1	036.14	943.75	788.38	604.7	400.4	262.39	275.56	435.18	663.3	876.26	1056.17		(97)
Space he	eating	require	ement fo	r each m	nonth, k\	Wh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 43	7.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
	-							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1987.06	(98)
Space he	eating	require	ement in	kWh/m²	/year								31.09	(99)
9a. Energ		•			•	veteme i	ncluding	micro-C	'HDI					
Space h			its — Iriui	viduai Ti	calling s	yatema n	ricidaling	i illicio-c) II <i>)</i>					
Fraction	_		t from se	econdar	//supple	mentarv	svstem						0	(201)
Fraction				-		,	-	(202) = 1	- (201) =				1	(202)
Fraction				•	. ,				02) × [1 –	(203)] =				(204)
				•				(201) – (2	02) X [1	(200)] -			1	╡゛゛
Efficienc		•											93.5	(206)
Efficienc	y of se	conda	ry/supple	ementar	y heating	g system	1, %						0	(208)
J	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space he	Ť		<u> </u>		d above)								
43	7.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
(211)m =	{[(98)n	n x (20	4)] } x 1	00 ÷ (20	6)			_						(211)
46	7.48	343.5	254.15	108.52	29.41	0	0	0	0	129.24	311.89	481.01		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u></u>	2125.2	(211)
Space he	eating	fuel (se	econdary	y), kWh/	month									
= {[(98 <u>)</u> m	x (201))] } x 1	00 ÷ (20	8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water hea	_													
Output fro								l	l		·	T 1		
		161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04		7,
Efficiency													79.8	(216)
· · ·		86.61	85.71	83.75	81.29	79.8	79.8	79.8	79.8	84.1	86.29	87.17		(217)
Fuel for w		•												
(219)m = 21		186.7	198.38	182.32	184.34	168.16	161.85	177.12	176.65	188.25	193.61	205.39		
(= : 2/				. 52.52		1 . 30.10	1		I = Sum(2		L	L	2233.4	(219)
Annual to	ntale								\-		Wh/year	, ,	kWh/year	
Space hea		ıel use	d, main	system	1					ĸ	y cai		2125.2	1
-	-			-									<u> </u>	_

					_
Water heating fuel used				2233.4	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	i)(230g) =		75	(231)
Electricity for lighting				287.67	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4721.27	(338)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	_				
	Energy kWh/year	Emission factoring the kg CO2/kWh		Emissions kg CO2/yea	
Space heating (main system 1)	3 7				
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar ¬
	kWh/year	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 459.04 0 482.41	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= =	kg CO2/yea 459.04 0 482.41 941.46	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.519	= = =	kg CO2/yea 459.04 0 482.41 941.46 38.93	(261) (263) (264) (265) (267)

TER =

(273)

17.67

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:07:04

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 60.34m²Site Reference:Highgate Road - GREENPlot Reference: 01 - I

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 18.05 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.55 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

45.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.8 kWh/m²

OK
2 Fabric U-values

Element Av

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Roof

Thermal bridging calculated from linear thermal transmittances for each junction

(no roof)

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	ок
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	4.7m ²	
Windows facing: South East	6.09m ²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar F	Details:												
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					010943 on: 1.0.5.50							
Address	Property Address: 01 - I Address:														
1. Overall dwelling dimensions:															
5		Are	a(m²)		Av. He	ight(m)		Volume(m	³)						
Ground floor		6	60.34	(1a) x	2	.65	(2a) =	159.9	(3a)						
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (60.34	(4)											
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	159.9	(5)						
2. Ventilation rate:															
	main seconda heating heating	ry	other		total			m³ per hou	ır						
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)						
Number of open flues	0 + 0	- + -	0	Ī - [0	x 2	20 =	0	(6b)						
Number of intermittent fa	ns				2	x ′	10 =	20	(7a)						
Number of passive vents				Ē	0	x ′	10 =	0	(7b)						
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)						
				L				_							
				_			Air ch	nanges per ho	our —						
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.13	(8)						
Number of storeys in the	een carried out or is intended, proceence one dwelling (ns)	ea 10 (17),	otrierwise	onunue ir	om (9) to ((16)		0	(9)						
Additional infiltration	3 ([(9)-	-1]x0.1 =	0	(10)						
	.25 for steel or timber frame o			•	uction			0	(11)						
if both types of wall are prideducting areas of openir	resent, use the value corresponding t	o the grea	ter wall are	a (after											
,	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)						
If no draught lobby, en	ter 0.05, else enter 0							0	(13)						
-	s and doors draught stripped							0	(14)						
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)						
Infiltration rate	250 averaged in autic mate		(8) + (10)					0	(16)						
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	•		•	etre or e	envelope	area	5	(17)						
•	s if a pressurisation test has been do				is being u	sed		0.38	(10)						
Number of sides sheltere	ed							0	(19)						
Shelter factor			(20) = 1 -		19)] =			1	(20)						
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.38	(21)						
Infiltration rate modified for	- 1 	1	1 .					1							
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec								
Monthly average wind sp	 	3.8	3.7		4.3	1.5	4.7	1							
(22)m= 5.1 5	4.9 4.4 4.3 3.8] 3.6	3.1	4	4.3	4.5	4.1	J							
Wind Factor (22a)m = (22	2)m ÷ 4							1							
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18								

Adjusted infiltr	ation rate (allow	ina for el	nelter an	d wind s	need) –	(21a) v	(22a)m					
0.48	0.47 0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44]	
	ctive air change	rate for t	he appli	cable ca	se		<u> </u>					
	al ventilation:					.=					0	(23a)
	eat pump using App) = (23a)			0	(23b)
	heat recovery: effi	-	_								0	(23c)
	d mechanical v	1		i	<u> </u>	- ^ ` ` - 	ŕ	<u> </u>	- 	- ` 	÷ 100] I	(245)
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24a)
· -	d mechanical v	1				- ^ ` 	ŕ	r `		Ι ο	l	(24h)
(24b)m= 0	0 0	0	0		0	0	0	0	0	0		(24b)
,	ouse extract ve $1 < 0.5 \times (23b)$,		•	•				5 v (23h	,)			
(24c)m = 0	0 0.5 x (2.55),	0	0	0	0	0	0	0	0	0		(24c)
(1)	ventilation or w	nole hous	e nositiv	/e input	ventilatio	n from l	oft.					, ,
,	n = 1, then (24d		•					0.5]				
(24d)m= 0.61	0.61 0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air	change rate - e	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)	-	-			
(25)m= 0.61	0.61 0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. Heat losse	s and heat loss	paramet	er:									
ELEMENT	Gross	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	9 ,	AXk
	area (m²)	· m		A ,r	n²	W/m2	!Κ	(W/I	<u>()</u>	kJ/m²-l	K	kJ/K
Windows Type	: 1			4.7	x1,	/[1/(1.4)+	0.04] =	6.23				(27)
Windows Type	2			6.09	x1,	/[1/(1.4)+	0.04] =	8.07				(27)
Windows Type	: 3			2.92	x1,	/[1/(1.4)+	0.04] =	3.87				(27)
Walls Type1	52.8	13.7	1	39.09	X	0.18	=	7.04				(29)
Walls Type2	27.31	0		27.31	X	0.18	=	4.92				(29)
Total area of e	lements, m ²			80.11								(31)
Party wall				16.88	3 X	0	=	0				(32)
Party floor				60.34								(32a)
Party ceiling				60.34					Ī		\neg	(32b)
Internal wall **				107.9	1				Ī		7 —	(32c)
	roof windows, use as on both sides of				ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	3.2	
Fabric heat los	ss, W/K = S (A >	(U)				(26)(30)) + (32) =				30.13	(33)
Heat capacity	$Cm = S(A \times k)$						((28).	(30) + (32	2) + (32a).	(32e) =	9938.59	(34)
Thermal mass	parameter (TM	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
ŭ	sments where the d ad of a detailed cal		construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L x Y) ca	lculated	using Ap	pendix l	<						7.3	(36)
	al bridging are not k	nown (36) =	= 0.05 x (3	11)								<u></u>
Total fabric he							(33) +	(36) =			37.43	(37)
Ventilation hea	nt loss calculate	1		1		1		= 0.33 × (1	1	
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

20)	32.18	31.95	30.87	30.67	29.73	29.73	29.56	20.4	30.67	31.08	24.54		(38)
38)m= 32.42	<u> </u>		30.67	30.67	29.73	29.73	29.56	30.1			31.51		(30)
Heat transfer 69.85	69.61	69.38	68.31	68.1	67.16	67.16	66.99	67.53	= (37) + (3 68.1	68.51	68.94		
00.00	05.01	05.50	00.01	00.1	07.10	07.10	00.55		Average =			68.3	(39)
leat loss para	ameter (H	HLP), W	m²K						= (39)m ÷				_ `
40)m= 1.16	1.15	1.15	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.14	1.14		_
Number of da	ve in mo	oth (Tob	lo 1a)					,	Average =	Sum(40) ₁	12 /12=	1.13	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
,													
4. Water hea	ting ene	av regui	rement:								kWh/ye	ear:	
+. Water fied	ung cho	gy roqui	rement.								KVVII/ y		
Assumed occ if TFA > 13.			[1 - ovn	(<u>-</u> 0 0003	2/0 v /TE	-Λ ₋ 13 Ω)2)1 ± 0 ()012 v /	Γ Ε Λ -13		.99		(42)
if TFA £ 13.		+ 1.70 X	[i - exp	(-0.0003	949 X (17	- H - 13.9)2)] + 0.() X C 1 O.	IFA - 13.	9)			
Annual averaç											.49		(43
Reduce the annu not more that 125	_				_	_	to achieve	a water us	se target o	f			
	· · ·	·				<u> </u>	Λ	Con	0-4	Nav	Daa		
Jan lot water usage	Feb in litres per	Mar dav for ea	Apr ach month	May <i>Vd.m</i> = fa	Jun ctor from 7	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
14)m= 89.64	86.38	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64		
H4)III= 03.04	00.30	03.12	79.00	70.0	73.34	73.54	70.0		Total = Su		<u> </u>	977.9	(44
nergy content o	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			· /		011.0	
45)m= 132.93	116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74		
									Γotal = Su	m(45) ₁₁₂ =	=	1282.18	(45
instantaneous v	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)				1	_
19.94	17.44	18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31		(46
Vater storage Storage volun		includin	na anv eo	olar or M	/\//HRS	storana	within sa	ma vas	امء		450		(47
community I	` ,		•			Ū		iiiie ves	361		150		(47
Otherwise if n	_			-			. ,	ers) ente	er '0' in (47)			
Vater storage			`					,	`	,			
a) If manufac	turer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(48
emperature	actor fro	m Table	2b							0.	.54		(49
inergy lost fro		_	-				(48) x (49)	=		0.	.75		(50
o) If manufac lot water stor			-								0		(51
community I	-			C Z (KVV	11/11116/06	iy <i>)</i>					0		(3)
olume factor	•										0		(52
emperature	actor fro	m Table	2b								0		(53
nergy lost fro	om water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54
Enter (50) or	(54) in (5	55)								0.	.75		(55
Vater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
	1	00.00		00.00	22.50	23.33	23.33	22.58	23.33	22.58	23.33		(56
56)m= 23.33	21.07	23.33	22.58	23.33	22.58								•
cylinder contain												ix H	•

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder	er thermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51	23.26 22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0	0 0 0 (61)
Total heat required for water heating calculated for each month (62)m = 0.85 x	(45)m + (46)m + (57)m + (59)m + (61)m
(62)m= 179.53 158.35 166.57 149.69 146.96 131.7 126.85 138.69 138.28	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar	ar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	3,
(63)m= 0 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
(64)m= 179.53 158.35 166.57 149.69 146.96 131.7 126.85 138.69 138.28	155.2 163.64 175.34
	vater heater (annual) ₁₁₂ 1830.8 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8	
(65)m= 81.48 72.33 77.17 70.85 70.65 64.87 63.96 67.9 67.06	73.39 75.49 80.08 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot v	water is from community neating
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= 99.56 99.56 99.56 99.56 99.56 99.56 99.56 99.56	99.56 99.56 99.56 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 15.49 13.76 11.19 8.47 6.33 5.35 5.78 7.51 10.08	12.8 14.94 15.93 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Ta	able 5
(68)m= 173.8 175.61 171.06 161.39 149.17 137.69 130.03 128.22 132.77	142.44 154.66 166.13 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table	e 5
(69)m= 32.96 32.96 32.96 32.96 32.96 32.96 32.96 32.96 32.96	32.96 32.96 (69)
Pumps and fans gains (Table 5a)	· · · · · · · · · · · · · · · · · · ·
(70)m= 3 3 3 3 3 3 3 3 3 3	3 3 3 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -79.65 -79.65 -79.65 -79.65 -79.65 -79.65 -79.65 -79.65	-79.65 -79.65 -79.65 (71)
Water heating gains (Table 5)	
(72)m= 109.51 107.63 103.72 98.41 94.96 90.1 85.97 91.26 93.14	98.64 104.85 107.64 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m +$	
(73)m= 354.68 352.87 341.84 324.13 306.33 289.01 277.64 282.86 291.85	
6. Solar gains:	000.70 000.01 040.01
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to t	the applicable orientation.
Orientation: Access Factor Area Flux g_	FF Gains
Table 6d m ² Table 6a Table 6b	
Southeast 0.9x 0.77 x 6.09 x 36.79 x 0.63	× 0.7 = 68.48 (77)
Southeast 0.9x 0.77 x 6.09 x 62.67 x 0.63	× 0.7 = 116.65 (77)
0.05	. 0.7 - 110.00 (11)

CHINSAIION PACTA	പാവ വഷി	ns ior II	iving area, N	1,111 (8	see ra	NIE 281							
•	Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a)												
7. Mean intern	7. Mean internal temperature (heating season)												
(84)m= 486.08	580.03	661.54	735.15 780	.29	765.52	734.56	691.	91 643.03	563.21	488.31	457.62]	(84)
Total gains – int	ernal an	d solar	(84)m = (73))m + ((83)m	, watts	· · · · ·	ı		1	I	1	
T		319.7	411.01 473		476.51	456.92	409.		253.46	157.99	112.06]	(83)
Solar gains in w	atte colo	aulatad	for each ma	nth			(83)m	= Sum(74)m .	(82)m				
Northwest _{0.9x}	0.77	X	2.92	X	(9.21	x	0.63	x [0.7	=	8.22	(81)
Northwest 0.9x	0.77	X	2.92	X		14.2	x	0.63	x [0.7	=	12.67	(81)
Northwest _{0.9x}	0.77	X	2.92	×	2	8.07	x	0.63	x [0.7	=	25.05	(81)
Northwest 0.9x	0.77	X	2.92	X	5	0.42	x	0.63	x [0.7	=	44.99	(81)
Northwest 0.9x	0.77	X	2.92	X	7	2.63	x	0.63	x [0.7	=	64.81	(81)
Northwest 0.9x	0.77	x	2.92	X	(91.1	x	0.63	x [0.7	=	81.3	(81)
Northwest _{0.9x}	0.77	x	2.92	X	9	7.38	x	0.63	× [0.7		86.9	(81)
Northwest _{0.9x}	0.77	x	2.92	x	9	1.35	х	0.63	x [0.7		81.52	(81)
Northwest _{0.9x}	0.77	x	2.92	×	6	7.96	x	0.63	x [0.7	=	60.64	(81)
Northwest _{0.9x}	0.77	x	2.92	×	4	1.38	x	0.63	x	0.7		36.93	(81)
Northwest _{0.9x}	0.77	x	2.92	×	2	2.97	x	0.63	x [0.7	=	20.5	(81)
Northwest _{0.9x}	0.77	x	2.92	×	1	1.28	х	0.63	x [0.7	=	10.07	(81)
Southwest _{0.9x}	0.77	x	4.7	T x	3	1.49		0.63	x	0.7		45.23	(79)
Southwest _{0.9x}	0.77	x	4.7	i x		4.07		0.63	_ x [0.7		63.3	(79)
Southwest _{0.9x}	0.77	x	4.7	X		9.27		0.63	x [0.7	=	99.49	(79)
Southwest _{0.9x}	0.77	x	4.7	x		2.85		0.63	x [0.7		133.37	(79)
Southwest _{0.9x}	0.77	x	4.7	×		04.39	,	0.63	x [0.7	= =	149.94	(79)
Southwest _{0.9x}	0.77	×	4.7	^ x		13.91	, l [0.63	^ L x [0.7	= =	163.62	(79)
Southwest _{0.9x}	0.77	= x	4.7	^ x		18.15	ı l [0.63	^ L x [0.7	= =	169.71	(79)
Southwest _{0.9x}	0.77	×	4.7	^ x		19.01	ı l [0.63	^ L x [0.7	=	170.94	(79)
Southwest _{0.9x}	0.77	$=$ $\frac{1}{x}$	4.7	$\frac{1}{x}$		06.25	ı l [0.63	^ L x [0.7	= -	152.62	(79)
Southwest _{0.9x}	0.77	→ x	4.7	┤ ^ ╴		5.75	, l [0.63	_ ^ L 	0.7	╡ -	123.17	(79)
Southwest _{0.9x}	0.77	X x	4.7	→ × → ×		6.79 2.67	ı l [0.63		0.7		52.85 90.02	(79)
Southwest _{0.9x}	0.77	×	6.09	→ ↓		1.49	×	0.63		0.7	=	58.6	(77) (79)
Southeast 0.9x	0.77	×	6.09	→ ↓		4.07		0.63	_	0.7	╡ -	82.02	$\frac{1}{1}$
Southeast 0.9x	0.77	×	6.09	→ ↓		9.27	X _V	0.63	_	0.7	_ = _	128.92	$=$ $\frac{(77)}{(77)}$
Southeast 0.9x	0.77	= ×	6.09	→ ↓		2.85		0.63	_	0.7	╡ :	172.81	$=$ $\frac{(77)}{(77)}$
Southeast 0.9x	0.77	×	6.09	→ ↓		04.39	x	0.63	_	0.7	╡ :	194.29	$\frac{1}{1}$
Southeast 0.9x	0.77	×	6.09	→ ↓		13.91	X	0.63	_	0.7	_ = -	212.01	$\frac{1}{1}$
Southeast 0.9x	0.77	x	6.09	X		18.15	X	0.63		0.7	=	219.9	$= \begin{pmatrix} (77) \\ (77) \end{pmatrix}$
Southeast 0.9x	0.77	X	6.09	X		19.01	X	0.63		0.7	_ =	221.5	(77)
Southeast 0.9x	0.77	X	6.09	→ ×		06.25	X	0.63	×	0.7	_ =	197.75	(77)
Southeast 0.9x	0.77	X	6.09	X		5.75	X	0.63		0.7	=	159.6	(77)

(86)m=	0.99	0.98	0.95	0.88	0.74	0.55	0.4	0.44	0.68	0.92	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				ı	
(87)m=	19.94	20.14	20.42	20.72	20.91	20.98	21	21	20.96	20.7	20.26	19.9		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)			•	I	
(88)m=	19.95	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.99	19.98	19.97	19.97		(88)
	tion for	tor for a	oine for	root of d	u allin a	h2 m /oc	L Toblo	00)						
(89)m=	0.99	0.98	0.94	0.85	0.68	0.47	0.31	0.35	0.6	0.88	0.98	0.99		(89)
						<u> </u>	l			<u> </u>	0.00	0.00		()
			r	r		- ` `	r	eps 3 to			40.05	40.50		(00)
(90)m=	18.56	18.86	19.25	19.67	19.9	19.98	19.99	19.99	19.95	19.66	19.05 g area ÷ (4	18.52	0.44	(90)
									!	LA = LIVII	g area - (4	4) =	0.44	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2				-	
(92)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate			1	
(93)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut		l	r –	using Ta				 			·		I	
1.14.11	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.7			T	T				I	(04)
(94)m=	0.99	0.97	0.94	0.85	0.7	0.5	0.35	0.39	0.63	0.89	0.97	0.99		(94)
				4)m x (84		005.40	050.00	000.44	100.50	500.0	475.70	450.00	I	(OE)
(95)m=	480.21	564.23	620.58	627.23	547	385.18	256.89	269.11	406.58	500.6	475.73	453.36		(95)
			i	perature		i	16.6	16.4	144	10.6	7.1	4.2	Ī	(96)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(90)
		1011.35	920.55	767.42	588.89	· ·	=[(39)fff . 257.65	x [(93)m	- (96)m 425.27	648.19	855.43	1029.57	l	(97)
(97)m=		ļ	ļ	<u> </u>		391.27		270.39		<u> </u>		1029.57	l	(31)
-	415.5	300.46	223.18	100.94	31.17	0	$\ln = 0.02$	24 x [(97])m – (95 0	109.81	273.39	428.7	1	
(98)m=	415.5	300.46	223.10	100.94	31.17	0							1000 11	7(00)
								rota	ıl per year	(kwn/yeai	r) = Sum(9	8)15,912 =	1883.14	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								31.21	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												_
Fracti	on of sp	ace hea	nt from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	t from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	∟ .ar
Snace				alculate			Jui	<u> </u> Aug	Гоер	001	1100	Dec	, KWII/ye	aı
Орас	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7		
(211)		<u> </u>	<u> </u>				<u> </u>			L	I		l	(244)
(211)	1 = {[(98 444.39)m x (20 321.35	238.69	00 ÷ (20	33.33	0	0	0	0	117.44	292.39	458.5		(211)
	777.08	021.00	230.08	107.80	00.00	L "	<u> </u>		l (kWh/yea				2014.05	(211)
								1010	(,(1	- 15,1012	2	2014.05	(211)

Space heating fuel (secondary), kWh/mon	th								
= {[(98)m x (201)]} x 100 \div (208)					_				
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_
			Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating									
Output from water heater (calculated above 179.53 158.35 166.57 149.69 146		126.85	138.69	138.28	155.2	163.64	175.34		
Efficiency of water heater		0.00	.00.00	.00.20				79.8	(216)
(217)m= 86.98 86.5 85.59 83.79 81.4	49 79.8	79.8	79.8	79.8	83.91	86.17	87.11		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								l.	
(219)m= 206.4 183.07 194.6 178.65 180.	35 165.04	158.96	173.79	173.29	184.96	189.9	201.28		
	•	•	Tota	I = Sum(2	19a) ₁₁₂ =			2190.29	(219)
Annual totals					k\	Wh/year	•	kWh/year	- -
Space heating fuel used, main system 1								2014.05	
Water heating fuel used								2190.29	
Electricity for pumps, fans and electric keep	-hot								
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								273.64	(232)
Total delivered energy for all uses (211)(2	21) + (231)	+ (232).	(237b)	=				4552.98	(338)
12a. CO2 emissions – Individual heating s	ystems incl	uding mi	cro-CHP)					
		ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(21	1) x			0.2	16	=	435.03	(261)
Space heating (secondary)	(21	5) x			0.5	19	=	0	(263)
Water heating	(21	9) x			0.2	16	=	473.1	(264)
Space and water heating	(26	1) + (262)	+ (263) + (264) =				908.14	(265)
Electricity for pumps, fans and electric keep	-hot (23	1) x			0.5	19	=	38.93	(267)
Electricity for lighting	(23	2) x			0.5	19	=	142.02	(268)
Total CO2, kg/year				sum o	f (265)(2	271) =		1089.08	(272)
							·		_

TER =

(273)

18.05

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:06:47*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 48.96m²

Site Reference: Highgate Road - GREEN

Plot Reference: 02 - A

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

19.27 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

16.43 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.5 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.17 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	5.45m ²	
Windows facing: South East	6.09m ²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

			Jser D	otaile:										
Access on Names	Assessor Name: Neil Ingham Stroma Number: STRO0													
Assessor Name: Software Name:	Stroma FSAP 2012	2		Softwa					on: 1.0.5.50					
Continui o Humo.	5.15.11.12.1 57.11 25.12			Address:		OlOII.		7 0 10 10	711 11010100					
Address :														
1. Overall dwelling dimensions: Area(m²) Av. Height(m) Volume(m³)														
Ground floor				<u> </u>	(10) v			(2a) =	Volume(m³) (3a)				
	-) . (4 -) . (4 -) . (4 -) . (4 -)	(4.5)			(1a) x		65	(2a) =	129.74	(Sa)				
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e))+(1II)	4	8.96	(4)	. (0.) (0	I) (O)	(0.)		_				
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	129.74	(5)				
2. Ventilation rate:	main se	condary		other		total			m³ per hou	r				
Number of allipsychia	heating he	eating	+ [1 _ [40 =		_				
Number of chimneys		0		0] = [0			0	(6a)				
Number of open flues	0 +	0	+	0] = [0		20 =	0	(6b)				
Number of intermittent fa					L	2		10 =	20	(7a)				
Number of passive vents	;					0	X '	10 =	0	(7b)				
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)				
								Air ch	nanges per ho	our				
Infiltration due to chimne	vs_flues and fans = (6a	ı)+(6b)+(7a)-	+(7b)+(7	7c) =	Г	20		÷ (5) =	0.15	(8)				
	peen carried out or is intended				ontinue fr			. (0) –	0.13					
Number of storeys in the	he dwelling (ns)								0	(9)				
Additional infiltration							[(9)	-1]x0.1 =	0	(10)				
	.25 for steel or timber for resent, use the value corresp				•	uction			0	(11)				
deducting areas of openii		oriding to tri	ie great	er wan area	a (aner									
If suspended wooden t	floor, enter 0.2 (unseale	ed) or 0.1	(seale	ed), else	enter 0				0	(12)				
If no draught lobby, en	ter 0.05, else enter 0								0	(13)				
ŭ	s and doors draught str	ripped							0	(14)				
Window infiltration				0.25 - [0.2		_			0	(15)				
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)				
•	q50, expressed in cubi	•	•	•	•	etre of e	envelope	area	5	(17)				
If based on air permeabil	es if a pressurisation test has					is heina u	sad		0.4	(18)				
Number of sides sheltere		been done (or a deg	jiee ali pei	теаышу	is being u	seu		0	(19)				
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			1	(20)				
Infiltration rate incorporat	ting shelter factor			(21) = (18)	x (20) =				0.4	(21)				
Infiltration rate modified f	or monthly wind speed							!		_				
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind sp	eed from Table 7													
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7						
Wind Factor (22a)m = (2	2)m ∸ 4													
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]					
` '									J					

Adjusted infiltra	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.52	0.51	0.5	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47]	
Calculate effec		_	rate for t	he appli	cable ca	se							
If mechanica												0	(23a)
If exhaust air he) = (23a)			0	(23b)
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance						- ` ` 	- 	ŕ	- 	` 	' ' ') ÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance			ntilation	without	heat rec	overy (N	ЛV) (24b	m = (22)	 	- 		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole he				•	-				.5 × (23k	o)	_	_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.5]				
(24d)m= 0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	-	
(25)m= 0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25)
3. Heat losses	s and he	eat loss r	naramete	ōt.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k J/K
Windows Type		,			5.45		/[1/(1.4)+	0.04] =	7.23	<u></u>			(27)
Windows Type	2				6.09	x ₁ ,	/[1/(1.4)+	0.04] =	8.07				(27)
Walls Type1	35.3	3	11.54	4	23.76		0.18		4.28	=			(29)
Walls Type2	35.9		0		35.99	=	0.18	_	6.48			-	(29)
Total area of e					71.29	=	00		00				(31)
Party wall		,			14.89	=	0	- - □	0	[$\neg \Box$	(32)
Party floor					48.96	=						= =	(32a)
Party ceiling					48.96	=]		╡	(32b)
Internal wall **						=				l T		_	= '
* for windows and		owe use e	ffective wi	ndow H-vs	96.46		ı formula 1	/[(1/ ₋ val	د 0.41 (مرامر	es aiven in	naragrant		(32c)
** include the area						atou uomg	normala 1	/[(10) 10.0-1] (ao givoir iii	paragrapi	7 0.2	
Fabric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				26.05	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	8550.39	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used instead				constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						6.09	(36)
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	· (36) =			32.15	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 27.09	26.87	26.65	25.64	25.45	24.56	24.56	24.4	24.9	25.45	25.83	26.24		(38)
Heat transfer of	oefficier	nt, W/K						(39)m	= (37) + (38)m		_	
(39)m= 59.24	59.02	58.8	57.79	57.6	56.71	56.71	56.55	57.05	57.6	57.98	58.38]	
Stroma FSAP 201	2 Version:	: 1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com	-		Average =	Sum(39)	12 /12=	57.7β _{ag}	e 2 of ³⁹)

(40) (41) (41) (42) (1.21 1.21 1.2 1.18 1.18 1.18 1.16 1.16 1.16 1.15 1.17 1.18 1.18 1.19 (40) (41)	Heat loss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
Number of days in month (Table 1a)		<u> </u>	· ·		1.18	1.16	1.16	1.15	1.17	1.18	1.18	1.19		
A. Water heating energy requirement: XWhiyear:			!		!	!	!	!		Average =	Sum(40) ₁	12 /12=	1.18	(40)
### Assumed occupancy, N ### ITFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) ### ITFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) ### ITFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) ### ITFA > 13.9, N = 1 ### Annual average hot water usage in litters per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litters per day Vd.average = (25 x N) + 36 ### Annual average hot water usage by 5% if the dwelting is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) ### Annual average hot water usage by 5% if the dwelting is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) ### Annual average in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage to water use, hot and cold) ### Item vater usage in litres per day for each month Vd.m = factor from Table 1c x (43) ### Annual average in litres per day for each month Vd.m = factor from Table 1c x (43) ### Annual average in litres per day Vd.average in Table 1c x (43) ### Annual average in litres per day Vd.average in Table 1c x (44) ### Bo.98			· `		·	 								
### Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water used processes and pro				<u> </u>	<u> </u>	-	-	Ť		-	+			(44)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43) (44)ms 80.98 78.03 75.09 72.14 69.2 66.25 66.25 69.2 72.14 75.09 78.03 80.98 Total = Sum(44)s = 883.37 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kW/minch (see Tables 1b, 1c, 1d) (45)ms 120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 46)ms 18.01 15.75 16.26 14.17 13.6 11.74 10.87 12.48 12.63 14.72 16.06 17.44 (46) Water Storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Temperature factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2b 0.075 (50) Water storage loss calculated for each month ((56)m = (55) x (41)m (55) (50) (53) Water storage loss calculated for each month ((56)m = (55)m x (41)m (56)m = (56)m x (57)m =	(41)m= 31	20	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water usa, bot and cold) 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) (44)ms 80.98 78.03 75.09 72.14 69.2 66.25 66.25 69.2 72.14 75.09 78.03 80.98 Total = Sum(44) ₁₋₁₀ = 80.34 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (45)ms 120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)ms 18.01 15.75 16.26 14.17 13.6 11.74 10.87 12.48 12.63 14.72 16.06 17.44 (46) Water Storage Volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Temperature factor from Table 2b 0.54 (9) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) (50) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss (actor from Table 2b 0.0.75 (50) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)m = (56)m x (61)m =														
if TFA ≥ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)z)] + 0.0013 x (TFA -13.9) if TFA ≥ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		66		(42)
Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43) (44)m= 80.98 78.03 75.09 72.14 69.2 66.25 66.25 69.2 72.14 75.09 78.03 80.98 Total = Sum(44) = 883.37 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 18.01 15.75 16.26 14.17 13.6 11.74 10.87 12.48 12.63 14.72 16.06 17.44 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Temperature factor from Table 2b (50) (60) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2b 0 (52) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (52) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55) Water storage loss calculated for each month ((56)m = (55) x (41)m)	Reduce the annua	ıl average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.61		(43)
(44)m= 80.98 78.03 75.09 72.14 69.2 66.25 66.25 69.2 72.14 75.09 78.03 80.98 Total = Sum(44)12 = 883.37 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 Total = Sum(45)12 = 1158.23 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 18.01 15.75 16.26 14.17 13.6 11.74 10.87 12.48 12.63 14.72 16.06 17.44 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 b 0.554 0.075 (50) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) Community heating see section 4.3 Volume factor from Table 2a 0.0 (52) Temperature factor from Table 2b 0.0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55) Water storage loss calculated for each month (56)m = (55) x (41)m (56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Total = Sum(44)	Hot water usage in	n litres per	r day for ea		Vd,m = fa	ctor from	Table 1c x							
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 Total = Sum(45)	(44)m= 80.98	78.03	75.09	72.14	69.2	66.25	66.25	69.2	72.14	75.09	78.03	80.98		
120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 Total = Sum(45)u =	Energy content of	hot water	used cal	culated m	onthly – 1	100 v Vd i	n v nm v [Tm / 2600			. ,	L	883.37	(44)
Total = Sum(45) v = 1158.23 (45)												· ·		
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)111= 120.06	105.05	100.30	94.49	90.00	10.23	72.5	03.19			<u> </u>	l	1158 23	(45)
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Temperature factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (48) × (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m = (55) × (41)m (56)m = 23.33	If instantaneous w	ater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		rotar – ou	III(40) 112 -		1130.23	()
Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)	(46)m= 18.01	15.75	16.26	14.17	13.6	11.74	10.87	12.48	12.63	14.72	16.06	17.44		(46)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year If community heating see section 4.3 Volume factor from Table 2b Energy lost from water storage, kWh/year If community heating see section 4.3 Volume factor from Table 2b Energy lost from water storage, kWh/year If community heating see section 4.3 Volume factor from Table 2b Energy lost from water storage, kWh/year If community heating see section 4.3 (52) Energy lost from water storage, kWh/year If community heating see section 4.3 (53) Energy lost from water storage, kWh/year If community heating see section 4.3 (54) Energy lost from Table 2b If community heating see section 4.3 (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m = (23.33) 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m × [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	_								•					
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 0.54 (49) Energy lost from water storage, kWh/year (48) × (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (23.33) 21.07 23.33 22.58 23.33 22.58 23.33 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m × [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	_	, ,					_		ame ves	sei		150		(47)
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) b) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 23.33 22.58 23.33	•	_			-			, ,	ers) ente	er '0' in <i>(</i>	(47)			
Temperature factor from Table 2b				(, ,			
Energy lost from water storage, kWh/year (48) × (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m × [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	a) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] \div (50), else (57)m = (56)m where (H11) is from Appendix H	Temperature fa	actor fro	m Table	2b							0.	54		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = $\begin{bmatrix} 23.33 \\ 21.07 \\ 23.33 \end{bmatrix}$ 21.07 23.33 22.58 23.33 22.58 23.33 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] \div (50), else (57)m = (56)m where (H11) is from Appendix H	0,		•					(48) x (49)) =		0.	75		(50)
If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0 (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ $(56)m = (23.33) \times (21.07) \times (23.33) \times (22.58) \times (23.33) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times (23.28) \times ($	•			-								0		(51)
Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where (H11) is from Appendix H		-			_ (, ,	-7/					0		(0.)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where (H11) is from Appendix H												0		(52)
Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where (H11) is from Appendix H	Temperature fa	actor fro	m Table	2b								0		(53)
Water storage loss calculated for each month $((56)m = (55) \times (41)m$ $(56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)$ If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m \times (H11)$ is from Appendix H	••		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-			
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	` , ,	, ,	,					//EC\ /	(FF) (44).		0.	75		(55)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H								. , ,	1	ı				(50)
	` '												v H	(56)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$													X11	(57)
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)	(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33		<u> </u>		. ,
Primary circuit loss (annual) from Table 3 O (58)	•	•	•			E0\	(EO) - 00	SE /44\				0		(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	•				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59)	· ·								<u> </u>		' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' 	23.26		(59)

Combi loss	ooloulotod	for oach	month ((61)m –	(60) · 2(SE (41	\m						
Combi loss (61)m= 0	0 0	0	0	0	00) + 3	05 x (41)	0	0	0	0	0		(61)
				<u> </u>			ļ	<u> </u>			<u> </u>	(59)m + (61)m	` ,
(62)m= 166.6		154.97	139.58	137.26	123.33	119.09	129.78		144.7	152.18	162.89		(62)
Solar DHW inp	ut calculated	using App	endix G oı	Appendix	H (negati	ve quantity	y) (enter	'0' if no sola	r contribut	tion to wate	r heating)	<u> </u>	
(add additio											σ,		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter		-		-			-	-	-		
(64)m= 166.6	8 147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89		_
							Οι	tput from w	ater heate	r (annual)	12	1706.85	(64)
Heat gains t	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 77.2	68.59	73.31	67.49	67.42	62.09	61.38	64.94	64.06	69.9	71.68	75.94		(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic g	ains (Table	e 5), Wat	ts									_	
Jai	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 82.9	8 82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 12.8	9 11.44	9.31	7.05	5.27	4.45	4.8	6.25	8.38	10.64	12.42	13.24		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5		-	•	
(68)m= 144.5	146.03	142.25	134.21	124.05	114.51	108.13	106.63	110.41	118.45	128.61	138.16		(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	-	-		
(69)m= 31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3		(69)
Pumps and	fans gains	(Table 5	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (nega	tive valu	es) (Tab	le 5)								
(71)m= -66.3	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38		(71)
Water heati	ng gains (1	able 5)		-		-					-		
(72)m= 103.7	77 102.07	98.54	93.74	90.62	86.23	82.5	87.28	88.98	93.95	99.56	102.08		(72)
Total interr	al gains =	•			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m		
(73)m= 312.0	08 310.44	300.99	285.88	270.83	256.08	246.33	251.05	258.66	273.94	291.48	304.37		(73)
6. Solar ga													
Solar gains a		_	r flux from	Table 6a			ations to	convert to the	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ix ble 6a		g_ Table 6b	т	FF able 6c		Gains	
					ı a	DIE Ga	, –	Table ob	_ '	able oc		(W)	,
Southeast 0.9		X	6.0)9	X 3	36.79	X	0.63	x	0.7	=	68.48	<u> </u> (77)
Southeast 0.9	-	X	6.0)9	x 6	62.67	X	0.63	x	0.7	_ =	116.65	(77)
Southeast 0.9	0.77	X	6.0)9	X 8	35.75	X	0.63	x	0.7	=	159.6	(77)
Southeast 0.9		X	6.0)9	x 1	06.25	X	0.63	x	0.7	=	197.75	(77)
Southeast 0.9	× 0.77	X	6.0	9	x 1	19.01	X	0.63	x	0.7	=	221.5	(77)

r							-		_				_
Southeast _{0.9x}	0.77	X	6.0)9	x	118.15	X	0.63	X	0.7	=	219.9	(77)
Southeast _{0.9x}	0.77	X	6.0)9	x	113.91	X	0.63	X	0.7	=	212.01	(77)
Southeast _{0.9x}	0.77	X	6.0)9	x	104.39	X	0.63	X	0.7	=	194.29	(77)
Southeast 0.9x	0.77	X	6.0)9	X	92.85	X	0.63	X	0.7	=	172.81	(77)
Southeast _{0.9x}	0.77	X	6.0)9	x	69.27	X	0.63	x	0.7	=	128.92	(77)
Southeast _{0.9x}	0.77	X	6.0)9	x	44.07	x	0.63	X	0.7	=	82.02	(77)
Southeast _{0.9x}	0.77	X	6.0)9	x	31.49	x	0.63	x	0.7	=	58.6	(77)
Southwest _{0.9x}	0.77	X	5.4	15	X	36.79		0.63	X	0.7	=	61.28	(79)
Southwest _{0.9x}	0.77	X	5.4	15	X	62.67		0.63	X	0.7	=	104.39	(79)
Southwest _{0.9x}	0.77	X	5.4	1 5	x	85.75		0.63	x	0.7	=	142.83	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	106.25]	0.63	x	0.7	=	176.97	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	119.01]	0.63	x	0.7	=	198.22	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	118.15]	0.63	x	0.7	=	196.79	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	113.91	Ī	0.63	x	0.7	_ =	189.73	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	104.39	ĺ	0.63	x	0.7	=	173.87	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	92.85	ĺ	0.63	x	0.7	=	154.65	(79)
Southwest _{0.9x}	0.77	x	5.4	ļ5	x	69.27	ĺ	0.63	x	0.7	=	115.37	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	44.07	ĺ	0.63	x	0.7	=	73.4	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	31.49	ĺ	0.63	x	0.7	=	52.45	(79)
Solar gains in (83)m= 129.76 Total gains – i	221.04 3	302.43	374.73	419.72	416.		(83)m 368	n = Sum(74)m . .16 327.47	(82)m 244.29	9 155.43	111.05		(83)
(84)m= 441.84	531.47	603.42	660.61	690.55	672.	.76 648.06	619		E40 0	146.01	445 40	1	
7. Mean inter	nal temper												
7. Mean internal temperature (heating season)													(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a)													(84)
•	during hea	ating p	eriods ir	n the livi	ng ar				516.2	3 440.91	415.42	21	_
•	during hea	ating p	eriods ir	n the livi	ng ar	Table 9a)	ole 9		Oct		Dec	21	_
Utilisation fac	during hea ctor for gair Feb	ating p	eriods ir iving are	n the livi	ng ard	Table 9a) un Jul	ole 9	, Th1 (°C)				21	_
Utilisation fac	during heat ctor for gain Feb	ating p ns for I Mar 0.94	eriods ir iving are Apr 0.85	n the living the hand	ng ard (see Ju	Table 9a) un Jul un 0.38	ole 9	, Th1 (°C) ug Sep	Oct	Nov	Dec	21	(85)
Utilisation fac	during heater for gair Feb 0.97 temperate	ating p ns for I Mar 0.94	eriods ir iving are Apr 0.85	n the living the hand	ng ard (see Ju	Table 9a) un Jul us 0.38 steps 3 to 7	ole 9	Table 9c)	Oct	Nov 0.97	Dec	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean internation (87)m= 19.95	during heater for gair Feb 0.97 temperate 20.18	ating p ns for I Mar 0.94 ure in I 20.45	eriods ir iving are Apr 0.85 living are 20.74	n the livingea, h1,m May 0.71 ea T1 (for 20.92	y (see Ju 0.5)	e Table 9a) un Jul 3 0.38 steps 3 to 7	ole 9 A 0.4 7 in T	Sep 12 0.64 Table 9c)	Oct: 0.89	Nov 0.97	Dec 0.99	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean internal	during heater for gair Feb 0.97 It temperate 20.18	ating p ns for I Mar 0.94 ure in I 20.45	eriods ir iving are Apr 0.85 living are 20.74	n the livingea, h1,m May 0.71 ea T1 (for 20.92	y (see Ju 0.5)	e Table 9a) un Jul 3 0.38 steps 3 to 7 98 21 ling from Ta	ole 9 A 0.4 7 in T	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C)	Oct: 0.89	Nov 0.97 20.29	Dec 0.99	21	(85)
Utilisation factors Jan (86)m= 0.99 Mean internation (87)m= 19.95 Temperature (88)m= 19.91	during heater for gair Feb 0.97 ltemperate 20.18 ctollars during heater 19.92	ns for I Mar 0.94 ure in I 20.45 ating p 19.92	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94	mathe living the hand may 0.71 the a T1 (for 20.92 the rest of 19.94	ng ard (see Ju 0.5)	e Table 9a) un Jul 3 0.38 steps 3 to 7 98 21 ling from Ta 95 19.95	A 0.47 in T 2 able 9	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C)	Oct 0.89	Nov 0.97 20.29	Dec 0.99	21	(85) (86) (87)
Utilisation factors Jan	during heater for gair Feb 0.97 Itemperate 20.18 during heater for gair	ns for I Mar 0.94 ure in I 20.45 ating p 19.92 ns for r	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94	n the living the sea, h1,mm May 0.71 ea T1 (for 20.92 n rest of 19.94 welling,	ng ard (see Ju 0.5) ollow 20.9 dwell 19.9 h2,m	e Table 9a) un Jul 3 0.38 steps 3 to 7 98 21 ling from Ta 95 19.95 (see Table	ole 9 A 0.4 7 in T 2 able 9 19.	Sep 12 0.64 Table 9c) 1 20.96 1 20.96 1 19.95	Oct 0.89 20.73	Nov 0.97 20.29	Dec 0.99 19.92	21	(85) (86) (87)
Utilisation factors Jan (86)m= 0.99 Mean internal (87)m= 19.95 Temperature (88)m= 19.91 Utilisation factors (89)m= 0.99	during heater for gair Feb 0.97 ltemperate 20.18 20.18 19.92 etor for gair 0.96	ns for I Mar 0.94 ure in I 20.45 ating p 19.92 ns for r 0.92	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of do	m the living the sea, h1,mm and may 0.71 the sea T1 (for 20.92 the rest of 19.94 the sea T1 (sea T1) and s	(see Ju 0.5) collow 20.5 dwell 19.5 h2,m 0.4	e Table 9a) un Jul 3 0.38 steps 3 to 7 98 21 ling from Ta 95 19.95 (see Table 5 0.29	Dole 9 A 0.4 7 in T 2 Able 9 19. 9a) 0.3	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95	Oct 0.89 20.73 19.94 0.85	Nov 0.97 20.29	Dec 0.99	21	(85) (86) (87) (88)
Utilisation factors (86)m= 0.99 Mean internation (87)m= 19.95 Temperature (88)m= 19.91 Utilisation factors (89)m= 0.99 Mean internation factors (89)m= 0.99	during heater for gair Feb 0.97 ltemperate 20.18 ctor for gair 0.96 ltemperate 19.92 ctor for gair 0.96 ltemperate	ns for I Mar 0.94 ure in I 20.45 ating p 19.92 ns for r 0.92 ure in t	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of de 0.82 the rest	n the living the hand the living the hand the ha	dwell 19.5 h2,m 0.4	e Table 9a) un Jul 3 0.38 steps 3 to 7 98 21 ling from Ta 95 19.95 (see Table 5 0.29 2 (follow ste	A 0.4 7 in T 2 able (9 19.) 9a) 0.3	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95 10 7 in Table	Oct 0.89 20.73 19.94 0.85 e 9c)	Nov 0.97 20.29 19.93	Dec 0.99 19.92 19.93 0.99	21	(85) (86) (87) (88) (89)
Utilisation factors Jan (86)m= 0.99 Mean internal (87)m= 19.95 Temperature (88)m= 19.91 Utilisation factors (89)m= 0.99	during heater for gair Feb 0.97 ltemperate 20.18 ctor for gair 0.96 ltemperate 19.92 ctor for gair 0.96 ltemperate	ns for I Mar 0.94 ure in I 20.45 ating p 19.92 ns for r 0.92	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of do	m the living the sea, h1,mm and may 0.71 the sea T1 (for 20.92 the rest of 19.94 the sea T1 (sea T1) and s	(see Ju 0.5) collow 20.5 dwell 19.5 h2,m 0.4	e Table 9a) un Jul 3 0.38 steps 3 to 7 98 21 ling from Ta 95 19.95 (see Table 5 0.29 2 (follow ste	Dole 9 A 0.4 7 in T 2 Able 9 19. 9a) 0.3	Table 9c) 1 20.96 2 0.55 1 0.55 1 19.92	Oct 0.89 20.73 19.94 0.85 e 9c) 19.66	Nov 0.97 20.29 19.93	Dec 0.99 19.92 19.93 0.99		(85) (86) (87) (88) (89)
Utilisation factors Jan	during heater for gair Feb 0.97 ltemperate 20.18 20.18 19.92 etor for gair 0.96 ltemperate 18.88	ns for I Mar 0.94 ure in I 20.45 ating p 19.92 ns for r 0.92 ure in 1 19.27	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of dr 0.82 the rest 19.66	n the living the sea, h1,mm and may 0.71 ea T1 (for 20.92 en rest of 19.94 elling, 0.65 ef dwelling, 19.87	(see Ju 0.5) collow 20.9 dwell 19.9 h2,m 0.4 ing T2	e Table 9a) In Jul 3 0.38 steps 3 to 7 98 21 ling from Ta 95 19.95 (see Table 5 0.29 2 (follow ste 94 19.95	oble 9 A 0.4 7 in T 2 19. 9a) 0.3 19.	Th1 (°C) ug Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95 to 7 in Table 95 19.92	Oct 0.89 20.73 19.94 0.85 e 9c) 19.66	Nov 0.97 20.29 19.93	Dec 0.99 19.92 19.93 0.99	21	(85) (86) (87) (88) (89)
Utilisation factors Jan (86)m= 0.99 Mean internal (87)m= 19.95 Temperature (88)m= 19.91 Utilisation factors (89)m= 0.99 Mean internal (90)m= 18.55	during heater for gair Feb 0.97 ltemperate 20.18 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ns for I Mar 0.94 ure in I 20.45 ating p 19.92 urs for r 0.92 ure in 1 19.27	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of dr 0.82 the rest 19.66 r the wh	n the living the part of the living the part of the living, the part of the pa	Ju 0.5 Ollow 20.5 19.5 19.5 19.5 Illing)	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 Iling from Ta 95 19.95 (see Table 5 0.29 2 (follow ste 94 19.95 = fLA × T1	9a) 0.3 19. + (1	Th1 (°C) ug Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95 to 7 in Table 95 19.92 f LA) × T2	Oct 0.89 20.73 19.94 0.85 e 9c) 19.66 fLA = Liv	Nov 0.97 20.29 19.93 0.97 19.06 ring area ÷ (-	Dec 0.99 19.92 19.93 0.99 18.51 4) =		(85) (86) (87) (88) (89) (90) (91)
Utilisation factors Jan	during heater for gair Feb 0.97 ltemperate 20.18 20.18 20.18 20.18 20.18 20.19	ns for I Mar 0.94 ure in I 20.45 ating p 19.92 ure in 1 19.27 ure (fo	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of dr 0.82 the rest 19.66 r the wh	n the living the living that t	dwell 19.5 h2,m 0.4 lling) 20.4	e Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 ling from Ta 95 19.95 (see Table 5 0.29 2 (follow ste 94 19.95 = fLA × T1 46 20.47	9a) 0.3 19. + (1 20.	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95 to 7 in Table 95 19.92 f -fLA) × T2 47 20.44	Oct 0.89 20.73 19.94 0.85 e 9c) 19.66 FLA = Liv	Nov 0.97 20.29 19.93 0.97 19.06 ring area ÷ (4	Dec 0.99 19.92 19.93 0.99		(85) (86) (87) (88) (89)

(02)	40.05	40.50	40.00	20.0	20.20	20.40	20.47	00.47	20.44	20.40	40.07	40.04		(93)
(93)m=	19.25	19.52	19.86	20.2	20.39	20.46	20.47	20.47	20.44	20.19	19.67	19.21		(93)
			uirement				44 -4	Table 0	41	4 T: /	70)	-11-	late	
			or gains			ed at ste	ер ттог	rable 9	o, so tha	t 11,m=(rojin an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm					,						
(94)m=	0.98	0.96	0.92	0.83	0.68	0.49	0.34	0.37	0.59	0.86	0.96	0.99		(94)
Usefu			W = (94)		r –		ı	,			1	1	ı	
(95)m=		510.71	553.96	545.79	467.37	327.35	218.89	229.22	348.34	444.13	430.33	409.63		(95)
		age exte	rnal tem	perature			•	,					1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat			i				- ` 	- ` 	– (96)m					
(97)m=	885.41	862.97	785.37	652.83	500.34	332.38	219.54	230.24	361.63	552.53	728.96	876.25		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		•	
(98)m=	335.86	236.72	172.17	77.07	24.53	0	0	0	0	80.65	215.01	347.16		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	1489.17	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								30.42	(99)
0a En	eray rea	ujremer	nts – Indi	vidual h	eating s	veteme i	ncluding	micro-C	'HDI					
	e heatir		its – iriui	Muuai II	ealing s	ysterris i	ricidaling	i illicio-c) IF)					
•		•	at from s	econdar	v/supple	mentary	svstem						0	(201)
						,	•	(202) = 1	- (201) =				1	(202)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$										1	(204)			
Efficiency of main space heating system 1										93.5	(206)			
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g systen	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar ar
Space	e heatin	g require	ement (c	alculate	d above))	•	•					•	
	335.86	236.72	172.17	77.07	24.53	0	0	0	0	80.65	215.01	347.16		
(211)m	n = {[(98)m x (20	(4)] } x 1	00 ÷ (20)6)		•	•	•		•	•	•	(211)
,	359.21	253.18	184.14	82.42	26.23	0	0	0	0	86.26	229.96	371.3		
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u> </u>	1592.7	(211)
Snace	e heatin	a fuel (s	econdar	v) k\//h/	month							ļ		
•		•	00 ÷ (20	• , .										
(215)m=		0	o	0	0	0	0	0	0	0	0	0		
			ļ				<u> </u>	Tota	l (kWh/yea	ar) =Sum(2	L 215) _{15.1012}	<u>. </u>	0	(215)
Water	heating													」` ′
	_		ter (calc	ulated al	hove)									
Odipai	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89		
Efficier	ncv of w	ater hea	ıter					<u>. </u>	!		!	ļ	79.8	(216)
(217)m=		86.08	85.09	83.3	81.26	79.8	79.8	79.8	79.8	83.33	85.74	86.78		(217)
. ,			kWh/mo											` /
		•) ÷ (217)											
. ,	192.37	170.91	182.12	167.55	168.92	154.54	149.24	162.64	162	173.66	177.5	187.7		
			•					Tota	I = Sum(2	19a) ₁₁₂ =	•	•	2049.14	(219)
Annua	al totals									k'	Wh/year		kWh/year	
		fuel use	ed, main	system	1						•		1592.7	
														_

					-					
Water heating fuel used				2049.14						
Electricity for pumps, fans and electric keep-hot										
central heating pump:			30]	(230c)					
boiler with a fan-assisted flue			45		(230e)					
Total electricity for the above, kWh/year)(230g) =		75	(231)						
Electricity for lighting				227.56	(232)					
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 3944.39 (338										
12a. CO2 emissions – Individual heating systems	s including micro-CHP									
	Energy	Emission fa	ctor	Emissions						
	kWh/year	kg CO2/kWh		kg CO2/yea	ar					
Space heating (main system 1)	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	ar](261)					
Space heating (main system 1) Space heating (secondary)	•				_					
	(211) x	0.216	=	344.02	(261)					
Space heating (secondary)	(211) x (215) x	0.216	=	344.02	(261)					
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216	=	344.02 0 442.61	(261) (263) (264)					
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	= = =	344.02 0 442.61 786.64	(261) (263) (264) (265)					
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= = =	344.02 0 442.61 786.64 38.93	(261) (263) (264) (265) (267)					

TER =

(273)

19.27

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:06:28*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 53.46m²Site Reference:Highgate Road - GREENPlot Reference: 02 - B

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

18.07 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.38 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.0 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	ОК
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	9.56m ²	
Windows facing: North West	3.98m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Iser-I	Details:							
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				0010943 on: 1.0.5.50		
Address :	· ·	Property	Address	: 02 - B						
Overall dwelling dime	ensions:									
		Are	a(m²)		Av. He	ight(m)		Volume(m	3)	
Ground floor			53.46	(1a) x	2	2.65	(2a) =	141.67	(3a)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) [53.46	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	141.67	(5)	
2. Ventilation rate:										
	main seconda heating heating	ry	other		total			m³ per hou	ır	
Number of chimneys	0 + 0	+	0	_ = [0	X 4	40 =	0	(6a)	
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)	
Number of intermittent fa	ns				2	x ′	10 =	20	(7a)	
Number of passive vents				Ī	0	x -	10 =	0	(7b)	
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)	
				_						
				_			Air ch	nanges per he	our —	
•	ys, flues and fans = (6a)+(6b)+(neen carried out or is intended, proced			oontinuo fi	20		÷ (5) =	0.14	(8)	
Number of storeys in the		eu 10 (17),	ourer wise t	conunue n	om (9) to	(10)		0	(9)	
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)	
	.25 for steel or timber frame o			•	ruction			0	(11)	
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after						
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)	
If no draught lobby, en	ter 0.05, else enter 0							0	(13)	
-	s and doors draught stripped							0	(14)	
Window infiltration			0.25 - [0.2	. ,	-			0	(15)	
Infiltration rate	250 amaza dia adia adia ada		(8) + (10)					0	(16)	
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$		•	•	etre or e	envelope	area	5	(17)	
· ·	es if a pressurisation test has been do				is being u	sed		0.39	(10)	
Number of sides sheltere	ed							0	(19)	
Shelter factor			(20) = 1 -		19)] =			1	(20)	
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.39	(21)	
Infiltration rate modified f	- 1 	1	Δ		0-4	Nan	Data	1		
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	J		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1		
(-2)::-	7 7.0 0.0	I 3.0	1 3.7	<u> </u>	I 7.5	I 7.5	I 7./	J		
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4			,			1	1		
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18			

Adjusted infiltration	n rate (alle	owing for s	nelter an	nd wind s	peed) =	(21a) x	(22a)m					
0.5 0.	49 0.4	8 0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46		
Calculate effective		ge rate for	he appli	cable ca	se	•	•	•	•	•	•	— ,
If mechanical ve		\nnondiv N ()2h) _ (22a	a) v Emy (c	auation (VEVV otho	nuico (22h) - (22a)			0	(23
If exhaust air heat p) = (23a)			0	<u></u> (23
If balanced with hea	_	-	_					21.) (4 (00.)	0	(2:
a) If balanced m	ecnanica 0 0	1	with nea	at recove	ery (IVIVI	$\frac{HR}{10}$	$\int_{0}^{1} 0$	2b)m + (0	$\frac{230) \times [}{0}$	1 – (23c) 1 ₀	i ÷ 100] I	(24
′										0		(2.
b) If balanced m	ecnanica 0 0		Without	neat rec	overy (r	VIV) (240 1 0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	2b)m + (. 0	23b) ₀	1 0	1	(2
,								0	0	0		(2
c) If whole hous			•	•				.5 × (23b	p)		1	
24c)m= 0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural ven if (22b)m =								0.5]				
24d)m= 0.62 0.	62 0.6	1 0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(2
Effective air cha	nge rate	enter (24a	n) or (24k	o) or (24	c) or (24	d) in bo	(25)					
(25)m= 0.62 0.	62 0.6	1 0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(2
3. Heat losses ar	d heat lo	ss paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val		A X U (W/		k-value kJ/m²-l		X k J/K
Vindows Type 1	,			9.44		/[1/(1.4)+		12.52	$\stackrel{\prime}{\Box}$			(2
Vindows Type 2				3.93		/[1/(1.4)+	0.04] =	5.21	=			(2
Walls Type1	40.04	13.3	7	26.67		0.18		4.8	=) (2
Valls Type2	12.16	0	<u>-</u>	12.16	=	0.18	=	2.19	_			(2
Total area of elem				52.2	<u>'</u>	0.16		2.19				(2 (3
	Citto, iii				=		_	0	— r			
Party wall				27.88	=	0	=	0				(3
Party floor				53.46	=				<u> </u>			(3.
Party ceiling				53.46							_	(3
nternal wall **				102.0								(3
for windows and roof it include the areas on					ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
abric heat loss, V						(26)(30)	+ (32) =				24.71	(3
Heat capacity Cm	,	,					((28)	(30) + (32	2) + (32a).	(32e) =	9848.67	<u> </u>
· Thermal mass par	•	•	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium	, ,	250	<u> </u>
- For design assessmen can be used instead of	ts where the	e details of the	,			recisely the	indicative	e values of	TMP in T	able 1f		`
hermal bridges :	S (L x Y)	calculated	using Ap	pendix ł	<						6.09	(3
details of thermal brid otal fabric heat lo		ot known (36)	= 0.05 x (3	31)			(33) +	(36) =			30.81	
entilation heat lo	ss calcula	ited monthl	y				(38)m	= 0.33 × ((25)m x (5)		
	eb Ma		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
38)m= 29.19 28	.96 28.7	 	27.51	26.6	26.6	26.44	26.95	27.51	27.9	28.31		(3
Heat transfer coef	icient. W	 /K	•	•		•	(39)m	= (37) + (38)m	•	•	
	.77 59.5		58.31	57.41	57.41	57.24	57.76	58.31	58.71	59.12]	
00/111-												

eat lo	ss para	meter (H	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
0)m=	1.12	1.12	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.1	1.11		
			-41- / T -1-	la 4a\						Average =	Sum(40) ₁	12 /12=	1.09	(40
umbe	ı i		nth (Tab		N.A	1	11	Δ	0	0-4	N ₁	Daa		
4\	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(4
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
4. Wa	ter heat	ing ene	gy requi	rement:								kWh/ye	ar:	
		pancy, l										79		(4
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13	.9)			
		•	ater usad	ne in litre	s ner da	ıv Vd av	erage =	(25 x N)	+ 36		76	5.76		(4
educe	the annua	ıl average	hot water	usage by	5% if the a	welling is	designed t			se target o		0.76		(4
ot more	that 125	litres per _l	person per	day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m=	84.44	81.37	78.3	75.23	72.16	69.09	69.09	72.16	75.23	78.3	81.37	84.44		
											m(44) ₁₁₂ =	L	921.15	(4
nergy (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
5)m=	125.22	109.52	113.01	98.53	94.54	81.58	75.6	86.75	87.78	102.3	111.67	121.27		
· •				-1		()		h (40		Total = Su	m(45) ₁₁₂ =	= [1207.78	(4
instant		ater neatii	ng at point		not water	storage),	enter 0 in	DOXES (46)) to (61)					
6)m=	18.78	16.43	16.95	14.78	14.18	12.24	11.34	13.01	13.17	15.35	16.75	18.19		(4
	storage		includir	na anv eo	olar or M	/\//HRS	storage	within es	ama vas	امء		450		(4
_		` ,		•			_		arric vos	001		150		(4
	-	_			_		litres in neous co	' '	ers) ente	er 'O' in <i>(</i>	(47)			
	storage		not wate	, (uno ii	10144001	notantai	10000 00	11101 0011	010) 01110	31 0 111 (,			
	-		eclared I	oss facto	or is kno	wn (kWh	n/day):				1.	39		(4
empe	rature fa	actor fro	m Table	2b							0.	54		(4
-				, kWh/ye	ear			(48) x (49)) =			75		(5
٠.			·	ylinder l		or is not	known:							•
		•		om Tabl	e 2 (kW	h/litre/da	ıy)					0		(5
	-	_	ee secti	on 4.3										
		from Ta	ole 2a m Table	2h								0		(5
•									> .	>		0		(5
٠.		m water 54) in (5	•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(5
	. , .	,	•					//EC\ /	EE) (44).		0.	75		(5
		ioss cai	culated	or each	month		1	((56)m = (55) × (41)	m •	r			
6)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Appendi	хH	
7)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
rimar	y circuit	loss (ar	nual) fro	m Table	3							0		(5
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	om Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
9)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(!

Combi loss	ooloulotod	for oach	month ((61)m -	(60) · 2(SE (41)	\m						
(61)m= 0	0 0	0	0	0	00) + 30	05 x (41)	0	0	0	0	0	1	(61)
		ļ					<u> </u>	<u> </u>		<u> </u>		J (59)m + (61)m	(0.1)
(62)m= 171.8	<u> </u>	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	(59)111 + (61)1111	(62)
Solar DHW inp						<u> </u>						l	(- /
(add addition										.o to mate	5ag/		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ter				ļ.	Į.				l	ı	
(64)m= 171.8	-	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86]	
	_ '						Out	out from w	ater heate	r (annual)₁	12	1756.39	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 78.9	1 70.08	74.85	68.83	68.71	63.2	62.41	66.12	65.26	71.29	73.2	77.6	1	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	om com	munity h	reating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ains (Table	e 5), Wat	ts									_	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 89.6	1 89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 13.9	3 12.37	10.06	7.62	5.69	4.81	5.19	6.75	9.06	11.5	13.43	14.31		(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	-		
(68)m= 156.2	21 157.83	153.74	145.05	134.07	123.75	116.86	115.24	119.33	128.02	139	149.32		(68)
Cooking gai	ns (calcula	ated in A	opendix	L, equat	ion L15	or L15a), also s	ee Table	5	-	-		
(69)m= 31.9	6 31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96		(69)
Pumps and	fans gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (nega	ive valu	es) (Tab	le 5)	-	-		-		-		
(71)m= -71.6	8 -71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68		(71)
Water heating	ng gains (1	Table 5)											
(72)m= 106.0	06 104.29	100.61	95.6	92.35	87.78	83.89	88.87	90.64	95.82	101.67	104.3		(72)
Total intern	al gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m		
(73)m= 329.0	08 327.37	317.29	301.15	285	269.22	258.82	263.74	271.91	288.23	306.98	320.81		(73)
6. Solar ga	ins:												
Solar gains ar		Ü	r flux from	Table 6a			itions to co	onvert to th	ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a	7	g_ able 6b	т	FF able 6c		Gains	
•					Tal	DIE Ga	, —	able ob	_ '	able 60		(W)	,
Southwest _{0.9}		X	9.4	14	x 3	36.79	<u> </u>	0.63	x	0.7	=	106.15	(79)
Southwest _{0.9}	•	X	9.4	14	x 6	62.67	<u> </u>	0.63	x	0.7	=	180.81	(79)
Southwest _{0.9}	• • • • • • • • • • • • • • • • • • • •	X	9.4	14	x8	35.75	! <u> </u>	0.63	x	0.7	=	247.4	(79)
Southwest _{0.9}		Х	9.4	14	x 1	06.25	ļ <u>L</u>	0.63	x	0.7	=	306.53	(79)
Southwest _{0.9}	x 0.77	X	9.4	14	x 1	19.01		0.63	x	0.7	=	343.34	(79)

_		_			_		_						_
Southwest _{0.9x}	0.77	X	9.4	14	x L	118.15	╛	0.63	X	0.7	=	340.86	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	113.91		0.63	X	0.7	=	328.63	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	104.39		0.63	X	0.7	=	301.16	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	92.85		0.63	x	0.7	=	267.88	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	69.27		0.63	x	0.7	=	199.84	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	44.07		0.63	x	0.7	=	127.14	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	31.49		0.63	х	0.7	=	90.84	(79)
Northwest _{0.9x}	0.77	X	3.9	93	x	11.28	x	0.63	x	0.7	=	13.55	(81)
Northwest _{0.9x}	0.77	X	3.9	93	x	22.97	x	0.63	x	0.7	=	27.58	(81)
Northwest 0.9x	0.77	X	3.9	93	x [41.38	x	0.63	x	0.7	=	49.7	(81)
Northwest _{0.9x}	0.77	X	3.9	93	x	67.96	×	0.63	x	0.7	=	81.62	(81)
Northwest _{0.9x}	0.77	X	3.9	93	x	91.35	×	0.63	x	0.7	-	109.71	(81)
Northwest 0.9x	0.77	x	3.9	93	x	97.38	X	0.63	x	0.7	=	116.96	(81)
Northwest 0.9x	0.77	X	3.9	93	x	91.1	x	0.63	x	0.7	=	109.42	(81)
Northwest 0.9x	0.77	×	3.9	93	x	72.63	x	0.63	x	0.7	=	87.23	(81)
Northwest 0.9x	0.77	= x	3.9	93	x	50.42	×	0.63	x	0.7	=	60.56	(81)
Northwest 0.9x	0.77	X	3.9	93	x [28.07	x	0.63	x	0.7	=	33.71	(81)
Northwest 0.9x	0.77	×	3.9	93	x	14.2	x	0.63	x	0.7	=	17.05	(81)
Northwest 0.9x	0.77	= x	3.9	93	x	9.21	×	0.63	x	0.7	=	11.07	(81)
Solar gains in (83)m= 119.7		lated	for eac	h month 453.06		7.83 438.04	- ` 	n = Sum(74)m .39 328.43	(82)m	5 144.19	101.91	1	(83)
Total gains – i	nternal and	solar	(84)m =	<u> </u>	<u>- (8</u> ;	3)m , watts	_ -				ļ	l	
(84)m= 448.78		4.39	689.3	738.05	·	7.04 696.8	_	.14 600.34	521.78	3 451.17	422.72		(84)
7. Mean inter	nal tempera	ture (heating	season	\ \							I	
Temperature	•				<i>'</i>	rea from T	able 9	Th1 (°C)				21	(85)
Utilisation fac	ŭ	٠.			•			, (3)					
Jan		Mar	Apr	May	r `	$\overline{}$	<i>,</i>						
(86)m= 0.99	 	-	, , , ,	, <u>~</u> ,		un I Jul	A	ua Sep	Oct	Nov	Dec	1	
		.94	0.85	0.69	 	un Jul .5 0.36	0.	ug Sep 4 0.64	Oct	Nov 0.98	Dec 0.99		(86)
Moon intorna	!I			ļ	0	.5 0.36	0.4	4 0.64	 	-			(86)
Mean interna	l temperatui	re in I	iving are	ea T1 (fo	0 ollow	.5 0.36 v steps 3 to	0.4 7 in T	4 0.64 able 9c)	0.9	0.98	0.99		
(87)m= 20.02	l temperatui 20.23 2	re in I	iving are	ea T1 (fo	0 Ollow 20	.5 0.36 v steps 3 to .99 21	0.4 7 in T	able 9c) 1 20.97	 	0.98			(86) (87)
(87)m= 20.02 Temperature	l temperatul 20.23 2 during heat	re in I	iving are 20.78 eriods ir	ea T1 (fo	0 20 dwe	.5 0.36 y steps 3 to .99 21 elling from	0.0 7 in T 2 Table 9	able 9c) 1 20.97 9, Th2 (°C)	20.75	0.98	0.99		(87)
(87)m= 20.02 Temperature (88)m= 19.98	l temperatur 20.23 2 during heat 19.99 19	re in I 0.5 ing po	20.78 eriods ir	ea T1 (for 20.94 n rest of 20.01	0 20 dwe	0.36 y steps 3 to 99 21 elling from 02 20.02	0.7 in T 2 Table 9 20.	able 9c) 1 20.97 9, Th2 (°C)	0.9	0.98	0.99		
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fac	temperature 20.23 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	re in I 0.5 ing pe	20.78 eriods ir 20.01 est of d	ea T1 (for 20.94 or rest of 20.01 welling,	ollow 20 dwe 20 h2,n	.5 0.36 v steps 3 to .99 21 elling from .02 20.02 n (see Tab	0.0 7 in T 2 2 Table 9 20.	7 able 9c) 1 20.97 9, Th2 (°C) 02 20.02	20.75	20.34	0.99		(87)
(87)m= 20.02 Temperature (88)m= 19.98	temperature 20.23 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	re in I 0.5 ing po	20.78 eriods ir	ea T1 (for 20.94 n rest of 20.01	ollow 20 dwe 20 h2,n	0.36 y steps 3 to 99 21 elling from 02 20.02	0.7 in T 2 Table 9 20.	7 able 9c) 1 20.97 9, Th2 (°C) 02 20.02	20.75	0.98	0.99		(87)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fac	during heat 19.99 19 etor for gains 0.97 0	re in I 0.5 ing po 9.99	20.78 eriods ir 20.01 est of d	ea T1 (for 20.94 in rest of 20.01 welling, 0.63	0 20 dwe 20 h2,n	0.36 v steps 3 to 0.99 21 elling from 0.02 20.02 n (see Tab 43 0.28	0.4 7 in T 2 Table 9 20.4 10 9a) 0.3	7 able 9c) 1 20.97 9, Th2 (°C) 02 20.02	20.75 20.01 0.86	20.34	0.99		(87)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation factors (89)m= 0.99	during heat 19.99 19 tor for gains 0.97 0 I temperature	re in I 0.5 ing po 9.99	20.78 eriods ir 20.01 est of d	ea T1 (for 20.94 in rest of 20.01 welling, 0.63	0 20 dwe 20 h2,n 0.	0.36 v steps 3 to 0.99 21 elling from 0.02 20.02 n (see Tab 43 0.28	0.0 7 in T 2 Γable 9 10.3 teps 3	Table 9c) 1 20.97 9, Th2 (°C) 02 20.02 20.56 to 7 in Tab 02 20	0.9 20.75 20.01 0.86 le 9c) 19.75	0.98 20.34 20 0.97	0.99 19.98 20 0.99		(87) (88) (89) (90)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fact (89)m= 0.99 Mean internal	during heat 19.99 19 tor for gains 0.97 0 I temperature	re in I 0.5 ing po 0.99 s for re .93	20.78 eriods ir 20.01 est of do 0.81 he rest	ea T1 (for 20.94 in rest of 20.01 welling, 0.63 of dwelling	0 20 dwe 20 h2,n 0.	0.36 y steps 3 to 99 21 elling from 02 20.02 n (see Tab 43 0.28	0.0 7 in T 2 Γable 9 10.3 teps 3	Table 9c) 1 20.97 9, Th2 (°C) 02 20.02 20.56 to 7 in Tab 02 20	0.9 20.75 20.01 0.86 le 9c) 19.75	20.34	0.99 19.98 20 0.99	0.45	(87) (88) (89)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fact (89)m= 0.99 Mean internal	during heat 19.99 19 tor for gains 0.97 0 I temperatur	re in l 0.5 ing po 0.99 s for r .93	eriods ir 20.01 est of dr 0.81 he rest	ea T1 (for 20.94 in rest of 20.01 welling, 0.63 of dwelling)	0 20 dwe 20 h2,n 0.	0.36 v steps 3 to 0.99 21 elling from 0.02 20.02 n (see Tab 43 0.28 72 (follow see Tab 0.02 20.02	0.0 7 in T 2 20. le 9a) 0.3 steps 3	7 able 9c) 1 20.97 20.97 20.02 20.02 20.02 20.02 20.02 20.02 20.02	0.9 20.75 20.01 0.86 le 9c) 19.75 fLA = Liv	0.98 20.34 20 0.97	0.99 19.98 20 0.99	0.45	(87) (88) (89) (90)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fact (89)m= 0.99 Mean internation (90)m= 18.7	during heat 19.99 19 tor for gains 0.97 0 I temperatur 19 19	re in l 0.5 ing po 0.99 s for r .93	eriods ir 20.01 est of dr 0.81 he rest	ea T1 (for 20.94 in rest of 20.01 welling, 0.63 of dwelling)	0 20 dwe 20 0	0.36 v steps 3 to 0.99 21 elling from 0.02 20.02 n (see Tab 43 0.28 72 (follow see Tab 0.02 20.02	0.0 7 in T 2 Table 9 20.1 le 9a) 0.3 steps 3 20.1	4 0.64 Table 9c) 1 20.97 9, Th2 (°C) 02 20.02 12 0.56 15 7 in Tab 02 20 - fLA) × T2	0.9 20.75 20.01 0.86 le 9c) 19.75 fLA = Liv	0.98 20.34 20 0.97	0.99 19.98 20 0.99	0.45	(87) (88) (89) (90)
Temperature (88)m= 19.98 Utilisation fac (89)m= 0.99 Mean interna (90)m= 18.7	temperature 20.23	re in l 0.5 ing po 0.99 s for r .93 re in t 0.38	est of do 0.81 he rest 19.77 the wh	ea T1 (for 20.94 in rest of 20.01 welling, 0.63 of dwelling 19.96 ole dwe 20.4	0 0 0 0 0 0 0 0 0 0	0.36 v steps 3 to .99 21 elling from .02 20.02 n (see Tab 43 0.28 T2 (follow s .02 20.02) = fLA × T .46 20.46	0.0 7 in T 2 20. le 9a) 0.3 steps 3 20. 1 + (1 20.	7 able 9c) 1 20.97 20.97 20.02 20.02 20.02 20.02 20 46 20.44	0.9 20.75 20.01 0.86 le 9c) 19.75 fLA = Liv	0.98 20.34 20 0.97 19.17 ring area ÷ (4)	0.99 19.98 20 0.99 18.66 4) =	0.45	(87) (88) (89) (90) (91)

(00)	1 40 55	10.00	00.00		00.40	00.40	00.40	00.44	22.2	1	40.00	[(93)
(93)m= 19.29	19.55	19.89	20.23	20.4	20.46	20.46	20.46	20.44	20.2	19.7	19.26		(93)
8. Space hea				ro obtoin	ad at at	nn 11 of	Table 0	o oo tha	tTim (76\m an	d ro oolo	uloto	
Set Ti to the the utilisation			•		eu ai sii	эр 11 01	Table 9	J, SO IIIa	t 11,111=(70)III aII	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:									ı	
(94)m= 0.99	0.97	0.93	0.82	0.65	0.46	0.32	0.36	0.59	0.87	0.97	0.99		(94)
Useful gains,	1	<u>`</u>	<u> </u>							·		1	(05)
(95)m= 442.32	518.28	568.34	567.06	482.79	333.19	221.4	231.97	355.02	452.87	437.17	418.01		(95)
Monthly aver		1				40.0	10.4	444	40.0	7.4	4.0		(06)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea	1	ai tempe	507.38	_m , vv = 336.22	=[(39)m 221.74	x [(93)m 232.59	- (96)m 365.95	559.92	739.61	900.2		(97)
(97)m= 899.43		797.14								ļ	890.2		(91)
Space heatin (98)m= 340.09	240.21	170.23	r each n	18.29	0	n = 0.02	24 X [(97])m – (95)	79.64	217.76	351.31		
(98)111= 340.09	240.21	170.23	09	10.29	0	U				ļ	<u> </u>	1486.54	(98)
							Tota	l per year	(Kvvn/yeai	r) = Sum(9	O) _{15,912} =	1400.04	╡``
Space heatin	g require	ement in	kWh/m²	² /year								27.81	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heati	ng:												_
Fraction of sp	pace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of sp	pace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin	g require	ement (c	alculate	d above)							•	ı	
340.09	240.21	170.23	69	18.29	0	0	0	0	79.64	217.76	351.31		
$(211)m = \{[(98)$	3)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
363.74	256.91	182.06	73.8	19.56	0	0	0	0	85.18	232.89	375.73		
							Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	F	1589.89	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month							•		_
$= \{[(98) \text{m x } (20)]\}$	01)] } x 1	00 ÷ (20	8)									1	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating	9												
Output from w	1									1		1	
171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86		_
Efficiency of w	ater hea	iter					,					79.8	(216)
(217)m= 86.6	86.04	84.99	82.98	80.9	79.8	79.8	79.8	79.8	83.23	85.69	86.74		(217)
Fuel for water	•												
(219)m = (64) (219)m = 198.4	m x 100 176.21) ÷ (217) 187.81	m 173.07	174.46	158.74	153.12	167.1	166.51	178.9	182.94	193.53		
(210)111-1130.4	1,10.21	107.01	170.07	1,4.40	100.74	100.12		I = Sum(2		102.34	100.00	2110.78	(219)
Annual totals							, 0.00			Whhaa			
Space heating		ed, main	system	1					ĸ	Wh/year		kWh/yeai 1589.89	٦
,	,	,	,										_

Water heating fuel used				2110.78	٦
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting			245.94	(232)	
Total delivered energy for all uses (211)(221) +		4021.61	(338)		
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy	Emission fac	tor	Emissions	
	kWh/year	kg CO2/kWh		kg CO2/ye	ar
Space heating (main system 1)	(211) ×	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (main system 1) Space heating (secondary)	•		=		_
	(211) x	0.216		343.42	(261)
Space heating (secondary)	(211) x (215) x	0.216	=	343.42	(261)
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216	=	343.42 0 455.93	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	=	343.42 0 455.93 799.34	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= =	343.42 0 455.93 799.34 38.93	(261) (263) (264) (265) (267)

TER =

(273)

18.07

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:06:11*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 72.62m²Site Reference:Highgate Road - GREENPlot Reference:02 - C

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 18.46 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.74 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 42.5 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.71m²	
Windows facing: North West	3.46m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser-l	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	: 02 - C					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor			72.62	(1a) x	2	2.65	(2a) =	192.44	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	72.62	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	192.44	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0	_ = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				3	x ′	10 =	30	(7a)
Number of passive vents				Ē	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				30		÷ (5) =	0.16	(8)
Number of storeys in the	peen carried out or is intended, proced he dwelling (ns)	ed to (17),	otherwise (continue ti	rom (9) to	(16)		0	(9)
Additional infiltration	no awaming (no)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fc	r masoni	ry consti	ruction			0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding t	o the grea	ter wall are	ea (after					
deducting areas of opening If suspended wooden f	floor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	,	(,,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metro		•	•	etre of e	envelope	area	5	(17)
· ·	lity value, then $(18) = [(17) \div 20] +$				ia haina u	and		0.41	(18)
Number of sides sheltere	es if a pressurisation test has been do ed	ne or a de	gree air pe	тпеавшу	is being u	sea		0	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18) x (20) =				0.41	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
• / []			1	1		<u> </u>		J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.52	0.51	0.5	0.45	0.44	0.39	0.39	0.38	0.41	0.44	0.46	0.48		
Calculate effe		•	rate for t	he appli	cable ca	se	-	-	-	-	-	·	
If exhaust air h			endix N (2	3h) <i>– (2</i> 3a	ı) x Fmv (e	equation (N	VS)) othe	rwise (23h) = (23a)			0	(23
If balanced with) = (23a)			0	(23
		•	•	_					2h\m . (22h) v [1 (220)	0	(23
a) If balance 24a)m= 0		o lical ve	0	0	0	0	1K) (24a	0	0	230) x [$\frac{1 - (230)}{1}$	- 100] 	(24
b) If balance				-								J	(-
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole h				,								J	,-
,	n < 0.5 ×			•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural					•				0.51	•		-	
24d)m= 0.63	n = 1, th 0.63	0.62	0.6	0.6	0.57	0.57	0.5 + [(2	0.58	0.5]	0.6	0.61]	(2
									0.0	0.0	0.01	J	(2
Effective air 25)m= 0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	1	(2
23)111= 0.03	0.03	0.02	0.0	0.0	0.57	0.57	0.57	0.30	0.0	0.0	0.01		(2)
3. Heat losse	es and he	eat loss p	paramete	er:									
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		AXk J/K
Vindows Type	e 1				12.71	x1.	/[1/(1.4)+	0.04] =	16.85				(2
Vindows Type	e 2				3.46	x1.	/[1/(1.4)+	0.04] =	4.59				(2
Walls Type1	72.6	62	16.17	7	56.45	, x	0.18	i	10.16				(2
Valls Type2	17.7	'8	0		17.78	x	0.18	<u> </u>	3.2	=		7 F	(2
Total area of e	elements	, m²			90.4								 (3
Party wall					30.32	<u> </u>	0		0				(3
Party floor					72.62	=						5 H	(3.
Party ceiling					72.62	=				[╡	(3.
nternal wall **	ŧ				146.1	_				[-	(3)
for windows and		ows. use e	ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	l as aiven in	paragraph	 1.3.2	(0
* include the area									,	3	, p = 1 = 3 = p =		
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				34.8	(3
Heat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	12217.13	(3
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	ı kJ/m²K			Indica	tive Value	: Medium		250	(3
For design asses: an be used inste				constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						7.11	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he								(33) +	(36) =			41.91	(3
entilation hea	at loss ca	alculated	monthly	/			ı		= 0.33 × ((25)m x (5	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 40.26	39.93	39.6	38.08	37.8	36.47	36.47	36.23	36.98	37.8	38.37	38.98		(3
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m			
39)m= 82.16	81.83	81.51	79.99	79.71	78.38	78.38	78.14	78.89	79.71	80.28	80.88		
Stroma FSAP 201	12 Version	: 1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39)	₁₁₂ /12=	79.9 ⊝ aç	<u>e 2 of </u> 3

leat loss para	meter (I	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
1.13	1.13	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11		
lumber of day	rs in mo	nth (Tab	lo 10)			<u>!</u>		'	Average =	Sum(40) ₁ .	12 /12=	1.1	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
11)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•				•	•	•	•	•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		31		(42)
Annual averag Reduce the annua ot more that 125	e hot wa Il average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.02		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot water usage ir	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•					
14)m= 97.92	94.36	90.8	87.24	83.67	80.11	80.11	83.67	87.24	90.8	94.36	97.92		_
nergy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	L	1068.18	(44
15)m= 145.21	127	131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63		
		ı			l	l	l		Total = Su	m(45) ₁₁₂ =	=	1400.56	(45
instantaneous w									1	1			
16)m= 21.78 Vater storage	19.05	19.66	17.14	16.44	14.19	13.15	15.09	15.27	17.8	19.42	21.09		(46
Storage volum) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47
community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Vater storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48
emperature fa					`	,					54		(49
nergy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50
o) If manufact			-										<i>-</i>
lot water stora community h	J			e 2 (KVV	n/litre/da	ay)					0		(51
olume factor	_		311 1.0								0		(52
emperature fa	actor fro	m Table	2b							—	0		(53
nergy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter (50) or (54) in (5	55)								0.	75		(55
Vater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56
cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57
rimary circuit	loss (ar	nual) fro	m Table	3							0		(58
rimary circuit				,	•	. ,	, ,						
(modified by					ı —			<u> </u>		<u> </u>			
59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59

Combi loso	Combi loss calculated for each month (61)m = (60) \div 365 × (41)m													
(61)m= 0	o localizated	o each	0	0	00) - 30	05 × (41)	0	0	0	0	0	1	(61)	
	!						ļ	ļ		<u> </u>	<u> </u>	(50)== : (61)==	(01)	
(62)m= 191.8	-i	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	· (59)m + (61)m]	(62)	
Solar DHW inpu]	(02)	
(add addition									i contribut	ion to wate	er neating)			
(63)m= 0	0	0	0	0	0	0	0		0	0	0	1	(63)	
Output from	l		-									J	` ,	
(64)m= 191.8		177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22]		
` '	_ l					l	<u> </u>	put from w		ļ	I12	1949.18	(64)	
Heat gains f	rom water	heating.	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)r	nl + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	_	
(65)m= 85.56	_	80.85	74.06	73.73	67.53	66.42	70.72	69.92	76.72	79.13	84.03]	(65)	
	L 7)m in cal	culation o	of (65)m	only if c	vlinder i	ເ s in the ເ	dwelling	or hot w	ater is f	om com	munity h	neating		
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):														
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts														
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1		
(66)m= 115.4	1 115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	1	(66)	
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				•		
(67)m= 18.13	i	13.09	9.91	7.41	6.26	6.76	8.79	11.79	14.97	17.48	18.63	1	(67)	
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			4		
(68)m= 203.3	<u> </u>	200.13	188.81	174.52	161.09	152.12	150.01	155.32	166.64	180.93	194.36	1	(68)	
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a	, also s	ee Table	5			•		
(69)m= 34.54	<u> </u>	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	1	(69)	
Pumps and	fans gains	(Table 5	ia)									1		
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)	
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)		Į.			!	!			
(71)m= -92.3	2 -92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32]	(71)	
Water heating	ng gains (T	able 5)				!			!			•		
(72)m= 115	112.94	108.67	102.87	99.1	93.79	89.28	95.06	97.11	103.12	109.9	112.95]	(72)	
Total intern	al gains =				(66))m + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•		
(73)m= 397.0	8 395.1	382.51	362.21	341.65	321.75	308.78	314.47	324.85	345.36	368.93	386.56]	(73)	
6. Solar gai	ins:									•	•			
Solar gains ar	e calculated	using sola	flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	tion.			
Orientation:			Area		Flu		_	g_ 	_	FF		Gains		
	Table 6d		m²			ble 6a		Table 6b	_ '	able 6c		(W)	_	
Northeast 0.9		Х	12.	71	x 1	1.28	х	0.63	x	0.7	=	43.83	(75)	
Northeast 0.9	0	Х	12.	71	x 2	22.97	х	0.63	x	0.7	=	89.21	(75)	
Northeast 0.9	0	х	12.	71	X 4	11.38	х	0.63	x	0.7	=	160.73	(75)	
Northeast 0.9		X	12.	71	× 6	67.96	x	0.63	x	0.7	=	263.96	(75)	
Northeast 0.93	× 0.77	X	12.	71	x g	91.35	Х	0.63	х	0.7	=	354.82	(75)	

		_					, ,		_				_
Northeast _{0.9x}	0.77	X	12.	71	X	97.38	_ x	0.63	X	0.7	=	378.27	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	91.1	X	0.63	X	0.7	=	353.87	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	72.63	X	0.63	X	0.7	=	282.11	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	50.42	X	0.63	X	0.7	=	195.85	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	28.07	X	0.63	X	0.7	=	109.02	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	14.2	X	0.63	X	0.7	=	55.15	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	9.21	x	0.63	X	0.7	=	35.79	(75)
Northwest 0.9x	0.77	x	3.4	l 6	x	11.28	x	0.63	X	0.7	=	11.93	(81)
Northwest _{0.9x}	0.77	x	3.4	16	X	22.97	X	0.63	X	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.4	16	X .	41.38	x	0.63	X	0.7	=	43.75	(81)
Northwest _{0.9x}	0.77	×	3.4	16	X	67.96	x	0.63	x	0.7		71.86	(81)
Northwest _{0.9x}	0.77	×	3.4	16	X	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest _{0.9x}	0.77	×	3.4	16	X	97.38	x	0.63	x	0.7	_ =	102.98	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x	91.1	x	0.63	x	0.7	_ =	96.33	(81)
Northwest _{0.9x}	0.77	×	3.4	16	X	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	×	3.4	16	X	50.42	х	0.63	x	0.7	=	53.32	(81)
Northwest 0.9x	0.77	×	3.4	16	X	28.07	х	0.63	x	0.7	=	29.68	(81)
Northwest 0.9x	0.77	×	3.4	16	х	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest 0.9x	0.77	×	3.4	16	X	9.21	x	0.63	x	0.7	=	9.74	(81)
-													
Solar gains in	watts, calcu	ılated	for eac	h month			(83)m	= Sum(74)m .	(82)m			•	
(83)m= 55.76	<u> </u>)4.48	335.82	451.41	481.25	450.2	358	3.9 249.17	138.7	70.16	45.53		(83)
Total gains – i				<u> </u>	`	, watts						1	
(84)m= 452.84	508.6 58	36.99	698.03	793.06	803.01	758.98	673.	.38 574.02	484.0	439.09	432.1		(84)
7. Mean inter	nal tempera	ature ((heating	season	1)								
Temperature	during heat	ting p	eriods ir	n the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for l	iving are	ea, h1,m	(see Ta	able 9a)				_		1	
Jan	Feb I	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 1	1 0).99	0.94	0.81	0.6	0.45	0.5	0.82	0.97	1	1		(86)
Mean_interna	l temperatu	re in l	iving are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)			-	_	
(87)m= 19.81	19.95 20	0.22	20.59	20.87	20.98	21	20.9	99 20.9	20.53	20.11	19.79		(87)
Temperature	during heat	ting p	eriods ir	n rest of	dwelling	g from Ta	able 9	9, Th2 (°C)					
(88)m= 19.98	19.98 19	9.98	20	20	20.02	20.02	20.0	02 20.01	20	20	19.99]	(88)
Utilisation fac	tor for gains	s for r	est of d	welling,	h2,m (s	ee Table	9a)	•		-		•	
(89)m= 1		0.98	0.92	0.75	0.52	0.35	0.4	2 0.74	0.96	0.99	1]	(89)
Mean interna	l temperatu	re in t	the rest	of dwell	ina T2 (f	follow ste	ne 3	to 7 in Tabl	 _ ()c)		!	J	
(90)m= 18.39	 	8.99	19.53	19.88	20	20.02	20.0		19.46	18.85	18.38]	(90)
()	1			L						ving area ÷ (0.38	(91)
Many late	l taman a mat	/5	n Alexa . !	الماما	II: \	: A . T.1	. /4			•			 ` ′
Mean interna	ı temperatu	re (to	r the wh	oie ame	iiing) = 1	LA X I1	+ (1	– TLA) × 12				•	
(02)m- 10 02	1 10 11 1 11	വംI	10.04	20.26	20.20	20.20	20.4	20 20 24	10 07	1004	10 00		(02)
(92)m= 18.93 Apply adjustr		9.46 mean	19.94	20.26	20.38	20.39	20.3		19.87		18.92		(92)

(93)m= 18.93 19.11 19.46 19.94 20.26 20.38 20.39 20.39 20.31 19.87 19.34 18.92 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	(93)
<u> </u>	
Set 11 to the mean internal temperature obtained at step 11 of 1 able 9b, so that 11,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	
(94)m= 1 0.99 0.98 0.92 0.77 0.55 0.39 0.46 0.77 0.96 0.99 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 450.87 504.39 573.79 641.97 610.85 443.15 296.05 309.09 440.19 464.28 435.34 430.62	(95)
Monthly average external temperature from Table 8	(00)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	(07)
(97)m= 1202.21 1163.16 1056.33 883.13 682.47 452.97 297.33 311.94 489.65 739.07 982.47 1190.69	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 558.99 442.69 359.01 173.64 53.28 0 0 0 0 204.44 393.93 565.49	
	7(00)
Total per year (kWh/year) = Sum(98) _{15,912} = 2751.48	(98)
Space heating requirement in kWh/m²/year 37.89	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	_
Fraction of space heat from secondary/supplementary system 0	(201)
Fraction of space heat from main system(s) (202) = 1 - (201) = 1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$	(204)
Efficiency of main space heating system 1 93.5	(206)
Efficiency of secondary/supplementary heating system, %	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/ye	⊐ ar
Space heating requirement (calculated above)	
558.99 442.69 359.01 173.64 53.28 0 0 0 0 204.44 393.93 565.49	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
597.85 473.47 383.97 185.71 56.99 0 0 0 218.66 421.32 604.8	
Total (kWh/year) =Sum(211) _{15,1012} = 2942.76	(211)
Space heating fuel (secondary), kWh/month	_
$= \{[(98)m \times (201)] \} \times 100 \div (208)$	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	
Total (kWh/year) =Sum(215) _{15,1012} = 0	(215)
Water heating	_
Output from water heater (calculated above)	
191.8 169.09 177.65 159.35 156.22 139.69 134.26 147.19 146.89 165.23 174.59 187.22	_
Efficiency of water heater 79.8	(216)
(217)m= 87.5 87.27 86.65 85.04 82.27 79.8 79.8 79.8 79.8 85.38 86.92 87.58	(217)
Fuel for water heating, kWh/month	
$(219) m = (64) m \times 100 \div (217) m$	
(219)m= 219.2 193.76 205.01 187.37 189.88 175.06 168.24 184.45 184.07 193.51 200.86 213.77	7 ,
Total = Sum(219a) ₁₁₂ = 2315.18	(219)
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 2942.76	٦
Space heating fuel used, main system 1 2942.76	╛

					_
Water heating fuel used				2315.18	╛
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue		(230e)			
Total electricity for the above, kWh/year		75	(231)		
Electricity for lighting				320.14	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			5653.09	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	635.64	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	500.08	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1135.72	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.15	(268)
					_
Total CO2, kg/year	sum	of (265)(271) =		1340.79	(272)

TER =

(273)

18.46

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:05:56*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 53.96m²Site Reference:Highgate Road - GREENPlot Reference:02 - D

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.25 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.23 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 39.2 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.17 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
	400.00/	
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	ОК
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ОК
Based on:	Wedidiff	OK
	Avorago or unknown	
Overshading:	Average or unknown 12.07m²	
Windows facing: North East	· - · • · · ·	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012	Strom Softwa	are Ve				010943 on: 1.0.5.50		
Address :	F	Property	Address	02 - D					
1. Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		;	53.96	(1a) x	2	2.65	(2a) =	142.99	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (53.96	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	142.99	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	x ′	10 =	20	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	20		÷ (5) =	0.14	(8)
Number of storeys in the		iu io (17),	otrierwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250 amaza dia adia adia mata		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	etre or e	envelope	area	5	(17)
•	s if a pressurisation test has been do				is being u	sed		0.39	(10)
Number of sides sheltere	d							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.39	(21)
Infiltration rate modified for		T	1 .			<u> </u>		1	
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0 4.4 4.3 3.8] 3.6	3.1	4	4.3	4.0	4.1		
Wind Factor (22a)m = (22	2)m ÷ 4							1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.5 Calculate effe	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46		
If mechanica		_	ale ioi i	пе арри	саын са	3E						0	(23a)
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	n)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b)m = (22	2b)m + (23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h if (22b)r		tract ven (23b), t		•	-				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)r		on or wh en (24d)							0.5]	•	•	-	
(24d)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6]	(24d)
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6		(25)
3. Heat losse	s and he	eat loss p	paramete	er:									
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
Windows					12.07	x1.	/[1/(1.4)+	0.04] =	16				(27)
Walls Type1	27.6	66	12.0	7	15.59) x	0.18	_ =	2.81	$\overline{}$ [(29)
Walls Type2	24.2	24	0		24.24	x x	0.18	_ = [4.36				(29)
Total area of e	elements	, m²			51.9								(31)
Party wall					31.67	, X	0	= [0				(32)
Party floor					53.96	5						$\exists \ \Box$	(32a)
Party ceiling					53.96	5				Ī			(32b)
Internal wall **	•				95.03	<u></u>				Ī		7 F	(32c)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	h 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				23.17	(33)
Heat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	8447.4	2 (34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge					-	<						6.04	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			29.21	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))	-	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 29.42	29.2	28.98	27.93	27.74	26.83	26.83	26.66	27.18	27.74	28.13	28.55]	(38)
Heat transfer	coefficie	nt, W/K			,	•	•	(39)m	= (37) + (38)m		7	
(39)m= 58.63	58.41	58.18	57.14	56.95	56.04	56.04	55.87	56.39	56.95	57.34	57.75		
								,	Average =	Sum(39) ₁	12 /12=	57.14	(39)

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.09	1.08	1.08	1.06	1.06	1.04	1.04	1.04	1.04	1.06	1.06	1.07		
` /				<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	L Average =	: Sum(40)₁.	12 /12=	1.06	(40)
Number of day	s in mo	nth (Tab	le 1a)							, ,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ina ene	rav reaui	rement								kWh/ye	ear.	
4. Water fleat	ing cho	igy roqui	romont.								icvvii, y c	our.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		81		(42)
Annual average	ıl average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.11		(43)
not more that 125	litres per	person per	aay (all w	/ater use, I	not and co	ia) •							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 84.82	81.74	78.65	75.57	72.49	69.4	69.4	72.49	75.57	78.65	81.74	84.82		
Energy content of	hot water	used - cali	culated m	onthly = 4	190 x Vd r	n x nm x F)Tm / 3600			ım(44) ₁₁₂ = ables 1b 1		925.35	(44)
(45)m= 125.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82		
(43)111= 123.79	110.02	113.55	90.90	34.91	01.95	75.94	07.14			Im(45) ₁₁₂ =		1213.27	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		rolar = Su	1111(43)112 =	l	1213.27	(40)
(46)m= 18.87	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27		(46)
Water storage	loss:				ļ	l	l		<u> </u>	<u> </u>			
Storage volume	e (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage				مسامات	/1.\^/L	- /-l : \ .							(40)
a) If manufact				or is kno	wn (kvvr	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost from b) If manufaction		_	-		or io not		(48) x (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	-			() ()		-57					<u> </u>		(0.1)
Volume factor	•										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in (55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by					ı —			<u> </u>	ı —	- 			(50)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$											
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)										
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m$											
(62)m= 172.39 152.1 160.12 144.07 141.57 127.04 122.54 133.74 133.28 149.36 157.27 168.42	+ (01 <i>)</i> 111 (62)										
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	(- /										
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)											
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)										
Output from water heater											
(64)m= 172.39 152.1 160.12 144.07 141.57 127.04 122.54 133.74 133.28 149.36 157.27 168.42											
	61.89 (64)										
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]											
(65)m= 79.1 70.25 75.02 68.98 68.85 63.32 62.53 66.25 65.39 71.45 73.37 77.78	(65)										
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating											
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= 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34	(66)										
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
(67)m= 14.04 12.47 10.14 7.68 5.74 4.85 5.24 6.81 9.13 11.6 13.54 14.43	(67)										
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
(68)m= 157.5 159.14 155.02 146.25 135.18 124.78 117.83 116.2 120.31 129.08 140.15 150.55	(68)										
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
(69)m= 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03	(69)										
Pumps and fans gains (Table 5a)											
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)										
Losses e.g. evaporation (negative values) (Table 5)											
(71)m= -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27	(71)										
Water heating gains (Table 5)											
(72)m= 106.32 104.54 100.84 95.81 92.55 87.95 84.04 89.05 90.83 96.03 101.91 104.55	(72)										
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$											
(73)m= 330.96 329.25 319.1 302.84 286.57 270.67 260.21 265.15 273.38 289.81 308.7 322.63	(73)										
6. Solar gains:											
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.											
Orientation: Access Factor Area Flux g_ FF Gain											
Table 6d m² Table 6a Table 6b Table 6c (W	')										
Northeast 0.9x 0.77 x 12.07 x 11.28 x 0.63 x 0.7 = 4	1.62 (75)										
Northeast 0.9x 0.77 x 12.07 x 22.97 x 0.63 x 0.7 = 8.	4.72 (75)										
Northeast 0.9x 0.77 x 12.07 x 41.38 x 0.63 x 0.7 = 15	(75)										
Northeast 0.9x 0.77 x 12.07 x 67.96 x 0.63 x 0.7 = 25	(75)										
Northeast 0.9x 0.77 x 12.07 x 91.35 x 0.63 x 0.7 = 33	66.95 (75)										

Northeast _{0.9x}	0.77	х	12.0	07	x	97.38	X		0.63	x	0.7	=	359.23	(75)
Northeast _{0.9x}	0.77	х	12.0	07	x	91.1	X		0.63	x	0.7	=	336.05	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	72.63	X		0.63	x	0.7	=	267.9	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	50.42	X		0.63	x	0.7	=	185.99	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	28.07	X		0.63	x	0.7	=	103.53	(75)
Northeast _{0.9x}	0.77	х	12.0	07	x	14.2	X		0.63	x	0.7	=	52.37	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	9.21	X		0.63	x [0.7	=	33.99	(75)
Solar gains in w	ī				1		(83)m	n = Si	um(74)m .	(82)m			l	
(83)m= 41.62	84.72	152.64	250.67	336.95		9.23 336.05	267	7.9	185.99	103.53	52.37	33.99		(83)
Total gains – in			` 		·			1			1			(0.4)
(84)m= 372.58	413.97	471.74	553.51	623.52	62	9.9 596.26	533	3.05	459.37	393.35	361.07	356.62		(84)
7. Mean intern	al tempo	erature ((heating	season)									
Temperature of	during he	eating p	eriods ir	the livi	ng a	rea from Tal	ble 9	, Th	1 (°C)				21	(85)
Utilisation factor	or for ga	ins for l	iving are	ea, h1,m	(se	e Table 9a)							l	
Jan	Feb	Mar	Apr	May	J	un Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.92	0.77	0.	56 0.41	0.4	48	0.77	0.96	0.99	1		(86)
Mean internal	tempera	ature in I	iving are	ea T1 (fo	ollow	steps 3 to	7 in T	Table	e 9c)					
(87)m= 19.93	20.07	20.33	20.68	20.91	20	.99 21	2	1	20.93	20.62	20.22	19.91		(87)
Temperature of	during he	eating p	eriods ir	rest of	dwe	lling from Ta	able 9	9, Tł	n2 (°C)					
(88)m= 20.01	20.02	20.02	20.03	20.04	20	.05 20.05	20.	.05	20.05	20.04	20.03	20.03		(88)
Utilisation factor	or for ga	ins for r	est of d	wellina	h2 m	n (see Table	9a)	•					l	
(89)m= 0.99	0.99	0.97	0.9	0.71	_	48 0.32	0.3	38	0.69	0.94	0.99	1		(89)
Mean internal	tompore	turo in t	ho roct	of dwalli	na T	72 (follow st	nc 2	2 to 7	7 in Tahl	0.00)				
(90)m= 18.59	18.79	19.17	19.67	19.96	Ť	.04 20.05	20.		20	19.6	19.04	18.58		(90)
(11)		!									ng area ÷ (4		0.47	(91)
Managara da Garagara I			. 11 1.	.1) (I A T4	. /4		۸\ <u>T</u> 0				••••	`
Mean internal (92)m= 19.22	19.4	19.72	20.15	20.41		$ \begin{array}{c c} 1 = 1 \text{LA} \times 11 \\ \hline .49 & 20.5 \end{array} $	+ (1		20.44	20.08	19.6	19.21		(92)
Apply adjustm											19.0	19.21		(02)
(93)m= 19.22	19.4	19.72	20.15	20.41	_	.49 20.5	20		20.44	20.08	19.6	19.21		(93)
8. Space heati														· ·
Set Ti to the m			nperatur	e obtair	ned a	at step 11 of	Tabl	le 9t	o, so tha	t Ti,m=((76)m an	d re-calc	ulate	
the utilisation f						<u>'</u>					,		ı	
Jan	Feb	Mar	Apr	May	J	un Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisation factor	Ť	ī										i	1	4
(94)m= 0.99	0.99	0.97	0.9	0.73	0.	52 0.37	0.4	43	0.72	0.94	0.99	0.99		(94)
Useful gains, h		<u> </u>				. 04 047.05	1 007		000.4	074.00	050.45	05470		(OE)
` '	409.06	457.35	497.41	457.34		5.31 217.85	227	.64	332.1	371.03	356.45	354.76		(95)
Monthly avera	ge exter	6.5	8.9	11.7		8 I.6 16.6	16	. 4	14.1	10.6	7.1	4.2		(96)
Heat loss rate											1 '.1	7.4		(00)
(97)m= 874.98	846.6	769	642.6	495.76	_	30 218.42	228	_	357.48	540.07	716.56	866.86		(97)
Space heating														• •
· -	294.03	231.87	104.53	28.59		0 0	- 1 / 0	1	0	125.77	259.28	381		
		!			Ь	<u> </u>					1	<u> </u>	l	

Total per year (kWh/y	ear) = Sum(9	98)15,912 =	1800.63	(98)				
Space heating requirement in kWh/m²/year			33.37	(99)				
9a. Energy requirements – Individual heating systems including micro-CHP)								
Space heating:		_		-				
Fraction of space heat from secondary/supplementary system			0	(201)				
Fraction of space heat from main system(s) $(202) = 1 - (201) =$		Ĺ	1	(202)				
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$		Į	1	(204)				
Efficiency of main space heating system 1		L	93.5	(206)				
Efficiency of secondary/supplementary heating system, %			0	(208)				
Jan Feb Mar Apr May Jun Jul Aug Sep Oc	Nov	Dec	kWh/ye	ar				
Space heating requirement (calculated above)								
375.57 294.03 231.87 104.53 28.59 0 0 0 0 125.7	7 259.28	381						
211)m = {[(98)m x (204)] } x 100 ÷ (206)	•			(211)				
401.68 314.47 247.99 111.8 30.57 0 0 0 0 134.5		407.49		_				
Total (kWh/year) =Su	n(211) _{15,101}	2=	1925.81	(211)				
Space heating fuel (secondary), kWh/month								
= {[(98)m x (201)] } x 100 ÷ (208)	<u> </u>							
215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0		¬				
Total (kWh/year) =Su	II(213) _{15,101}	2=	0	(215)				
Water heating								
Output from water heater (calculated above) 172.39 152.1 160.12 144.07 141.57 127.04 122.54 133.74 133.28 149.3	6 157.27	168.42						
Efficiency of water heater			79.8	(216)				
217)m= 86.84 86.54 85.8 83.97 81.42 79.8 79.8 79.8 79.8 84.30	86.14	86.93		(217)				
Fuel for water heating, kWh/month								
219)m = (64)m x 100 ÷ (217)m		1						
219)m= 198.52 175.75 186.62 171.56 173.88 159.2 153.55 167.59 167.01 177.0		193.74		٦				
Total = Sum(219a) ₁₁₂		L	2107.07	(219)				
Annual totals Space heating fuel used, main system 1	kWh/yea	r 「	1925.81	r ¬				
		L		╡				
Nater heating fuel used		L	2107.07					
Electricity for pumps, fans and electric keep-hot								
central heating pump:		30		(2300				
boiler with a fan-assisted flue		45		(230				
) =		75	(231)				
Fotal electricity for the above, kWh/year sum of (230a)(230g	Electricity for lighting							
, , , , , , , , , , , , , , , , , , , ,			247.96	(- /				
,		L T	4355.84	(232)				

Energy kWh/year **Emissions**

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	415.98	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	455.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =			871.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	128.69	(268)
Total CO2, kg/year	sum	of (265)(271) =		1038.72	(272)

TER =

(273)

19.25

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:05:40*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 69.44m²Site Reference:Highgate Road - GREENPlot Reference: 02 - E

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 16.69 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

14.29 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 33.7 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Windows facing: South West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m ² K	
Community heating, heat from boilers – mains gas		

		- 11	lcor D	etails:						
A Nove	NIa il la ala aus	U			- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012	2		Stroma Softwa					010943 on: 1.0.5.50	
Continuito Humo.	5.15.11.4.1 57.11 25.1.			Address:		OlOII.		7 0 10 10	711 11010100	
Address :		·								
1. Overall dwelling dime	ensions:									
Ground floor		ı	Area		(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	-) . (4 -) . (4 -) . (4 -) . (4 -)	\. (4.5\ [(1a) x	2	65	(2a) =	184.02	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e))+(1n)	69	9.44	(4)) (O.) (O.)	I) (O)	(0.)		_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	184.02	(5)
2. Ventilation rate:	main se	condary		other		total			m³ per hou	r
Number of allignments	heating heating	eating	+ [1 _ F			40 =		_
Number of chimneys		0	<u> </u>	0] = [0			0	(6a)
Number of open flues	0 +	0	+	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	2		10 =	20	(7a)
Number of passive vents	3					0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (68	a)+(6b)+(7a)+	+(7b)+(7	7c) =	Г	20		÷ (5) =	0.11	(8)
	peen carried out or is intende				ontinue fr			. (0) –	0.11	
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber for seart, use the value corresponding.				•	uction			0	(11)
deducting areas of openi		oriaing to the	e greate	er wall area	a (aner					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 ((seale	d), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0								0	(13)
· ·	s and doors draught str	ripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10) -					0	(16)
•	q50, expressed in cubi			•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has					is heina u	sad		0.36	(18)
Number of sides sheltere		been done o	n a deg	nee an per	теаышу	is being u	seu		0	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			1	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.36	(21)
Infiltration rate modified f	or monthly wind speed							!		
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2\m ÷ 4									
<u> </u>	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
` '			-						J	

djusted infiltration rate (allowi				`	`		1		1	
0.46 0.45 0.44 Calculate effective air change i	0.39 0.39	0.34 icable ca	0.34	0.33	0.36	0.39	0.4	0.42		
If mechanical ventilation:	ato for the appli	00070 00							0	(2
If exhaust air heat pump using Appe	endix N, (23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		ĺ	0	(2
If balanced with heat recovery: effici	ency in % allowing t	for in-use f	actor (fron	n Table 4h) =			ĺ	0	(2
a) If balanced mechanical ve	ntilation with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
.4a)m= 0 0 0	0 0	0	0	0	0	0	0	0		(2
b) If balanced mechanical ve	ntilation without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		1	
(4b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(2
c) If whole house extract ven if $(22b)m < 0.5 \times (23b)$, t	•	•				5 × (23b))			
(4c)m = 0 0 0	0 0	0	0	0	0	0	0	0		(2
d) If natural ventilation or whif (22b)m = 1, then (24d)	•					0.5]				
24d)m= 0.6 0.6 0.6	0.58 0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(2
Effective air change rate - en	ter (24a) or (24l	b) or (24	c) or (24	d) in box	(25)					
25)m= 0.6 0.6 0.6	0.58 0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(2
3. Heat losses and heat loss p	parameter:									
LEMENT Gross area (m²)	Openings m²	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·ł		X k J/K
indows Type 1		8.97	_ ,	/[1/(1.4)+		11.89	$\stackrel{\prime}{\Box}$			(
indows Type 2		2.92	x1.	/[1/(1.4)+	0.04] =	3.87				(:
/alls Type1 41.51	11.89	29.62	2 x	0.18	─ - i	5.33	Ħ r			
/alls Type2 16.73	0	16.73	3 x	0.18	-	3.01	F i			(2
otal area of elements, m ²		58.24	=							
arty wall		40.43	3 x	0	=	0				(:
arty floor		69.44								
arty ceiling		69.44	=				Ī			
iternal wall **		136.2	<u>=</u>				Ī		i	(;
for windows and roof windows, use e include the areas on both sides of in		alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] á	L as given in	paragraph	3.2	,
abric heat loss, $W/K = S (A x)$	U)			(26)(30)	+ (32) =				24.11	(
eat capacity Cm = S(A x k)					((28).	.(30) + (32	2) + (32a).	(32e) =	10687.04	(
nermal mass parameter (TMF	P = Cm ÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(
r design assessments where the de n be used instead of a detailed calcu		tion are no	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
nermal bridges : S (L x Y) cal	culated using Ap	pendix I	K						6.83	(
details of thermal bridging are not kn	$own(36) = 0.05 \times (3)$	31)			(33) 1	(26) -		ı		<u> </u>
otal fabric heat loss entilation heat loss calculated	monthly					$(36) =$ $= 0.33 \times ($	25)m v (F)	 	30.94	(
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 36.71 36.47 36.22	35.09 34.88	33.89	33.89	33.7	34.27	34.88	35.31	35.76		(
,	01.00	1 -5.55	1 -0.00	I	<u> </u>	<u> </u>	<u> </u>	1 -00		`
eat transfer coefficient, W/K 9)m= 67.65 67.4 67.16	66.03 65.82	64.83	64.83	64.64	(39)m 65.21	= (37) + (37) 65.82	66.25	66.69		
700 = 1 D/DO 1 D/4 1 D/16 1	00.03 I 05.8/	i 04.63	i 04.63	1 04.04	i və.ZT	เ บอ.ฮ่∠	i 00.∠5	1 00.09 l		

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.97	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96		
Number of day	re in mo	nth (Tab	lo 10)					,	Average =	Sum(40) ₁ .	12 /12=	0.95	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•											
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9))2)] + 0.0	0013 x (⁻	ΓFA -13.		23		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the a	welling is	designed t			se target o		.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 95.94	92.45	88.97	85.48	81.99	78.5	78.5	81.99	85.48	88.97	92.45	95.94		
Energy content of	hot water	used - cal	culated m	onthly – 4	190 v Vd r	n v nm v F	Tm / 3600			m(44) ₁₁₂ =	L	1046.65	(44)
(45)m= 142.28	124.44	128.41	111.95	107.42	92.7	85.9	98.57	99.74	116.24	126.89	137.79		
(40)111= 142.20	124.44	120.41	111.55	107.42	32.1	00.0	30.37			m(45) ₁₁₂ =		1372.32	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(12/112	L		` ′
(46)m= 21.34	18.67	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67		(46)
Water storage		\ in aludin		olor or M	WHDC	otoro ao	within or		001				(47)
Storage volum If community h	, ,		-			_		anie ves	9 C I		150		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufactHot water stora			-								0		(51)
If community h	-			- (-77					<u> </u>		(= -)
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	,						,		0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m 				
(56)m= 23.33 If cylinder contains	21.07 dedicate	23.33 d solar sto	22.58 rage. (57)	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Appendi	ix H	(56)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
									<u> </u>		0		(58)
Primary circuit Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m			·		(50)
(modified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

On all land and later	1 ((04)	(00) 0	DE (44)	.						
Combi loss calculated $(61)m = \begin{bmatrix} 0 & 0 \end{bmatrix}$	o for each	montn ((61)m =	(60) ÷ 36	0 × (41))m 0	0	0	0	0		(61)
							<u> </u>		<u> </u>	ļ	(F0)m + (G1)m	(01)
Total heat required fo (62)m= 188.88 166.53	_	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	(59)111 + (61)111	(62)
Solar DHW input calculated						<u> </u>						(02)
(add additional lines in								ii continbut	ion to wate	er neating)		
(63)m = 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water he	 ater				<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>			, ,
(64)m= 188.88 166.53	_	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39		
`						<u> </u>	out from w	ater heate	I r (annual)₁	12	1920.94	(64)
Heat gains from water heating, kWh/month 0.25 $^{'}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m											1	-
(65)m= 84.58 75.04	79.97	73.3	72.99	66.89	65.84	70.05	69.24	75.93	78.26	83.09	1	(65)
include (57)m in ca	culation (of (65)m	onlv if c	vlinder i	s in the	dwellina	or hot w	ater is fr	om com	munitv h	ı ıeatina	
5. Internal gains (se			•	,		J				• •	<u> </u>	
Metabolic gains (Tabl			,									
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 111.62 111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62		(66)
Lighting gains (calcula	ated in Ar	pendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5	•		•		
(67)m= 18 15.98	13	9.84	7.36	6.21	6.71	8.72	11.71	14.87	17.35	18.5		(67)
Appliances gains (cal	culated in	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m= 195.99 198.02	192.9	181.98	168.21	155.27	146.62	144.59	149.71	160.62	174.4	187.34		(68)
Cooking gains (calcul	ated in A	ppendix	L, equat	ion L15	or L15a), also se	ee Table	5		!		
(69)m= 34.16 34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16		(69)
Pumps and fans gain:	s (Table 5	Ба)				•		•	•	•		
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evaporati	on (negat	tive valu	es) (Tab	le 5)				•		•	•	
(71)m= -89.3 -89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3		(71)
Water heating gains (Table 5)					•		•		•	•	
(72)m= 113.69 111.67	107.49	101.8	98.11	92.91	88.49	94.15	96.16	102.05	108.7	111.68		(72)
Total internal gains	=			(66)	m + (67)m	n + (68)m +	+ (69)m +	(70)m + (7	1)m + (72))m	•	
(73)m= 387.16 385.17	372.87	353.12	333.17	313.88	301.31	306.95	317.07	337.03	359.93	377.01		(73)
6. Solar gains:												
Solar gains are calculated	_	r flux from	Table 6a	and assoc	iated equa	itions to co	nvert to th	ne applicat		tion.		
Orientation: Access		Area		Flu		-	g_ able 6b	_	FF		Gains	
Table 6	ı ———	m ²		Tai	ole 6a	,	able ob		able 6c		(W)	7
Northeast 0.9x 0.77	7 X	8.9)7	x 1	1.28	X	0.63	x	0.7	=	30.93	(75)
Northeast _{0.9x} 0.77	7 X	8.9	97	X 2	2.97	X	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x 0.77	7 X	8.9	97	X 4	1.38	X	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x 0.77	7 X	8.9	97	× 6	57.96	X	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x 0.77	7 X	8.9	97	x 9	1.35	x	0.63	x	0.7	=	250.41	(75)

		_					1		_				_
Northeast _{0.9x}	0.77	X	8.9	7	X (97.38	X	0.63	X	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	X	8.9	7	X	91.1	X	0.63	X	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	X	8.9	7	X	72.63	X	0.63	X	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	X	8.9	7	X E	50.42	X	0.63	X	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	X	8.9	7	x 2	28.07	X	0.63	X	0.7	=	76.94	(75)
Northeast _{0.9x}	0.77	X	8.9	7	X	14.2	X	0.63	X	0.7	=	38.92	(75)
Northeast 0.9x	0.77	X	8.9	7	X	9.21	X	0.63	X	0.7	=	25.26	(75)
Southwest _{0.9x}	0.77	X	2.9	2	x 3	36.79]	0.63	X	0.7	=	32.83	(79)
Southwest _{0.9x}	0.77	X	2.9	2	x (62.67		0.63	x	0.7	=	55.93	(79)
Southwest _{0.9x}	0.77	X	2.9	2	X 8	35.75]	0.63	X	0.7	=	76.52	(79)
Southwest _{0.9x}	0.77	х	2.9	2	x 1	06.25		0.63	X	0.7	=	94.82	(79)
Southwest _{0.9x}	0.77	х	2.9	12	x 1	19.01]	0.63	x	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	x	2.9	2	x 1	18.15]	0.63	x	0.7	_	105.44	(79)
Southwest _{0.9x}	0.77	х	2.9	2	x 1	13.91		0.63	х	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	x	2.9	2	x 1	04.39]	0.63	x	0.7	_	93.16	(79)
Southwest _{0.9x}	0.77	x	2.9	2	x S	92.85]	0.63	x	0.7	=	82.86	(79)
Southwest _{0.9x}	0.77	x	2.9	2	x e	69.27	Ī	0.63	x	0.7		61.81	(79)
Southwest _{0.9x}	0.77	x	2.9	2	X Z	14.07	Ī	0.63	x	0.7		39.33	(79)
Southwest _{0.9x}	0.77	x	2.9	2	x = 3	31.49	ĺ	0.63	x	0.7	<u> </u>	28.1	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m= 63.76		89.96	281.11	356.62	372.4	351.39	292	.25 221.08	138.7	78.25	53.36		(83)
Total gains – i		-	. ,									1	<i>(</i>)
(84)m= 450.92	504.05	62.83	634.22	689.78	686.28	652.7	599	9.2 538.15	475.7	3 438.18	430.36		(84)
7. Mean inte	rnal temper	rature	(heating	season)								
Temperature	during hea	ating p	eriods ir	the livin	ng area	from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation fac	 -			ea, h1,m	(see Ta	able 9a)						1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.93	0.8	0.59	0.44	0.4	19 0.77	0.96	0.99	1		(86)
Mean interna	al temperati	ure in I	iving are	ea T1 (fo	llow ste	ps 3 to 7	7 in T	able 9c)		_		<u>.</u>	
(87)m= 20.05	20.18	20.41	20.71	20.91	20.99	21	2	1 20.95	20.68	20.32	20.03		(87)
Temperature	during hea	ating p	eriods ir	rest of	dwelling	from Ta	able 9	9, Th2 (°C)					
(88)m= 20.1	20.11	20.44	20.12	20.13	20.14	20.14	20.	14 20.13	20.13	20.12	20.12		(88)
` ′	<u> </u>			welling,	h2,m (se	ee Table	9a)						
Utilisation fac	ctor for gair			welling, 0.75	h2,m (se	ee Table	9a) 0.	4 0.7	0.94	0.99	1		(89)
Utilisation fac	ctor for gair	ns for r 0.98	est of d	0.75	0.52	0.35	0.	l		0.99	1		(89)
Utilisation fac	otor for gair	ns for r 0.98	est of d	0.75	0.52	0.35	0.	to 7 in Tab			1 18.82]	(89)
Utilisation faction (89)m= 1 Mean internation	otor for gair	ns for r 0.98 ure in t	est of do 0.91 the rest	0.75 of dwelli	0.52 ng T2 (f	0.35	0. eps 3	to 7 in Tab	e 9c)		18.82	0.34	, ,
Utilisation factors (89)m= 1 Mean internation (90)m= 18.84	o.99 al temperati	ns for r 0.98 ure in t	0.91 the rest	0.75 of dwelli 20.05	0.52 ng T2 (f 20.13	0.35 ollow ste	0. eps 3	to 7 in Tab	e 9c)	19.24	18.82	0.34	(90)
Utilisation factors (89)m= 1 Mean internation (90)m= 18.84 Mean internation (90)m= 18.84	ctor for gair 0.99 al temperate 19.03	ns for r 0.98 ure in t 19.36	est of do 0.91 the rest 19.79	0.75 of dwelli 20.05	0.52 ng T2 (f 20.13	0.35 ollow ste 20.14 LA × T1	0. eps 3 20.	to 7 in Table 14 20.1 - fLA) × T2	e 9c) 19.76 LA = Liv	19.24 ving area ÷ (-	18.82	0.34	(90)
Utilisation factors (89)m= 1 Mean internation (90)m= 18.84	ctor for gair 0.99 al temperate 19.03 al temperate 19.43	ns for r 0.98 ure in 1 19.36 ure (fo	est of do 0.91 the rest 19.79 r the wh	0.75 of dwelli 20.05 ole dwe 20.34	0.52 ng T2 (f 20.13 lling) = f 20.43	0.35 ollow ste 20.14 LA × T1 20.43	0. eps 3 20. + (1 20.	to 7 in Tab 14 20.1 - fLA) × T2 43 20.39	e 9c) 19.76 LA = Liv	19.24 ring area ÷ (4	18.82	0.34	(90)

г													l	
(93)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24		(93)
			uirement											
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ا Utilisa			ains, hm	•	Iviay	<u> </u>	<u> </u>	<u> </u>	СОР	000	1101	200		
(94)m=	0.99	0.99	0.97	0.91	0.76	0.54	0.38	0.43	0.72	0.94	0.99	1		(94)
ւ Usefu	I gains,	hmGm	, W = (94	1)m x (84	4)m	ļ	ļ				<u> </u>		l	
(95)m=	448.52	498.69	547.41	578.07	525.27	372.74	248.03	259.75	387.12	448.63	433.16	428.57		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8						•		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1011.55	979.19	888.07	739.88	568.97	377.65	248.52	260.77	410.09	623.73	828.81	1002.75		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	,	ı	
(98)m=	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1986.58	(98)
Space	Space heating requirement in kWh/m²/year											28.61	(99)	
9a. Ene	ergy rec	uiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space	e heatir	ng:			j		J		, ,					
Fraction	on of sp	ace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction	Fraction of space heat from main system(s) (202) = 1 - (201) =										1	(202)		
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$											1	(204)		
Efficiency of main space heating system 1										93.5	(206)			
Efficiency of secondary/supplementary heating system, %										0	(208)			
]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ′
Space			ement (c	•		l	Jui	₁ Aug	ССР	001	1407	Dec	KVVIII y C	AI
	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19		
۱ (211)m	= {[(98)m x (20)4)] } x 1	00 ÷ (20	L)6)	ļ	ļ	<u> </u>			<u> </u>			(211)
(211)	448.02	345.34	271.07	124.6	34.78	0	0	0	0	139.32	304.67	456.89		(=)
L			<u> </u>					Tota	l I (kWh/yea	ar) =Sum(2	L 211) _{15.1012}	<u>. </u>	2124.68	(211)
Space	e heatin	a fuel (s	econdar	v) k\//h/	month									
•		•	00 ÷ (20											
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u></u>	0	(215)
Water	heating	I												
Output	from w	ater hea	ter (calc	ulated a	bove)									
L	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39		_
Efficien	ncy of w	ater hea	iter										79.8	(216)
(217)m=	86.88	86.55	85.8	84.03	81.48	79.8	79.8	79.8	79.8	84.23	86.15	86.98		(217)
		•	kWh/mo											
) ÷ (217)		100.00	170.67	166.02	101.01	101 5	102.22	100.62	244.00		
(219)m=	∠17.4	192.4	203.97	186.89	189.02	172.67	166.03	181.91 Tota	181.5 Il = Sum(2 ²	193.33	199.62	211.98	2206 74	7(240)
Λ mm··-	l totala							1018	– Juiii(2		Mb 4		2296.71	(219)
	I totals heating	fuel use	ed, main	system	1					K	Wh/yeaı		kWh/year 2124.68	7
,	3		,	,										J

Water heating fuel used				2296.71	7					
Electricity for pumps, fans and electric keep-hot					_					
central heating pump:			30]	(230c)					
boiler with a fan-assisted flue			45]	(230e)					
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)					
Electricity for lighting	317.84	(232)								
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 4814.23 (338)										
12a. CO2 emissions – Individual heating systems including micro-CHP										
	Energy	Emission fac	ctor	Emissions						
	kWh/year	kg CO2/kWh		kg CO2/yea	ar					
Space heating (main system 1)	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	ar](261)					
Space heating (main system 1) Space heating (secondary)	•		=		_					
	(211) x	0.216		458.93	(261)					
Space heating (secondary)	(211) x (215) x	0.216	=	458.93	(261) (263)					
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216	=	458.93 0 496.09	(261) (263) (264)					
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	=	458.93 0 496.09 955.02	(261) (263) (264) (265)					
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= =	458.93 0 496.09 955.02 38.93	(261) (263) (264) (265) (267)					

TER =

(273)

16.69

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:05:23

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:**

Flat

Total Floor Area: 69.61m²

Dwelling Details:

NEW DWELLING DESIGN STAGE

Plot Reference: Site Reference : Highgate Road - GREEN 02 - F

Address:

Client Details:

Name:

Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 16.77 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.35 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 34.0 kWh/m²

OK

OK

OK

2 Fabric U-values

Element Average Highest 0.18 (max. 0.70) External wall 0.18 (max. 0.30)

Party wall 0.00 (max. 0.20)

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Windows facing: South West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers - mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve		010943 on: 1.0.5.50			
Address :	F	Property	Address	02 - F					
1. Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor			69.61	(1a) x	2	2.65	(2a) =	184.47	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	69.61	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	184.47	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	_ + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	x '	10 =	20	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per he	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	20		÷ (5) =	0.11	(8)
Number of storeys in the		iu io (17),	otrierwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250 amaza dia adia adia mata		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	etre or e	envelope	area	5	(17)
•	s if a pressurisation test has been do				is being u	sed		0.36	(10)
Number of sides sheltere	d							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.36	(21)
Infiltration rate modified for		1	1 .			<u> </u>		1	
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0 4.4 4.3 3.8	3.6	3.1	4	4.3	4.0	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4	_						•	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

· -		<u> </u>					(21a) x	` 	T	T			
0.46 Calculate effe	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
If mechanica		•	ale ioi i	пе аррп	саыс са	3 C					Ī	0	(2
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)		i	0	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =			i	0	<u> </u>
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [ı (23c) – 1	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b)m = (22	2b)m + (23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ver	tilation o	or positiv	e input v	ventilatio	n from c	utside	•	•			
if (22b)n	n < 0.5 ×	(23b), t	hen (24	c) = (23b); other	wise (24	c) = (22b	o) m + 0.	.5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n				•	•				0.5]				
24d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
3. Heat losse	o ond be	at loss r	oromot	241			•		•	•			
LEMENT	S and ne	_	Openin		Net Ar	A2	U-valı	IΩ	AXU		k-value	Δ Δ	Χk
LEWEN	area	_	m		A,r		W/m2		(W/		kJ/m²-k		J/K
/indows Type	. 1				8.97	x1	/[1/(1.4)+	0.04] =	11.89				(2
/indows Type	2				2.92	x1.	/[1/(1.4)+	0.04] =	3.87	\equiv			(2
Valls Type1	41.5	59	11.89	€	29.7	x	0.18	ˈ = i	5.35	Ħ ſ			(2
Valls Type2	18.4	ļ1	0		18.41	X	0.18	<u> </u>	3.31	=		ī	<u> </u>
otal area of e	lements	, m²			60								 (3
arty wall					38.68	x	0		0				(3
arty floor					69.61		<u> </u>					i	(3
arty ceiling					69.61	=						╡ ├─	— `(3
nternal wall **					136.2	_						-	(3
for windows and		ows. use e	ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	L as aiven in	n paragraph		(
include the area								2(, ,	3	7-1-3-17		
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				24.42	(3
leat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	10725.79	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assess an be used inste				construct	ion are noi	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix I	<						6.83	(:
details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he								(33) +	(36) =		l	31.26	(;
entilation hea	i				<u> </u>		ī		= 0.33 × (
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	36.55	36.3	35.17	34.96	33.97	33.97	33.78	34.35	34.96	35.39	35.84		(3
8)m= 36.79	<u> </u>					l		l					
8)m= 36.79 eat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m			

Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.98	0.97	0.97	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.96	0.96		
Number of day	ıc in ma	nth (Tab	lo 10)					,	Average =	Sum(40) ₁ .	12 /12=	0.95	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		24		(42)
if TFA £ 13.9 Annual averag	•	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		87	.32		(43)
Reduce the annua							ò achieve	a water us	se target o				
not more that 125								_					
Jan Hot water usage ii	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	,				1			05.57	00.07	00.50	00.05		
(44)m= 96.05	92.56	89.07	85.57	82.08	78.59	78.59	82.08	85.57	89.07	92.56	96.05	4047.04	7(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1047.84	(44)
(45)m= 142.44	124.58	128.56	112.08	107.54	92.8	85.99	98.68	99.86	116.37	127.03	137.95		
(10)										m(45) ₁₁₂ =	l l	1373.88	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(- /			`
(46)m= 21.37	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69		(46)
Water storage					Į	Į	Į			!			
Storage volum	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '	\	(01: /	47)			
Otherwise if no Water storage		not wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWh	n/dav).				1	39		(48)
Temperature fa				51 10 Mile	("uay).					54		(49)
Energy lost fro				ear			(48) x (49)) <u>=</u>					(50)
b) If manufact		_	-		or is not		(40) X (40)	, –		0.	75		(30)
Hot water store	age loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	ıy)					0		(51)
If community h	_		on 4.3										
Volume factor			Ol-							—	0		(52)
Temperature fa											0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (. , .	,					((50) (EE) (44)		0.	75		(55)
Water storage		culated i				i	((56)M = (55) × (41)ı	m ———	,			
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Append	IX H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	•	•									0		(58)
Primary circuit				•	•	. ,	, ,						
(modified by					ı —	ı —				<u> </u>			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	0	0) 0		0	0	0	0]	(61)
	uired for	water h	L eating ca	Lalculated	L I for ea	 ch month	(62)	— m =	0.85 × (′45)m +		(57)m +	ו · (59)m + (61)m	
(62)m= 189.04	166.67	175.15	157.17	154.14	137.89		145	_	144.95	162.97	172.12	184.54]	(62)
Solar DHW input	calculated	using App	endix G o	r Appendix	H (nega	tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	1	
(add additiona												0,		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0	1	(63)
Output from w	ater hea	ter				•					•	!	•	
(64)m= 189.04	166.67	175.15	157.17	154.14	137.89	132.59	145	.27	144.95	162.97	172.12	184.54]	
						•		Outp	out from wa	ater heate	er (annual)	112	1922.5	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	n]	
(65)m= 84.64	75.09	80.02	73.34	73.03	66.93	65.87	70.	09	69.28	75.97	78.31	83.14]	(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):										
Metabolic gair	ns (Table	5). Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.83	111.83	111.83	111.83	111.83	111.83	111.83	111	.83	111.83	111.83	111.83	111.83	1	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5		•		•	
(67)m= 18.04	16.02	13.03	9.87	7.37	6.23	6.73	8.7	'4	11.74	14.9	17.39	18.54]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 196.39	198.42	193.29	182.36	168.55	155.58	146.92	144	.88	150.02	160.95	174.75	187.72]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	or L15a), als	o se	e Table	5	•		•	
(69)m= 34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.	18	34.18	34.18	34.18	34.18]	(69)
Pumps and fa	ns gains	(Table 5				•							•	
(70)m= 3	3	3	3	3	3	3	3	1	3	3	3	3]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)	•					•		•	
(71)m= -89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.	.46	-89.46	-89.46	-89.46	-89.46]	(71)
Water heating	gains (T	able 5)									•		•	
(72)m= 113.76	111.74	107.55	101.86	98.16	92.96	88.53	94.	.2	96.22	102.11	108.77	111.75]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m	•	
(73)m= 387.74	385.74	373.42	353.63	333.64	314.32	301.73	307	.38	317.52	337.51	360.46	377.56]	(73)
6. Solar gain	s:					•					•			
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica	ble orienta	tion.		
Orientation:			Area			ux		_	g_	-	FF		Gains	
_	Table 6d		m²			able 6a			able 6b	_ ' 	able 6c		(W)	_
Northeast _{0.9x}	0.77	Х	8.9	97	х	11.28	X		0.63	x	0.7	=	30.93	(75)
Northeast _{0.9x}	0.77	X	8.8	97	х	22.97	X		0.63	x	0.7	=	62.96	(75)
Northeast _{0.9x}	0.77	X	8.8	97	x	41.38	X		0.63	x	0.7	=	113.43	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	67.96	X		0.63	x	0.7	=	186.29	(75)
Northeast _{0.9x}	0.77	X	8.9	97	X	91.35	X		0.63	X	0.7	=	250.41	(75)

Northeast 0.5%			_			_		,		_				_
Northeast 0.ax	Northeast _{0.9x}	0.77	X	8.9	7	x	97.38	X	0.63	X	0.7	=	266.96	(75)
Northeast 0, 8x	L	0.77	X	8.9)7	x	91.1	X	0.63	X	0.7	=	249.74	(75)
Northeast 0.8x	<u>L</u>	0.77	X	8.9)7	x	72.63	X	0.63	X	0.7	=	199.1	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	8.9	7	X	50.42	X	0.63	X	0.7	=	138.22	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	8.9)7	x	28.07	X	0.63	X	0.7	=	76.94	(75)
Southwesto, 9x	Northeast _{0.9x}	0.77	X	8.9)7	x	14.2	X	0.63	X	0.7	=	38.92	(75)
Southwesto, 9x	Northeast 0.9x	0.77	X	8.9)7	x	9.21	X	0.63	x	0.7	=	25.26	(75)
Southwesto.9x	Southwest _{0.9x}	0.77	X	2.9)2	x	36.79]	0.63	x	0.7	=	32.83	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	X	2.9)2	x	62.67]	0.63	x	0.7	=	55.93	(79)
Southwesto.9x	Southwest _{0.9x}	0.77	X	2.9)2	x	85.75]	0.63	x	0.7	=	76.52	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	x	2.9)2	x	106.25]	0.63	х	0.7	=	94.82	(79)
Southwesto.9x	Southwest _{0.9x}	0.77	X	2.9)2	x	119.01		0.63	х	0.7	=	106.2	(79)
Southwest0,9x	Southwest _{0.9x}	0.77	x	2.9)2	x	118.15	Ī	0.63	x	0.7		105.44	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	x	2.9)2	x	113.91	Ī	0.63	x	0.7		101.65	(79)
Southwest0.9x	Southwest _{0.9x}	0.77	x	2.9)2	x	104.39	Ī	0.63	x	0.7	=	93.16	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	x	2.9)2	x	92.85	Ī	0.63	x	0.7		82.86	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 63.76	Southwest _{0.9x}	0.77	x	2.9)2	x	69.27	Ī	0.63	x	0.7		61.81	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 63.76 118.89 189.96 281.11 356.62 372.4 351.39 292.25 221.08 138.76 78.25 53.36 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.93 0.8 0.6 0.44 0.49 0.77 0.96 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.12 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) #IA = Living area + (4) = 0.38 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.46 20.42 20.11 19.64 19.27	Southwest _{0.9x}	0.77	x	2.9)2	x	44.07	ĺ	0.63	x	0.7		39.33	(79)
(83)m= 63.76 118.89 189.96 281.11 356.62 372.4 351.39 292.25 221.08 138.76 78.25 53.36 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	Southwest _{0.9x}	0.77	x	2.9)2	x	31.49	ĺ	0.63	×	0.7	╡ -	28.1	(79)
(83)m= 63.76 118.89 189.96 281.11 356.62 372.4 351.39 292.25 221.08 138.76 78.25 53.36 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	•							_						
(83)m= 63.76 118.89 189.96 281.11 356.62 372.4 351.39 292.25 221.08 138.76 78.25 53.36 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	Solar gains in	watts, cale	culated	for eac	h month			(83)m	n = Sum(74)m :	(82)m				
Ref Ref	<u> </u>	1 1					351.39	292	.25 221.08	138.7	6 78.25	53.36		(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.93 0.8 0.6 0.44 0.49 0.77 0.96 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.13 20.14 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	Total gains – i	nternal an	d solar	(84)m =	= (73)m	+ (83)	n , watts		•	•	•	•	-	
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.93 0.8 0.6 0.44 0.49 0.77 0.96 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	(84)m= 451.5	504.63	563.38	634.74	690.26	686.7	2 653.12	599	.63 538.6	476.2	7 438.71	430.92		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean inter	nal tempe	rature	(heating	season)								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				`		,	a from Ta	ble 9	, Th1 (°C)				21	(85)
(86)m= 1 0.99 0.98 0.93 0.8 0.6 0.44 0.49 0.77 0.96 0.99 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	Utilisation fac	ctor for gai	ns for I	iving are	ea, h1,m	(see	Table 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04	Jan	Feb	Mar	Apr	May	Jur	n Jul	A	ug Sep	Oct	Nov	Dec		
(87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	(86)m= 1	0.99	0.98	0.93	0.8	0.6	0.44	0.4	19 0.77	0.96	0.99	1		(86)
(87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	Mean interna	l temperat	ture in l	living ar	ea T1 (fo	ollow s	tens 3 to	7 in T	able 9c)	•		•		
(88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)		г - г	T I		· `	1	-i	_		20.68	20.31	20.03]	(87)
(88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	Tomporatura	during ho	ating n	oriode ir	roct of	dwolli	og from Tr	abla (Th2 (°C)	<u>!</u>	_!	<u>!</u>	ı	
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	·	, <u> </u>				1	<u> </u>	_		20.12	20.12	20.11]	(88)
(89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	` ′	<u> </u>					I				1 -5			, ,
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= $\begin{bmatrix} 18.83 & 19.02 & 19.35 & 19.78 & 20.04 & 20.13 & 20.14 & 20.14 & 20.09 & 19.75 & 19.23 & 18.81 & (90) \\ & & & & & & & & & & & & & & & & & & $, <u> </u>	i			1	1	T _	4 0.7		1 0 00	<u> </u>	1	(90)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(89)m= 1	0.99	0.98	0.91	0.75	0.52	0.35	0.	4 0.7	0.94	0.99	1		(69)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)		l temperat	ture in t	the rest	of dwell	ing T2	(follow ste	eps 3	to 7 in Tab	le 9c)		1	1	
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	(90)m= 18.83	19.02	19.35	19.78	20.04	20.13	20.14	20.				<u> </u>		_ ` ′
(92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)									•	tLA = Liv	/ing area ÷ (4) =	0.38	(91)
	Mean_interna	l temperat	ture (fo	r the wh	ole dwe	lling) =	= fLA × T1	+ (1	– fLA) × T2				_	
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	(92)m= 19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.	46 20.42	20.11	19.64	19.27		(92)
	Apply adjustr	ment to the	e mean	interna	temper	ature 1	rom Table	e 4e,	where appr	opriate				

(02)	40.00	40.40	40.75	20.42	20.27	20.40	20.40	00.40	20.40	20.44	40.04	40.07		(93)
(93)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27		(93)
			uirement				44 -4	Table 0	41	4 T: /	70)	-11-	late	
			or gains			ed at ste	ер ттог	rable 9	o, so tha	t 11,m=(rojm an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	:										
(94)m=	0.99	0.99	0.97	0.91	0.77	0.55	0.39	0.44	0.72	0.94	0.99	1		(94)
Usefu			, W = (9 ²	<u> </u>			T	,	1		1	1	ı	
(95)m=	449.14	499.38	548.31	579.82	528.59	376.65	251.51	263.23	390.23	449.79	433.81	429.17		(95)
	nly aver	age exte	rnal tem	perature			•	,				,		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
							-``	- ` 	– (96)m					
	1020.07		895.47	746.2	574.32	381.94	252.05	264.36	414.51	629.39	836	1011.25		(97)
Space			ı		nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	r		1	
(98)m=	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07		_
								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	2021.06	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								29.03	(99)
0a En	eray rea	uiremer	nts – Indi	vidual b	eating s	veteme i	ncluding	micro-C	'HDI					
	e heatir		its — Iriui	viduai II	eating s	y Sterris i	ricidaling	i illicio-c) II <i>)</i>					
•		•	at from s	econdar	v/supple	mentarv	svstem						0	(201)
	•		at from m			,	•	(202) = 1	- (201) =			-	1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	-									93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	alculate	d above))							•	
	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07		
(211)m	n = {[(98)m x (20	(4)] } x 1	00 ÷ (20)6)								l	(211)
(=)	454.3	350.72	276.24	128.12	36.39	0	0	0	0	142.92	309.71	463.17		()
								Tota	l I (kWh/yea	ar) =Sum(2	1 211), _{510 10}	<u> </u> ,=	2161.56	(211)
Space	o hoatin	a fual (e	econdar	v) k\//b/	month						7 10, 10 12		2.000	」` ′
•		`	00 ÷ (20	• , .	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
(- /		_							l (kWh/yea	ar) =Sum(2	1 215), _{540 4} ,	=	0	(215)
Motor	hootine									(- /15,1012	2	0	_(=:0)
	heating		ter (calc	اد امطواریا	hove)									
Output	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54		
Efficier	ncy of w	ater hea					<u> </u>		l		l		79.8	(216)
(217)m=		86.59	85.85	84.1	81.54	79.8	79.8	79.8	79.8	84.29	86.19	87.01	. 6.6	」` ′ (217)
, ,			kWh/mo		01.01	70.0	10.0	7 0.0	7 0.0	0 1.20	00.10	07.01		()
		•) ÷ (217)											
	217.51	192.48	204.02	186.88	189.02	172.8	166.15	182.05	181.64	193.34	199.7	212.08		
							•	Tota	I = Sum(2	19a) ₁₁₂ =		•	2297.68	(219)
Annua	al totals									k\	Wh/year	·	kWh/year	
		fuel use	ed, main	system	1						•		2161.56	1
													<u> </u>	_

Water heating fuel used				2297.68	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting				318.62	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4852.86	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	<u>_</u>				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)			ctor =		
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar ¬
	kWh/year	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 466.9 0 496.3	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= =	kg CO2/yea 466.9 0 496.3 963.2	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.519	= = =	kg CO2/yea 466.9 0 496.3 963.2 38.93	(261) (263) (264) (265) (267)

TER =

(273)

16.77

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:05:10*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 50.62m²Site Reference:Highgate Road - GREENPlot Reference: 02 - G

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.64 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.45 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

48.0 kWh/m²

29.7 kWh (res)

Dwelling Fabric Energy Efficiency (DFEE) 38.7 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.17 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					010943 on: 1.0.5.50	
Address :	F	Property	Address	: 02 - G					
1. Overall dwelling dime	ensions:								
J		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor			50.62	(1a) x	2	.65	(2a) =	134.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) =	50.62	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	134.14	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	<u> </u>	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				2	x 1	10 =	20	(7a)
Number of passive vents				Ē	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res				0	x 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per he	our
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.15	(8)
Number of storeys in the	een carried out or is intended, proceence	ea 10 (17),	otrierwise (conunue ii	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	ea (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)
Infiltration rate	250 averaged in autic mate		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	ietre oi e	envelope	area	5	(17)
· ·	es if a pressurisation test has been do				is being u	sed		0.4	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.4	(21)
Infiltration rate modified f	- 1 	1	Δ	0	0-4	Nan	Dan	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
(1	1	<u> </u>	<u> </u>	1	l	I	
Wind Factor (22a)m = (22	' 		_					1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.51	0.5	0.49	0.44	0.43	0.38	0.38	0.37	(22a)m _{0.4}	0.43	0.45	0.47		
Calculate effe			-		1		0.01	0.1	0.10	0.10	0.17		
If mechanic												0	(23
If exhaust air h		0		, ,	,	. ,	,, .	`) = (23a)			0	(23
If balanced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23
a) If balance	1					ery (MVI	HR) (24a	<u> </u>	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	1					- 	- ^ `	<u> </u>	 		1	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	nouse ex n < 0.5 ×			•	•				5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilatio	n or wh	ole hous	e positiv	/e input	L ventilatio	n from l	oft					
,	n = 1, the			•	•				0.5]				
24d)m= 0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25
3. Heat losse	es and he	eat loss r	paramete	er:									
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	re	AXU		k-value) A	λΧk
	area	(m ²)	· m		A ,r	m²	W/m2	K	(W/I	<)	kJ/m²-l	< k	J/K
Vindows					8.97	х1,	/[1/(1.4)+	0.04] =	11.89				(27
Valls Type1	31.4	4	8.97		22.43	3 X	0.18	=	4.04				(29
Valls Type2	22.9	92	0		22.92	<u>x</u>	0.18	= [4.13				(29
otal area of e	elements	, m²			54.32	2							(3
Party wall					30.08	3 x	0	=	0				(32
Party floor					50.62	2							(32
arty ceiling					50.62	2				Ī			(3:
nternal wall **	ŧ				83.2					Ī			(3:
for windows and	l roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the are				s and part	titions								
	ss, W/K :	•	U)				(26)(30)	,				20.06	(3:
		'Ayk)							$(30) \pm (33)$	2) + (32a).	(32e) =	8366.8	(3
leat capacity		,			,			***	, , ,	, , ,			
leat capacity hermal mass	parame	ter (TMF		,				Indica	tive Value:	Medium		250	(3:
Heat capacity Thermal mass For design asses	s parame	ter (TMF	tails of the	,			ecisely the	Indica	tive Value:	Medium	able 1f	250	(3:
Fabric heat lost lost leat capacity hermal mass for design assest and be used instead for the lost lost lost lost lost lost lost lost	s parame sments wh	eter (TMF ere the de tailed calci	tails of the ulation.	constructi	ion are not	t known pr	ecisely the	Indica	tive Value:	Medium	able 1f	250 5.76	
Heat capacity Thermal mass For design asses an be used inste Thermal bridg	s parame sments wh ead of a de es: S (L	eter (TMF ere the de tailed calcu x Y) cal	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	Indica	tive Value:	Medium	able 1f		
leat capacity hermal mass or design asses an be used inste hermal bridg details of therma	s parame sments wh ead of a de es:S(L al bridging	eter (TMF ere the de tailed calcu x Y) cal	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	Indica indicative	tive Value:	Medium	able 1f		(3)
Heat capacity Thermal mass For design asses an be used inste	s parame sments wh ead of a de es : S (L al bridging eat loss	ter (TMF ere the de tailed calco x Y) calco are not kn	tails of the ulation. culated (own (36) =	constructions constructions constructions constructions constructed as the construction construc	ion are not pendix l	t known pr	ecisely the	Indicative	tive Value:	Medium TMP in Ta		5.76	(3:
Thermal mass for design assessan be used instead for thermal bridges details of thermal fotal fabric hermal fabric	s parame sments wh ead of a de es : S (L al bridging eat loss	ter (TMF ere the de tailed calco x Y) calco are not kn	tails of the ulation. culated (own (36) =	constructions constructions constructions constructions constructed as the construction construc	ion are not pendix l	t known pr	ecisely the	Indicative	tive Values of values of (36) =	Medium TMP in Ta		5.76	(3)
Heat capacity Thermal mass For design assess an be used inste Thermal bridg Total fabric he Tentilation hea	s parame sments wh had of a dec es: S (L al bridging eat loss at loss ca	ere the de tailed calco x Y) cal- are not kn	tails of the ulation. culated u own (36) =	constructions and constructions are constructed using Ap = 0.05 x (3	ppendix h	t known pr		Indicative (33) + (38)m	(36) = = 0.33 × (Medium TMP in Ta		5.76	(3)
Heat capacity Thermal mass For design assessan be used inste Thermal bridg Tetails of thermal Total fabric he Ventilation hea	s parame sments wh had of a deces: S (L had bridging eat loss at loss ca Feb 27.64	ere the de tailed calculare not kn	tails of the ulation. culated u own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix ł 1) Jun	t known pr	Aug	Indicative (33) + (38)m Sep 25.66	(36) = = 0.33 × (Medium TMP in Ta 25)m x (5) Nov 26.6	Dec	5.76	(3)

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.06	1.05	1.03	1.03	1.01	1.01	1.01	1.02	1.03	1.04	1.04		
()				<u> </u>		<u> </u>	<u> </u>			Sum(40) ₁ .		1.03	(40)
Number of day	s in mo	nth (Tab	le 1a)							(),			``
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
LI				Į.		!	Į.		ļ	•			
1 Motor boot	ina ono	ravi koani	romonti								Is\A/b/ye	NOT!	
4. Water heat	ing ene	rgy requi	rement.								kWh/ye	ar.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		71		(42)
Annual average Reduce the annual									se target o		.77		(43)
not more that 125									•				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres pe					Table 1c x			<u> </u>				
(44)m= 82.25	79.26	76.27	73.28	70.29	67.3	67.3	70.29	73.28	76.27	79.26	82.25		
, ,				<u> </u>		<u> </u>	<u> </u>	<u> </u>		lm(44) ₁₁₂ =	l	897.28	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 121.98	106.68	110.09	95.97	92.09	79.47	73.64	84.5	85.51	99.65	108.78	118.13		
				1	l	1	ı	-	rotal = Su	ım(45) ₁₁₂ =	=	1176.48	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)			'		_
(46)m= 18.3	16	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72		(46)
Water storage	loss:			!		!	!						
Storage volume	e (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	rcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage				:	(1-) (1/1	. /-							(45)
a) If manufacti				or is kno	wn (kvvr	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufacteHot water stora			-										(51)
If community h	•			IC 2 (KVV)	11/11110/00	' y)					0		(31)
Volume factor	•										0		(52)
Temperature fa	actor fro	m Table	2b							_	0		(53)
Energy lost fro	m watei	r storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (_	,					, , , ,	•	-	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains												ix H	(00)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Duine am a sina sit	l /		T-1-1-			ļ	ļ	!	!				(58)
Primary circuit	•	•			50\m - 4	(EQ) + 26	SE v (44)	ım			0		(30)
Primary circuit (modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
(00)111- 20.20	۱.0۱	20.20	١٤.٦١	20.20	١٤.٠٦	20.20	20.20		20.20	22.01	20.20		(00)

Combi loss	ralculated	for each	month ((61)m –	(60) ± 3	865 v (41)m							
(61)m= 0	0	0	0	01)111 =	00) + 0	0 7 (41) 0		0	0	0	0	1	(61)
	<u> </u>												J · (59)m + (61)m	(-)
(62)m= 168.5	-i	156.68	141.07	138.69	124.56		131	_	130.6	146.25	153.87	164.72]	(62)
Solar DHW inpo			<u> </u>	<u> </u>		1	<u> </u>						<u></u>	` '
(add addition												-: ····································		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	7	(63)
Output from	water hea	ter	ı				•						_	
(64)m= 168.5	7 148.77	156.68	141.07	138.69	124.56	120.23	131	.1	130.6	146.25	153.87	164.72	1	
	Į.		ı	ı				Outp	ut from wa	ater heate	er (annual)	112	1725.1	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	1] + 0.8 >	([(46)m	+ (57)m	+ (59)m	 n]	
(65)m= 77.83	3 69.14	73.88	67.99	67.9	62.5	61.76	65.3	37	64.51	70.41	72.24	76.55]	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar	r Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 85.42	2 85.42	85.42	85.42	85.42	85.42	85.42	85.4	42	85.42	85.42	85.42	85.42]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso s	ee 7	Table 5				_	
(67)m= 13.59	12.07	9.81	7.43	5.55	4.69	5.07	6.5	9	8.84	11.22	13.1	13.97]	(67)
Appliances (gains (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	also	see Ta	ble 5			_	
(68)m= 148.8	4 150.39	146.5	138.21	127.75	117.92	111.35	109.	.81	113.7	121.99	132.45	142.28]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5	-	-	_	
(69)m= 31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.	54	31.54	31.54	31.54	31.54]	(69)
Pumps and	fans gains	(Table 5	5a)										_	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.3	3 -68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.	33	-68.33	-68.33	-68.33	-68.33]	(71)
Water heatir	ng gains (T	able 5)											_	
(72)m= 104.6	1 102.89	99.3	94.42	91.26	86.8	83.01	87.8	37	89.59	94.64	100.34	102.89]	(72)
Total intern	al gains =				(66	6)m + (67)m	า + (68)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 318.6	7 316.97	307.24	291.69	276.19	261.04	251.06	255.	.89	263.76	279.47	297.51	310.76		(73)
6. Solar ga														
Solar gains ar		Ü					ations 1	:0 CO		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		Т	g_ able 6b	т	FF able 6c		Gains (W)	
Northoast a a							1 1					_	. ,	1,75
Northeast 0.9		X			—	11.28	X		0.63	X	0.7	=	30.93	(75)
Northeast 0.9	<u> </u>	X			—	22.97] X]		0.63		0.7	_ =	62.96	(75)
Northeast 0.9	<u> </u>	X	8.9			41.38	X 1		0.63		0.7	=	113.43	[(75)
Northeast 0.9		X	8.9		-	67.96	X		0.63	_	0.7	=	186.29](75)] ₍₇₅₎
Northeast 0.9	× 0.77	X	8.9	97	X	91.35	X		0.63	X	0.7	=	250.41	(75)

Northeast 0.9x	0.77	×	8.9)7	X	97.38] x [(0.63	x	0.7	=	266.96	(75)
Northeast 0.9x	0.77	x	8.9)7	x	91.1] x [(0.63	x	0.7	=	249.74	(75)
Northeast 0.9x	0.77	x	8.9)7	x	72.63] x [(0.63	x	0.7	=	199.1	(75)
Northeast 0.9x	0.77	x	8.9)7	X .	50.42] x [0.63	x	0.7	=	138.22	(75)
Northeast 0.9x	0.77	X	8.9)7	x	28.07	x	(0.63	x	0.7	=	76.94	(75)
Northeast 0.9x	0.77	×	8.9)7	x	14.2	x	-	0.63	_ x _	0.7		38.92	(75)
Northeast 0.9x	0.77	Х	8.9)7	х	9.21	וֹ × וֹ	(0.63	_ x [0.7	=	25.26	(75)
							_							
Solar gains in	n watts, c	alculated	I for eacl	h month			(83)m	= Sun	m(74)m .	(82)m				
(83)m= 30.93	62.96	113.43	186.29	250.41	266.96	249.74	199.	.1	138.22	76.94	38.92	25.26		(83)
Total gains -	internal a	and solar	(84)m =	= (73)m	+ (83)m	, watts							•	
(84)m= 349.6	379.93	420.67	477.98	526.6	528	500.8	454.9	98	401.98	356.42	336.43	336.02		(84)
7. Mean inte	ernal temp	perature	(heating	season)									
Temperatur	e during h	neating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1	(°C)				21	(85)
Utilisation fa	actor for g	ains for l	living are	ea, h1,m	(see Ta	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.94	0.81	0.6	0.45	0.51	1	0.79	0.96	0.99	1		(86)
Mean intern	al temper	ature in	living ar	22 T1 (fo	ollow ste	ns 3 to -	7 in Ta	ahle	9c)					
(87)m= 19.97		20.32	20.65	20.89	20.98	21	20.9	-	20.93	20.62	20.25	19.95		(87)
					-l Ilia .		-1-1-0		. (00)			<u> </u>		
Temperatur (88)m= 20.03		20.04	20.06	20.06	20.07	20.07	20.0		20.07	20.06	20.05	20.05		(88)
` ′					<u> </u>	ļ	<u> </u>	,6	20.07	20.06	20.05	20.05		(00)
Utilisation fa		1				1	T -				1		1	
(89)m= 0.99	0.99	0.98	0.92	0.76	0.52	0.35	0.41	1	0.72	0.95	0.99	1		(89)
Mean intern	al temper	ature in	the rest	of dwell	ng T2 (1	follow ste	eps 3	to 7	in Tabl	e 9c)	_			
(90)m= 18.66	18.84	19.18	19.66	19.96	20.06	20.07	20.0)8	20.01	19.63	19.09	18.66		(90)
									f	LA = Livir	ng area ÷ (4	4) =	0.49	(91)
Mean intern	al temper	ature (fo	r the wh	ole dwe	lling) = f	fLA × T1	+ (1 -	- fLA	() × T2					
(92)m= 19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.5	53	20.46	20.12	19.66	19.29		(92)
Apply adjus	tment to t	he mean	internal	temper	ature fro	om Table	e 4e, v	where	e appro	priate	•			
(93)m= 19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.5	53	20.46	20.12	19.66	19.29		(93)
8. Space he	ating req	uirement												
Set Ti to the					ed at st	tep 11 of	Table	e 9b,	so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisatio	1				l .		Ι.			0 1		_	1	
Jan		Mar	Apr	May	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Utilisation fa	0.99	0.97	0.92	0.78	0.56	0.4	0.46	e T	0.75	0.95	0.99	0.99		(94)
Useful gains					0.50	0.4	0.40	<u> </u>	0.75	0.93	0.99	0.99		(0.1)
(95)m= 347.34		409.84	438.96	408.92	296.5	200.02	208.7	76	301.18	337.88	332.19	334.24		(95)
Monthly ave						1 =00.02				007.100	1 0020	00		, ,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Heat loss ra						1]	I	I	1	
(97)m= 805.22	1	704.94	587.07	453.33	302.4	200.76	210.2	 -	327.5	495.13	658.33	797.1		(97)
Space heati	ng requir	ement fo	r each n	nonth, k	Wh/mon	$\frac{1}{1}$ th = 0.02	24 x [((97)n	n – (95)m] x (4	1)m		1	
(98)m= 340.66	3 270.21	219.55	106.64	33.04	0	0	0		0	116.99	234.82	344.37		
													-	

			Tota	ıl per year	(kWh/yea	r) = Sum(9	98) _{15,912} =	1666.28	(98)
Space heating requirement in kWh/m²/y	/ear							32.92	(99)
9a. Energy requirements – Individual hea	ating syste	ms includin	g micro-C	CHP)					
Space heating:	·						ı		7,000
Fraction of space heat from secondary/s		itary systen		(004)				0	(201)
Fraction of space heat from main syster	` ,		(202) = 1	,	(000)1			1	(202)
Fraction of total heating from main syste			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system								93.5	(206)
Efficiency of secondary/supplementary	heating sy	stem, %	_					0	(208)
Jan Feb Mar Apr		un Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated a 340.66 270.21 219.55 106.64	´ i			0	116.00	1 224 02	344.37		
	l l	0	0		116.99	234.82	344.37		(0.1.1)
$(211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $364.34 $) 0	0	0	125.13	251.14	368.31		(211)
304.54 209 254.02 114.03	33.33	<u>, </u>		l (kWh/yea				1782.12	(211)
Space heating fuel (secondary), kWh/m	onth				,	7 15, 10 1.		1702.12	(,
$= \{[(98) \text{m x } (201)] \} \times 100 \div (208)$									
(215)m= 0 0 0 0	0 (0	0	0	0	0	0		
	-	-	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,101}	2=	0	(215)
Water heating									
Output from water heater (calculated about 168.57 148.77 156.68 141.07		1.56 120.23	131.1	130.6	146.25	153.87	164.72		
Efficiency of water heater	136.09	120.23	131.1	130.0	140.23	133.67	104.72	79.8	(216)
·	81.66 79	0.8 79.8	79.8	79.8	84.23	85.94	86.74	79.0	(217)
Fuel for water heating, kWh/month	01.00 70	70.0	7 0.0	7 0.0	04.20	00.04	00.74		(= : :)
(219) m = (64) m x $100 \div (217)$ m									
(219)m= 194.53 172.21 182.79 167.78 1	169.84 156	5.09 150.67		163.66	173.64	179.05	189.91		_
			Tota	ıl = Sum(2				2064.45	(219)
Annual totals Space heating fuel used, main system 1					k'	Wh/yea	r I	kWh/yea	r ¬
							[╡
Water heating fuel used								2064.45	
Electricity for pumps, fans and electric ke	eep-hot								
central heating pump:							30		(2300
boiler with a fan-assisted flue							45		(230
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =	:		75	(231)
Electricity for lighting								239.96	(232)
Total delivered energy for all uses (211).	(221) + (2	231) + (232)(237b)	=			ļ	4161.53	(338)
12a. CO2 emissions – Individual heating	g systems	includina m	icro-CHF)			l		
	_								
		Energy kWh/yea	-		Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	

Space heating (main system 1)	(211) x	0.216	384.94 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	445.92 (264)
Space and water heating	(261) + (262) + (263) + (264) =		830.86 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	124.54 (268)
Total CO2, kg/year	sum	of (265)(271) =	994.32 (272)

 $TER = 19.64 \tag{273}$

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:04:59

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 63.92m²Site Reference:Highgate Road - GREENPlot Reference:02 - H

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 17.67 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

15.46 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 38.8 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	ОК
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	9.56m²	
Windows facing: South East	8.76m²	
Ventilation rate:	6.00	
10 Key features		
	2.0 m ³ /m ² h	
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:									
Assessor Name: Software Name:												
Address :	F	Property	Address	02 - H								
Overall dwelling dime	ensions:											
		Are	a(m²)		Av. He	ight(m)		Volume(m	3)			
Ground floor		(63.92	(1a) x	2	2.65	(2a) =	169.39	(3a)			
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (63.92	(4)								
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	169.39	(5)			
2. Ventilation rate:												
	main seconda heating heating	ry	other		total			m³ per hou	ır			
Number of chimneys	0 + 0	+ [0] = [0	X 4	40 =	0	(6a)			
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)			
Number of intermittent fa	ns			Ī	2	x '	10 =	20	(7a)			
Number of passive vents	;			Ī	0	x -	10 =	0	(7b)			
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)			
				L								
				_			Air ch	nanges per he	our —			
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$ een carried out or is intended, proceed			ontinuo fr	20		÷ (5) =	0.12	(8)			
Number of storeys in the		eu 10 (17),	otrierwise (onunue n	om (9) to	(10)		0	(9)			
Additional infiltration	3 ()					[(9)	-1]x0.1 =	0	(10)			
	.25 for steel or timber frame o			•	ruction			0	(11)			
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after								
,	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)			
If no draught lobby, en	ter 0.05, else enter 0							0	(13)			
-	s and doors draught stripped							0	(14)			
Window infiltration			0.25 - [0.2	. ,	-			0	(15)			
Infiltration rate	arron annotation and in an abis an atm		(8) + (10)					0	(16)			
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] +$	•	•	•	etre or e	envelope	area	5	(17)			
· ·	es if a pressurisation test has been do				is being u	sed		0.37	(10)			
Number of sides sheltere	ed							0	(19)			
Shelter factor			(20) = 1 -		19)] =			1	(20)			
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.37	(21)			
Infiltration rate modified f	- 1 	1	1 4	0.5.5	0-4	Nan	Data	1				
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	J				
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1				
(5.0	1	1	<u>'</u>	I	<u> </u>	l	J				
Wind Factor (22a)m = (22			1					1				
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18					

Adjusted infiltr	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43]	
Calculate effe		change i	rate for t	he appli	l							<u> </u>	
If mechanic												0	(23a)
If exhaust air h) = (23a)			0	(23b)
If balanced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(23c)
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b)m = (22	2b)m + (23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)r	n < 0.5 ×			•					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r	ventilation								0.5]	-			
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•	•	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losse	s and he	at loss r	naramete	or.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		X k /K
Windows Type		` ,			8.34	_	/[1/(1.4)+		11.06	$\stackrel{\prime}{\Box}$			(27)
Windows Type					7.64	号 .	/[1/(1.4)+	0.04] =	10.13	=			(27)
Walls Type1	61.0	19	15.98	<u>. </u>	45.11	=	0.18		8.12	╡┌			(29)
Walls Type2	3.8		0		3.86	=	0.18		0.69	륵 ¦		╡	(29)
Total area of e					64.95	=	0.10		0.00				(31)
Party wall	, ionnonic	,				=		[(32)
Party floor					37.5	×	0	= [0	L		╣	=
•					63.92	=				Ĺ		┥	(32a)
Party ceiling					63.92	=				Ĺ		╣	(32b)
Internal wall **					113.4		. (/F/4/					(32c)
* for windows and ** include the area						atea using	Tormula 1	/[(1/ U- vaiu	ie)+0.04] a	as given in	paragrapr	1 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				30	(33)
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	10121.33	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess				constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridg	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						7.91	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric he									(36) =			37.91	(37)
Ventilation hea	i						_			(25)m x (5)	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 34.1	33.87	33.63	32.53	32.32	31.37	31.37	31.19	31.74	32.32	32.74	33.18		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m		1	
(39)m= 72.01	71.77	71.54	70.44	70.23	69.28	69.28	69.1	69.65	70.23	70.65	71.09		 .
Stroma FSAP 201	12 Version	: 1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com		,	Average =	Sum(39) ₁	12 /12=	70.4 ∮ age	2 of (3 7 9)

Heat loss para	ımeter (l	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.13	1.12	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11		
	<u>!</u>	<u>!</u>		<u> </u>		<u> </u>	<u> </u>	!	Average =	Sum(40) ₁	12 /12=	1.1	(40)
Number of day	/s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13:		09		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		3.84		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 92.22	88.87	85.51	82.16	78.81	75.45	75.45	78.81	82.16	85.51	88.87	92.22		
									Total = Su	m(44) ₁₁₂ =	=	1006.06	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 136.76	119.61	123.43	107.61	103.25	89.1	82.56	94.74	95.88	111.73	121.97	132.45		
If instantaneous w	votor hooti	na ot noint	of upo (no	hot woto	· otorogol	ontor O in	havas (16		Total = Su	m(45) ₁₁₂ =	= [1319.1	(45)
			,	ı	, , , , , , , , , , , , , , , , , , ,		· · ·	, , , ,	1	1	 1		(40)
(46)m= 20.51 Water storage	17.94	18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87		(46)
Storage volum) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	` '					_							()
Otherwise if no	-			_			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f										0.	54		(49)
Energy lost fro		•					(48) x (49)) =		0.	75		(50)
b) If manufactHot water store			-								0		(51)
If community h	-			(.,, o, ac	-97					<u> </u>		(01)
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)								0.	75		(55)
Water storage	loss cal	culated 1	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	x H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	 - 3							0		(58)
Primary circuit	,	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss	ooloulotod	for oach	month ((61)m -	(60) · 2(SE v. (41)	١m						
(61)m= 0	0	0	0	0	00) + 30	0 7 (41)	0	0	0	0	0	1	(61)
							<u> </u>	<u> </u>		<u> </u>		J (59)m + (61)m	, ,
(62)m= 183.3	<u> </u>	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04]	(62)
Solar DHW inp												I	, ,
(add addition										.o to mate	5ag/		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ıter				ļ.	Į.	·!			l	1	
(64)m= 183.3		170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04]	
	- '						Out	put from w	ater heate	r (annual)₁	12	1867.72	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m= 82.7	5 73.44	78.32	71.85	71.61	65.7	64.73	68.78	67.95	74.43	76.63	81.31		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ains (Table	e 5), Wat	ts									_	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 104.	5 104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 16.29	9 14.47	11.77	8.91	6.66	5.62	6.07	7.9	10.6	13.46	15.7	16.74		(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5	-	-		
(68)m= 182.7	71 184.61	179.83	169.66	156.82	144.75	136.69	134.8	139.57	149.75	162.58	174.65		(68)
Cooking gai	ns (calcula	ated in Ap	opendix	L, equat	ion L15	or L15a)), also s	ee Table	5			•	
(69)m= 33.4	5 33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45		(69)
Pumps and	fans gains	(Table 5	āa)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (negat	ive valu	es) (Tab	le 5)	-	-		-		-		
(71)m= -83.6	6 -83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6		(71)
Water heatir	ng gains (1	Table 5)		-		-	-	-	-	-	-		
(72)m= 111.2	22 109.29	105.26	99.8	96.25	91.25	87	92.44	94.38	100.04	106.43	109.29		(72)
Total intern	al gains =	:			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 367.5	365.71	354.21	335.72	317.08	298.97	287.12	292.49	301.9	320.59	342.07	358.04		(73)
6. Solar ga	ins:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		-	g_ Table 6b	_	FF		Gains	
	Table 6d		m²		Tai	ble 6a	. —	Table 6b	_ '	able 6c		(W)	_
Northeast 0.9		Х	8.3	34	x 1	1.28	х	0.63	x	0.7	=	28.76	(75)
Northeast 0.9		X	8.3	34	x 2	22.97	х	0.63	x	0.7	=	58.54	(75)
Northeast 0.9	<u> </u>	х	8.3	34	X 4	11.38	х	0.63	x	0.7	=	105.47	(75)
Northeast 0.9		X	8.3	34	x 6	67.96	х	0.63	x	0.7	=	173.21	(75)
Northeast 0.9	× 0.77	X	8.3	34	x 9	91.35	х	0.63	x	0.7	=	232.82	(75)

		_							_				_
Northeast _{0.9x}	0.77	X	8.3	34	X	97.38	X	0.63	X	0.7	=	248.21	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	91.1	x	0.63	X	0.7	=	232.2	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	72.63	×	0.63	X	0.7	=	185.11	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	50.42	X	0.63	X	0.7	=	128.51	(75)
Northeast _{0.9x}	0.77	X	8.3	34	x	28.07	X	0.63	x	0.7	=	71.54	(75)
Northeast _{0.9x}	0.77	x	8.3	34	x	14.2	X	0.63	x	0.7	=	36.19	(75)
Northeast _{0.9x}	0.77	х	8.3	34	x	9.21	X	0.63	x	0.7	=	23.49	(75)
Southeast _{0.9x}	0.77	x	7.6	64	х :	36.79	X	0.63	X	0.7	=	85.91	(77)
Southeast _{0.9x}	0.77	x	7.6	64	X	62.67	X	0.63	X	0.7	=	146.34	(77)
Southeast 0.9x	0.77	x	7.6	64	x	85.75	X	0.63	x	0.7	=	200.22	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	06.25	x	0.63	x	0.7	_	248.09	(77)
Southeast _{0.9x}	0.77	X	7.6	64	x 1	19.01	x	0.63	x	0.7	_	277.88	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	18.15	x	0.63	x	0.7	=	275.87	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	13.91	x	0.63	x	0.7		265.96	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	04.39	x	0.63	x	0.7		243.74	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	92.85	x	0.63	x	0.7	-	216.8	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	69.27	x	0.63	x	0.7		161.73	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x .	44.07	x	0.63	x	0.7		102.9	(77)
Southeast _{0.9x}	0.77	×	7.6	64	х =	31.49	x	0.63	x	0.7	-	73.52	(77)
Solar gains in	watts, calcu	ulated	for eac	h month	,	1	(83)m	= Sum(74)m .	(82)m		ı	1	
(83)m= 114.67		05.69	421.29	510.7	524.08	498.16	428.	85 345.31	233.27	7 139.08	97.01		(83)
Total gains – i				<u> </u>	<u> </u>							1	
(84)m= 482.24	570.59 6	59.9	757.01	827.78	823.06	785.28	721.	34 647.21	553.86	481.15	455.04		(84)
7. Mean inter	nal tempera	ature ((heating	season)								
Temperature	during hea	ting p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac				ea, h1,m	(see Ta	able 9a)						1	
Jan		Mar	Apr	May	Jun	Jul	Αι		Oct	-	Dec		
(86)m= 0.99	0.99	0.96	0.88	0.73	0.53	0.39	0.4	4 0.7	0.93	0.99	1		(86)
Mean interna	l temperatu	ıre in I	iving are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)		_		<u>.</u>	
(87)m= 19.93	20.12 2	0.41	20.73	20.92	20.99	21	21	20.95	20.68	20.25	19.9		(87)
Temperature	during hea	ting p	eriods ir	n rest of	dwelling	g from Ta	able 9), Th2 (°C)					
(88)m= 19.98	19.98 1	9.99	20	20	20.01	20.01	20.0	20.01	20	20	19.99		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,m (s	ee Table	9a)	-	-	-	-		
(89)m= 0.99		0.95	0.85	0.67	0.45	0.3	0.3	5 0.61	0.9	0.98	0.99		(89)
Mean interna	l temperatu	ıre in t	the rest	of dwelli	ing T2 (f	follow ste	ene 3	to 7 in Tahl	P 9c)		Į.		
(90)m= 18.57		9.25	19.7	19.93	20.01	20.01	20.0		19.65	19.05	18.54		(90)
()	1 .									ring area ÷ (4	<u> </u>	0.38	(91)
										•			 ` ′
Mass ! - (4 a maio = = = 1	/f .		ا- مام	II:\ '	1 A . T4	. /4	41 A\ TO					
Mean interna	 	`				1	1 `		20.04	10.5	10.06	1	(02)
Mean interna (92)m= 19.09 Apply adjustr	19.34 1	9.69	20.09	20.31	20.38	20.39	20.3	39 20.35	20.04		19.06		(92)

			-								1			
` ′		19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06		(93)
8. Space														
Set Ti to the utilisa				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio					iviay	Juli	Jui	L	Зер	Oct	INOV	Dec		
	.99	0.98	0.95	0.86	0.69	0.48	0.33	0.38	0.64	0.9	0.98	0.99		(94)
Useful ga		mGm .	W = (94	I)m x (84	4)m			<u> </u>	l		<u> </u>			
	1	558.2	624.35	647.45	567.74	395.74	261.85	274.51	415.81	500.89	471.24	451.67		(95)
Monthly :	averag	e exte	rnal tem	perature	from Ta	able 8		!	!		<u> </u>			
(96)m= 4	1.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss	s rate f	or mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 106	65.09 1	036.14	943.75	788.38	604.7	400.4	262.39	275.56	435.18	663.3	876.26	1056.17		(97)
Space he	eating	require	ement fo	r each m	nonth, k\	Wh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 43	7.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
	-							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1987.06	(98)
Space he	eating	require	ement in	kWh/m²	/year								31.09	(99)
9a. Energ		•			•	veteme i	ncluding	micro-C	'HDI					
Space h			its — Iriui	viduai Ti	calling s	yatema n	ricidaling	i illicio-c) II <i>)</i>					
Fraction	_		t from se	econdar	//supple	mentarv	svstem						0	(201)
Fraction				-		,	-	(202) = 1	- (201) =				1	(202)
Fraction				•	. ,				02) × [1 –	(203)] =				(204)
				•				(201) – (2	02) X [1	(200)] -			1	╡゛゛
Efficienc		•											93.5	(206)
Efficienc	y of se	conda	ry/supple	ementar	y heating	g system	1, %						0	(208)
J	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space he	Ť		<u> </u>		d above)								
43	7.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
(211)m =	{[(98)n	n x (20	4)] } x 1	00 ÷ (20	6)			_						(211)
46	7.48	343.5	254.15	108.52	29.41	0	0	0	0	129.24	311.89	481.01		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u></u>	2125.2	(211)
Space he	eating	fuel (se	econdary	y), kWh/	month									
= {[(98 <u>)</u> m	x (201))] } x 1	00 ÷ (20	8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water hea	_													
Output fro								l	l		·	T 1		
		161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04		7,
Efficiency													79.8	(216)
· · ·		86.61	85.71	83.75	81.29	79.8	79.8	79.8	79.8	84.1	86.29	87.17		(217)
Fuel for w		•												
(219)m = 21		186.7	198.38	182.32	184.34	168.16	161.85	177.12	176.65	188.25	193.61	205.39		
(= 12/				. 52.52		1 . 30.10	1		I = Sum(2		L	L	2233.4	(219)
Annual to	ntale								\-		Wh/year	, ,	kWh/year	
Space hea		ıel use	d, main	system	1					ĸ	y cai		2125.2	1
-	-			-									<u> </u>	_

					_
Water heating fuel used				2233.4	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	i)(230g) =		75	(231)
Electricity for lighting				287.67	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4721.27	(338)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	_				
	Energy kWh/year	Emission factoring the kg CO2/kWh		Emissions kg CO2/yea	
Space heating (main system 1)	3 7				
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar ¬
	kWh/year	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 459.04 0 482.41	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= =	kg CO2/yea 459.04 0 482.41 941.46	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.519	= = =	kg CO2/yea 459.04 0 482.41 941.46 38.93	(261) (263) (264) (265) (267)

TER =

(273)

17.67

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:04:48

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 60.34m²Site Reference:Highgate Road - GREENPlot Reference: 02 - I

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

18.05 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.55 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.8 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	ок
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	4.7m ²	
Windows facing: South East	6.09m ²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	02 - 1					
1. Overall dwelling dime	ensions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor		(60.34	(1a) x	2	2.65	(2a) =	159.9	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (60.34	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	159.9	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	Ī - [0	x	20 =	0	(6b)
Number of intermittent fa	ins				2	x '	10 =	20	(7a)
Number of passive vents)			Ē	0	x .	10 =	0	(7b)
Number of flueless gas fi	ires			F	0	x	40 =	0	(7c)
				L					
							Air ch	nanges per he	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.13	(8)
Number of storeys in the	peen carried out or is intended, procee he dwelling (ns)	ea 10 (17),	otrierwise (onunue ir	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t ngs): if equal user 0.35	o the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (45)		0	(15)
Infiltration rate	q50, expressed in cubic metre	se nar h	(8) + (10)				area	0	(16)
•	lity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	elle oi e	rivelope	aica	0.38	(17)
•	es if a pressurisation test has been do				is being u	sed		0.00	(\ -'/
Number of sides sheltere	ed		(20) 4	10 07F ·· //	10)1			0	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			1	(20)
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (10	/ X (20) =				0.38	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	1 ' 1 ' 1	1	<u>, </u>	•	•	1	1	l	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Faster (00s) (0	2)	•	•		•	-	-	•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18		
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	0.95	1 0.32	'	1.00	1.12	1.10	I	

Adjusted infiltratio	rate (allow	ina for sl	nelter an	nd wind s	need) –	(21a) v	(22a)m					
· —	17 0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44		
Calculate effective	_	rate for t	he appli	cable ca	se		ļ		<u> </u>	ļ		
If mechanical ve						.=					0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)												(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]											(23c)	
· ·	1	1	i	<u> </u>	' 	- ^ ` ` - 	ŕ	 	- 	<u>`</u>	÷ 100] I	(240)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced m		1		1	, 	- ^ ` 	ŕ				İ	(24h)
(24b)m= 0	0	0	0		0	0	0	0	0	0		(24b)
c) If whole hous if (22b)m <			•	•				5 v (23h	,)			
(24c)m = 0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural ven		nole hous	L onsitiv	ve innut	ventilatio	n from l	loft					, ,
if (22b)m =								0.5]				
(24d)m= 0.61 0	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air cha	nge rate - e	nter (24a	n) or (24k	o) or (24	c) or (24	d) in box	x (25)	-	-	-		
(25)m= 0.61 0	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. Heat losses ar	d heat loss	paramet	er:									
	Gross	Openir		Net Ar	ea	U-valı	ue	AXU		k-value	9 /	ΑΧk
i	rea (m²)		1 ²	A ,r	m²	W/m2	ĽΚ	(W/ł	K)	kJ/m²-l	< Ι	kJ/K
Windows Type 1				4.7	x1.	/[1/(1.4)+	0.04] =	6.23				(27)
Windows Type 2				6.09	х1.	/[1/(1.4)+	0.04] =	8.07				(27)
Windows Type 3				2.92	х1.	/[1/(1.4)+	0.04] =	3.87				(27)
Walls Type1	52.8	13.7	1	39.09) x	0.18	=	7.04				(29)
Walls Type2	27.31	0		27.3	1 X	0.18	=	4.92				(29)
Total area of elem	ents, m²			80.11	ı							(31)
Party wall				16.88	3 x	0	=	0				(32)
Party floor				60.34	1						\neg	(32a)
Party ceiling				60.34	1				Ī			(32b)
Internal wall **				107.9	1				Ī		-	(32c)
* for windows and root ** include the areas or					lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric heat loss, \	//K = S (A >	: U)				(26)(30)) + (32) =				30.13	(33)
Heat capacity Cm	= S(A x k)						((28).	.(30) + (32	2) + (32a).	(32e) =	9938.59	(34)
Thermal mass par	ameter (TM	P = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value:	: Medium		250	(35)
For design assessmer can be used instead o			construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridges:	S (L x Y) ca	lculated	using Ap	pendix l	K						7.3	(36)
if details of thermal bri		nown (36) :	= 0.05 x (3	31)								
Total fabric heat lo								(36) =			37.43	(37)
Ventilation heat lo	1	1	_	Ι.	Ι.	I -		= 0.33 × (i	1	
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

20) = 20,40	32.18	31.95	30.87	30.67	29.73	29.73	29.56	20.4	30.67	31.08	1 24 54	1	(38)
38)m= 32.42			30.67	30.67	29.73	29.73	29.56	30.1		l	31.51	l	(30)
Heat transfer	69.61	69.38	68.31	68.1	67.16	67.16	66.99	67.53	= (37) + (3 68.1	68.51	68.94	1	
00.00	05.01	05.50	00.01	00.1	07.10	07.10	00.55			Sum(39) ₁	<u> </u>	68.3	(39)
leat loss par	ameter (l	HLP), W	/m²K		_				= (39)m ÷				 ` ^
40)m= 1.16	1.15	1.15	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.14	1.14		_
Number of da	ave in mo	nth (Tah	lo 1a)					,	Average =	Sum(40) ₁	12 /12=	1.13	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
,	1											l	` ,
4. Water hea	ating ene	rav reau	irement:								kWh/y	ear:	
14. Water He	aurig erie	igy iequi	nement.								KVVII/y	cai.	
Assumed occ			. [4	/ O OOO) 40 (TF	-	\0\1 · 0 (2040 /	FFA 40		.99		(42)
if TFA > 13 if TFA £ 13		+ 1.76 X	:[1 - ехр	(-0.0003	349 X (11	-A -13.9)2)] + 0.0)013 X (IFA -13.	.9)			
Annual avera	,	ater usaç	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		81	.49]	(43)
Reduce the anno not more that 12	_				_	_	to achieve	a water us	se target o	f		ı	
	- 	· ·				<u> </u>				l	Γ_	1	
Jan Hot water usage	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	· ·	· ·	1	1	1	1					T	1	
44)m= 89.64	86.38	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64	077.0	\neg
nergy content o	of hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		977.9	(44
45)m= 132.93	116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74]	
.,										m(45) ₁₁₂ =	I	1282.18	(45
f instantaneous	water heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)		, ,			
46)m= 19.94	17.44	18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31		(46
Vater storag											•	' 1	
Storage volur	` ′					Ū		ame ves	sel		150		(47
f community	•			_			. ,	ora) onto	or 'O' in /	47\			
Otherwise if r Vater storag		not wate	ei (uiis ii	iciudes i	HStaritar	ieous cc	יווטט וטוווע	ers) erite	ei U iii (47)			
a) If manufac		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	.39]	(48
Temperature	factor fro	m Table	2b							0.	.54	<u> </u>	(49
Energy lost fr	om water	· storage	, kWh/ye	ear			(48) x (49)) =		0.	.75	ĺ	(50
b) If manufac			-										
lot water sto	•			e 2 (kW	h/litre/da	ıy)					0		(51
community olume facto	_		on 4.3								0	1	(52
emperature			2b								0	 	(52 (53
Energy lost fr				ear			(47) x (51)	x (52) x (53) =		0	1]	(54
Enter (50) or		_	,, icvvii, y	Jui			(11) X (01)	/ X (OL) X (30) —	-	.75		(55
Vater storage	, , ,	,	for each	month			((56)m = (55) × (41)ı	m		-	ı	(
56)m= 23.33		23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	1	(56
f cylinder contai												J lix H	(55)
		r		1		1						1	(57
57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	J	(37

Primary circuit loss (annual) from Table 3	0 (58)									
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m										
(modified by factor from Table H5 if there is solar water heating and a cylinder	er thermostat)									
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51	23.26 22.51 23.26 (59)									
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m										
(61)m= 0 0 0 0 0 0 0 0 0	0 0 0 (61)									
Total heat required for water heating calculated for each month (62)m = 0.85 x	(45)m + (46)m + (57)m + (59)m + (61)m									
(62)m= 179.53 158.35 166.57 149.69 146.96 131.7 126.85 138.69 138.28										
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)										
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)										
(63)m= 0 0 0 0 0 0 0 0	0 0 0 (63)									
Output from water heater										
(64)m= 179.53 158.35 166.57 149.69 146.96 131.7 126.85 138.69 138.28	155.2 163.64 175.34									
	vater heater (annual) ₁₁₂ 1830.8 (64)									
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8										
(65)m= 81.48 72.33 77.17 70.85 70.65 64.87 63.96 67.9 67.06	73.39 75.49 80.08 (65)									
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot v	water is from community neating									
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= 99.56 99.56 99.56 99.56 99.56 99.56 99.56 99.56	99.56 99.56 99.56 (66)									
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5										
(67)m= 15.49 13.76 11.19 8.47 6.33 5.35 5.78 7.51 10.08	12.8 14.94 15.93 (67)									
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Ta	able 5									
(68)m= 173.8 175.61 171.06 161.39 149.17 137.69 130.03 128.22 132.77	142.44 154.66 166.13 (68)									
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table	e 5									
(69)m= 32.96 32.96 32.96 32.96 32.96 32.96 32.96 32.96 32.96	32.96 32.96 (69)									
Pumps and fans gains (Table 5a)	· · · · · · · · · · · · · · · · · · ·									
(70)m= 3 3 3 3 3 3 3 3 3 3	3 3 3 (70)									
Losses e.g. evaporation (negative values) (Table 5)										
(71)m= -79.65 -79.65 -79.65 -79.65 -79.65 -79.65 -79.65 -79.65	-79.65 -79.65 -79.65 (71)									
Water heating gains (Table 5)										
(72)m= 109.51 107.63 103.72 98.41 94.96 90.1 85.97 91.26 93.14	98.64 104.85 107.64 (72)									
Total internal gains = $(66)m + (67)m + (68)m + (69)m +$										
(73)m= 354.68 352.87 341.84 324.13 306.33 289.01 277.64 282.86 291.85	 									
6. Solar gains:	000.70 000.01 040.01									
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to t	the applicable orientation.									
Orientation: Access Factor Area Flux g_	FF Gains									
Table 6d m ² Table 6a Table 6b										
Southeast 0.9x 0.77 x 6.09 x 36.79 x 0.63	× 0.7 = 68.48 (77)									
Southeast 0.9x 0.77 x 6.09 x 62.67 x 0.63	× 0.7 = 116.65 (77)									
0.05	. 0.7 - 110.00 (77)									

Utilisation facto	r for act	no for I	ivina araa	h1 /	(COO TO	blo Ool							
Temperature d	uring he	ating p		•	g area t	rom Tab	ole 9,	Th1 (°C)				21	(85)
7. Mean interna	al tempe	rature ((heating se	ason)									
(84)m= 486.08	580.03	661.54	735.15 78	30.29	765.52	734.56	691.	91 643.03	563.21	488.31	457.62]	(84)
Total gains – int	ernal an	d solar	(84)m = $(7$	3)m +	(83)m	, watts		1			I	1	
		319.7			476.51	456.92	409.		253.46	157.99	112.06]	(83)
Solar gains in w	atte colo	aulatad	for each m	onth			(83)m	= Sum(74)m .	(82\m				
Northwest _{0.9x}	0.77	х	2.92	X		9.21	X	0.63	x [0.7	=	8.22	(81)
Northwest 0.9x	0.77	x	2.92	×		14.2	X	0.63	x [0.7	=	12.67	(81)
Northwest _{0.9x}	0.77	x	2.92	×	2	8.07	x	0.63	x [0.7	=	25.05	(81)
Northwest 0.9x	0.77	x	2.92	×	5	0.42	X	0.63	x [0.7	=	44.99	(81)
Northwest 0.9x	0.77	X	2.92	X	7	2.63	X	0.63	x [0.7	=	64.81	(81)
Northwest _{0.9x}	0.77	x	2.92	×		91.1	x	0.63	x	0.7	=	81.3	(81)
Northwest _{0.9x}	0.77	x	2.92	×	9	7.38	x	0.63	x [0.7	=	86.9	(81)
Northwest _{0.9x}	0.77	x	2.92	x	9	1.35	x	0.63	×	0.7	=	81.52	(81)
Northwest _{0.9x}	0.77	x	2.92	x	6	7.96	X	0.63	×	0.7	=	60.64	(81)
Northwest _{0.9x}	0.77	x	2.92	×	4	1.38	x	0.63	_ x [0.7	=	36.93	(81)
Northwest _{0.9x}	0.77	x	2.92	x	2	2.97	X	0.63	×	0.7	=	20.5	(81)
Northwest _{0.9x}	0.77	x	2.92	x	1	1.28	x	0.63	×	0.7	=	10.07	(81)
Southwest _{0.9x}	0.77	×	4.7	×	3	1.49	j i	0.63	_ x [0.7	=	45.23	(79)
Southwest _{0.9x}	0.77	x	4.7	×		4.07	j i	0.63	×	0.7		63.3	(79)
Southwest _{0.9x}	0.77	x	4.7	×		9.27	j	0.63	×	0.7	= =	99.49	(79)
Southwest _{0.9x}	0.77	x	4.7	x		2.85	j	0.63	_ x	0.7	_ =	133.37	(79)
Southwest _{0.9x}	0.77	x	4.7	X		04.39	į ¦	0.63	×	0.7	= =	149.94	(79)
Southwest _{0.9x}	0.77	x	4.7	×	-	13.91	, 	0.63	^ L	0.7	╡ -	163.62	(79)
Southwest _{0.9x}	0.77	= x	4.7	^		18.15	,]	0.63	^ L _ x [0.7	╡ -	169.71	(79)
Southwest _{0.9x}	0.77	x	4.7	^		19.01	, 	0.63	^ L _ x [0.7	= =	170.94	(79)
Southwest _{0.9x}	0.77	$\frac{1}{x}$	4.7	$\stackrel{\wedge}{=}$ $\stackrel{\wedge}{_{x}}$		06.25	, 	0.63	^ L x [0.7	┥ -	152.62	(79)
Southwest _{0.9x}	0.77	T x	4.7	$\stackrel{\wedge}{=}$ $\stackrel{\wedge}{_{x}}$		5.75	, l] [0.63	^ L _ x [0.7	-	123.17	(79)
Southwest _{0.9x}	0.77	∃ ^ x	4.7	⊟ ^ ×		6.79 2.67]]	0.63	_ ^ [x [0.7	╡ -	52.85 90.02	(79)
Southwest _{0.9x}	0.77	X x	6.09	x	-	1.49) X]	0.63		0.7	=	58.6	(77)
Southeast 0.9x	0.77	×	6.09	×		4.07]	0.63	_	0.7	╡ -	82.02	$ = \frac{1}{1} $
Southeast 0.9x	0.77	X v	6.09	×		9.27]	0.63	_ × [0.7	_ =	128.92	$=$ $\frac{(77)}{(77)}$
Southeast 0.9x	0.77	X ×	6.09	→ × → ,		2.85]	0.63	_ × [0.7	╡ -	172.81	$=$ $\frac{1}{1}$ $\frac{1}{1}$ $\frac{1}{1}$ $\frac{1}{1}$ $\frac{1}{1}$
Southeast 0.9x	0.77	_ X	6.09	×		04.39	X	0.63	_ ×	0.7	_ =	194.29	$= \frac{1}{1} (77)$
Southeast 0.9x	0.77	X X	6.09	×		13.91	X	0.63	_ × [0.7	_ =	212.01	(77)
Southeast 0.9x	0.77	x	6.09	×		18.15	X]	0.63	_ × [0.7	_ =	219.9	= (77)
Southeast 0.9x	0.77	X	6.09	×		19.01	X	0.63	× [0.7	=	221.5	(77)
Southeast 0.9x	0.77	×	6.09	×		06.25	X	0.63	_ × [0.7	_ =	197.75	(77)
Southeast 0.9x	0.77	X	6.09	×		5.75	X	0.63	× [0.7	_ =	159.6	(77)

(86)m=	0.99	0.98	0.95	0.88	0.74	0.55	0.4	0.44	0.68	0.92	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				•	
(87)m=	19.94	20.14	20.42	20.72	20.91	20.98	21	21	20.96	20.7	20.26	19.9		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)		•	•		
(88)m=	19.95	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.99	19.98	19.97	19.97		(88)
	tion for	tor for a	oine for	root of d	u allin a	h2 m /oc	L Toblo	00)						
(89)m=	0.99	tor for g	0.94	0.85	0.68	0.47	0.31	0.35	0.6	0.88	0.98	0.99		(89)
						<u> </u>	l			<u> </u>	0.00	0.00		()
			r	r		- ` `	r	eps 3 to			10.05	40.50	1	(00)
(90)m=	18.56	18.86	19.25	19.67	19.9	19.98	19.99	19.99	19.95	19.66	19.05 g area ÷ (4	18.52	0.44	(90)
									!	LA = LIVII	ig area - (4	4) =	0.44	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2				ī	
(92)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate			•	
(93)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the ut		factor fo	r –					 			·		1	
1.14.11	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		tor for g	1		0.7			T	T		I		1	(04)
(94)m=	0.99	0.97	0.94	0.85	0.7	0.5	0.35	0.39	0.63	0.89	0.97	0.99		(94)
	<u> </u>	hmGm		<u> </u>		005.40	050.00	000.44	100.50	500.0	1 475 70	450.00	1	(OE)
(95)m=	480.21	564.23	620.58	627.23	547	385.18	256.89	269.11	406.58	500.6	475.73	453.36		(95)
		age exte	i			i	16.6	16.4	144	10.6	7.4	4.2	1	(96)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(90)
		1011.35	920.55	767.42	588.89	· ·	=[(39)fff . 257.65	x [(93)m	- (96)m 425.27	648.19	855.43	1029.57	I	(97)
(97)m=		ļ	ļ	<u> </u>		391.27		270.39		<u> </u>		1029.57		(91)
-	415.5	300.46	223.18	100.94	31.17	0	$\ln = 0.02$	24 x [(97])m – (95 0	109.81	273.39	428.7	l	
(98)m=	413.3	300.46	223.10	100.94	31.17	0							4000.44	7(00)
								rota	ıl per year	(kwn/yeai	r) = Sum(9	8)15,912 =	1883.14	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								31.21	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												_
Fracti	on of sp	ace hea	nt from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	t from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	∟ ar
Snace		g require		<u> </u>			Jui	<u> </u> Aug	Гоер	001	1400	Dec	KVVII/ye	aı
Орас	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7		
(211)		<u> </u>	<u> </u>				<u> </u>			L	L		1	(244)
(211)	444.39)m x (20 321.35	238.69	107.95	33.33	0	0	0	0	117.44	292.39	458.5		(211)
	7-1-1.03	021.00	230.08	107.80	00.00	L "	<u> </u>		l (kWh/yea				2044.05	(211)
								1010	(,(1	- · · /15,1012	2	2014.05	(211)

215)m= 0 0 0 0 0	0 0	0	0	0	0	0		
		Total	(kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0	(21
Vater heating						•		
Dutput from water heater (calculated above) 179.53 158.35 166.57 149.69 146.96 1	131.7 126.85	138.69	138.28	155.2	163.64	175.34		
Efficiency of water heater	120.03	130.03	130.20	100.2	103.04	175.54	79.8] ₍₂₁
	79.8 79.8	79.8	79.8	83.91	86.17	87.11		」` (21
Fuel for water heating, kWh/month		1 1						
(64)m x (64) m x (217) m (219) m	65.04 158.96	172.70	173.29	184.96	189.9	201.28		
219)m= 206.4 183.07 194.6 178.65 180.35 1	05.04 156.96	173.79 Total		19a) ₁₁₂ =	169.9	201.28	2190.29	(21
annual totals			•		Nh/year		kWh/year	٦٬٢٠
space heating fuel used, main system 1					,		2014.05	
Vater heating fuel used	2190.29	Ī						
Electricity for pumps, fans and electric keep-hot						•		
central heating pump:						30		(23
boiler with a fan-assisted flue						45		(23
otal electricity for the above, kWh/year		sum o	of (230a).	(230g) =			 75	(23
lectricity for lighting						[273.64	」 │(23
otal delivered energy for all uses (211)(221) +	(231) + (232)	(237b) =	=				4552.98	」 │(33
12a. CO2 emissions – Individual heating system	. , , ,							<u>」)</u>
	Energy kWh/year			kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.2	16	=	435.03	(26
space heating (secondary)	(215) x			0.5	19	= [0	(26
Vater heating	(219) x			0.2	16	=	473.1	(26
Space and water heating	(261) + (262)	+ (263) + (2	264) =			j	908.14	_](26
	(231) x			0.5	19	= [38.93] (26
electricity for pumps, fans and electric keep-hot								_
Electricity for pumps, fans and electric keep-hot Electricity for lighting	(232) x			0.5	19 l	=	142.02	(26

TER =

(273)

18.05

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:04:38

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 48.96m² Site Reference : Highgate Road - GREEN

03 - A **Plot Reference:**

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.27 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.43 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.5 kWh/m²

OK

2 Fabric U-values

Element Average Highest 0.18 (max. 0.70) External wall 0.17 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK**

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	5.45m ²	
Windows facing: South East	6.09m ²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		Heor	Dotails:									
Access on Names	User Details: Assessor Name: Neil Ingham Stroma Number: STRO											
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Softwa			on: 1.0.5.50						
Property Address: 03 - A												
Address :												
1. Overall dwelling dime	ensions:	_										
Ground floor		Ar	ea(m²) 48.96	(1a) x		ight(m) .65	(2a) =	Volume(m ³	(3a)			
	a) . (1b) . (1a) . (1d) . (1a) .	(1n)				.00	(24) -	129.74	(34)			
Total floor area TFA = (1	a)+(1b)+(1c)+(1u)+(1e)+	(111)	48.96	(4)) . (2-) . (2-	1) . (2 -) .	(2-)		_			
Dwelling volume				(3a)+(3b))+(3c)+(3c	l)+(3e)+	.(3h) =	129.74	(5)			
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	ır			
Number of chimneys	heating hea	ating		1 ₌ [40 =		_			
Number of chimneys			0		0		20 =	0	(6a)			
Number of open flues	0 +	0 +	0] = [0			0	(6b)			
Number of intermittent fa				Ĺ	2		10 =	20	(7a)			
Number of passive vents				Ĺ	0		10 =	0	(7b)			
Number of flueless gas fi	ires			L	0	X 4	40 =	0	(7c)			
							Air ch	nanges per ho	our			
Infiltration due to chimne	vs. flues and fans = (6a)-	+(6b)+(7a)+(7b)	+(7c) =	Г	20		÷ (5) =	0.15	(8)			
'	peen carried out or is intended,			ontinue fr			. (0)	0.10				
Number of storeys in the	he dwelling (ns)							0	(9)			
Additional infiltration						[(9)	-1]x0.1 =	0	(10)			
	.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)			
deducting areas of openii		riding to the gre	aler wall are	a (anter								
If suspended wooden f	floor, enter 0.2 (unsealed	d) or 0.1 (sea	iled), else	enter 0				0	(12)			
If no draught lobby, en								0	(13)			
ŭ	s and doors draught strip	oped						0	(14)			
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)			
Infiltration rate			(8) + (10)	, , ,	, , ,	, ,		0	(16)			
If based on air permeabil	q50, expressed in cubic	•	•	•	etre of e	envelope	area	5	(17)			
	es if a pressurisation test has b				is heina u	sed		0.4	(18)			
Number of sides sheltere		0011 d0110 01 d 0	.eg. ee a pe.		.o 2011.g u			0	(19)			
Shelter factor			(20) = 1 -	(0.075 x (1	19)] =			1	(20)			
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.4	(21)			
Infiltration rate modified f	or monthly wind speed						,					
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind sp	peed from Table 7											
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7					
Wind Factor (22a)m = (2	2)m ∸ 4											
	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18]				
, ,,		3.30	1 2.32			L <u>-</u>		J				

Adjusted infiltr	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.52	0.51	0.5	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47]	
Calculate effec		_	rate for t	he appli	cable ca	se						<u>. </u>	
If mechanica												0	(23a)
If exhaust air h) = (23a)			0	(23b)
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance					·	- ` ` 	- 	ŕ	- 	` 	' ' ') ÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	1		ntilation	without	heat red	overy (N	ЛV) (24b	m = (22)	 	- 		7	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h if (22b)n		tract ven (23b), t		•					.5 × (23k	o)	_	_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n		on or when (24d)							0.5]				
(24d)m= 0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24d)
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	-	
(25)m= 0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25)
3. Heat losse	s and he	eat loss r	naramete	ōt.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
Windows Type		,			5.45		/[1/(1.4)+	0.04] =	7.23	<u></u>			(27)
Windows Type	2				6.09	x ₁ ,	/[1/(1.4)+	0.04] =	8.07				(27)
Walls Type1	35.	3	11.54	4	23.76		0.18		4.28	=			(29)
Walls Type2	35.9		0		35.99	=	0.18	_	6.48			\exists	(29)
Total area of e					71.29	=	00		00				(31)
Party wall		,			14.89	=	0	- - □	0	[(32)
Party floor					48.96	=							(32a)
Party ceiling					48.96	=]		\exists	(32b)
Internal wall **						=				l T			==
* for windows and		OWS USA A	ffective wi	ndow I I-vs	96.46		ı formula 1	/[(1/ ₋ val	2 0.41 مراجر] es aiven in	naragrant	L	(32c)
** include the area						atou uomg	normala 1	/[(10) 10.0-1] (ao givoir iii	paragrapi	7 0.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				26.05	(33)
Heat capacity	Cm = S	(A x k)						((28).	(30) + (3	2) + (32a)	(32e) =	8550.39	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						6.09	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	· (36) =			32.15	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 27.09	26.87	26.65	25.64	25.45	24.56	24.56	24.4	24.9	25.45	25.83	26.24]	(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 59.24	59.02	58.8	57.79	57.6	56.71	56.71	56.55	57.05	57.6	57.98	58.38	<u></u>	
Stroma FSAP 201	2 Version	1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39)	12 /12=	57.7 β a	ge 2 of (3 / 9)

Average = Sum(40),	Heat loss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
Number of days in month (Table 1a)		<u> </u>	· ·		1.18	1.16	1.16	1.15	1.17	1.18	1.18	1.19		
Second S			!		!	!	!	!		Average =	Sum(40) ₁ .	12 /12=	1.18	(40)
4. Water heating energy requirement: **Notice of the standard			· `		·	 					·			
## Assumed occupancy, N				<u> </u>	<u> </u>	-	-	Ť		-				(44)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43) (44)ms 80.98 78.03 75.09 72.14 69.2 66.25 66.25 66.25 69.2 72.14 75.09 78.03 80.98 Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)ms 120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)ms 18.01 15.75 16.26 14.17 13.6 11.74 10.87 12.48 12.63 14.72 16.06 17.44 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared closs factor is known (kWh/day): 1.39 (48) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (52) Temperature factor from Table 2b (50) (50) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (52) Temperature factor from Table 2b (50) or (54) in (55) Water storage loss calculated for each month ((56)ms 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 2	(41)m= 31	20	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vum = factor from Table 1c x (43) (44)m= 80.98 78.03 75.09 72.14 69.2 66.25 66.25 66.25 69.2 72.14 75.09 78.03 80.98 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWhrhmonth (see Tables 1b. 1c. 1d) (45)m= 120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 Total = Sum(45)= 1158.23 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m= 18.01 15.75 16.26 14.17 13.6 11.74 10.87 12.48 12.63 14.72 16.06 17.44 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared olss factor is known (kWh/day): 1.39 (48) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) Total = Sum(45)= 1158.23 (45) Total = Sum(45)= 1158.23 (45) If community heating see section 4.3 Volume factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) Total = Sum(45)= 1158.23 (45) Total = Sum(45)= 1158.23 (45) In manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53														
if TFA ≥ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1	4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		66		(42)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 80.98 78.03 75.09 72.14 69.2 66.25 69.2 72.14 75.09 78.03 80.98 Total = Sum(44)z = 883.37 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m= 120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 Total = Sum(45)z = 1158.23 (45) If instantaneous water healing at point of use (no hot water storage), enter 0 in boxes (46) to (61) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: 1.39 (48) Temperature factor from Table 2b (49) (49) (51) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) Community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55)	Reduce the annua	ıl average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.61		(43)
Company Comp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Total = Sum(44)	Hot water usage in	n litres per	r day for ea		Vd,m = fa	ctor from	Table 1c x							
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m=	(44)m= 80.98	78.03	75.09	72.14	69.2	66.25	66.25	69.2	72.14	75.09	78.03	80.98		
120.08 105.03 108.38 94.49 90.66 78.23 72.5 83.19 84.18 98.11 107.09 116.29 Total = Sum(45)	Energy content of	hot water	used cal	culated m	onthly – 1	100 v Vd i	n v nm v [Tm / 2600			. ,	L	883.37	(44)
Total = Sum(45)\ 1.13 = 1158.23 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m=												· ·		
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)111= 120.06	105.05	100.30	94.49	90.00	10.23	72.5	03.19				l	1158 23	(45)
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: 1.39 (48) a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Temperature factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: 0 (51) Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 0 (52) Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55) (56) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)	If instantaneous w	ater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		rotar – ou	111(40)112 -		1130.23	()
Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)	(46)m= 18.01	15.75	16.26	14.17	13.6	11.74	10.87	12.48	12.63	14.72	16.06	17.44		(46)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	_								•					
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: (48) a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Temperature factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: 0 (51) Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 0 (52) Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55) (55) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58	_	, ,					_		ame ves	sei		150		(47)
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Temperature factor from Table 2b 0.54 (49) Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 26.58 23.33 26.58 23.33 26.58 23.33 26.58 23.33 26.58 23.33 26.58 23.33 26.58 23.33 26.58 23.33 26.58 23.33 26.58 23.33 <td< td=""><td>•</td><td>_</td><td></td><td></td><td>-</td><td></td><td></td><td>, ,</td><td>ers) ente</td><td>er '0' in <i>(</i></td><td>47)</td><td></td><td></td><td></td></td<>	•	_			-			, ,	ers) ente	er '0' in <i>(</i>	47)			
Temperature factor from Table 2b				(,		, ,			
Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (0.75) (55) Water storage loss calculated for each month ((56)m = (55) x (41)m) (56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	a) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWl	n/day):				1.	39		(48)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = $\begin{bmatrix} 23.33 & 21.07 & 23.33 & 22.58 & 23.33 & 22$	Temperature fa	actor fro	m Table	2b							0.	54		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	0,		Ū					(48) x (49)) =		0.	75		(50)
If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)m = 23.33 21.07 23.33 22.58	•			-								0		(51)
Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)		-			_ (, ,	-7/					0		(0.)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)$												0		(52)
Enter (50) or (54) in (55) 0.75 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	Temperature fa	actor fro	m Table	2b								0		(53)
Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	••		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-			
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	` , ,	, ,	,					//EC\ /	(FF) (44).		0.	75		(55)
								. , ,	1	ı	T			(50)
11 Symbol Solid Solid Storage, (67)11 = (65)11 x [(65) (1117)] . (65), 655 (67)11 = (65)11 where (1117) is 11611 x period x 1	` '												y H	(56)
$(57)_{12} = \begin{bmatrix} 1 & 0.2 $											· ·		X11	(57)
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)	(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33		<u> </u>		. ,
Primary circuit loss (annual) from Table 3 O (58)	•	•	•			E0\	(EO) - 00	SE /44\				0		(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	•				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59)	` 								<u> </u>		<u> </u>	23.26		(59)

Combi loss	ooloulotod	for oach	month /	(61)m –	(60) · 2(SE (41	\m						
Combi loss (61)m= 0	0 0	0	0	0	00) + 3	05 x (41)	0	0	0	0	0		(61)
				<u> </u>			<u> </u>	<u> </u>			<u> </u>	(59)m + (61)m	` /
(62)m= 166.6		154.97	139.58	137.26	123.33	119.09	129.78		144.7	152.18	162.89		(62)
Solar DHW inp	ut calculated	l	endix G o	Appendix		l) (enter	U'o' if no sola	r contribut	tion to wate	r heating)		
(add additio											σ,		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter		-		-			-		-		
(64)m= 166.6	8 147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89		_
							Οι	tput from w	ater heate	r (annual) ₁	12	1706.85	(64)
Heat gains t	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8	x [(46)m	+ (57)m	+ (59)m]	
(65)m= 77.2	68.59	73.31	67.49	67.42	62.09	61.38	64.94	64.06	69.9	71.68	75.94		(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic g	ains (Table	e 5), Wat	ts									_	
Jai	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 82.9	8 82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 12.8	9 11.44	9.31	7.05	5.27	4.45	4.8	6.25	8.38	10.64	12.42	13.24		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5		-	•	
(68)m= 144.5	146.03	142.25	134.21	124.05	114.51	108.13	106.63	110.41	118.45	128.61	138.16		(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	-	-		
(69)m= 31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3		(69)
Pumps and	fans gains	(Table 5	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							-	
(71)m= -66.3	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38		(71)
Water heati	ng gains (T	able 5)		-		-	-		-		-		
(72)m= 103.7	77 102.07	98.54	93.74	90.62	86.23	82.5	87.28	88.98	93.95	99.56	102.08		(72)
Total interr	al gains =	•			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m		
(73)m= 312.0	08 310.44	300.99	285.88	270.83	256.08	246.33	251.05	258.66	273.94	291.48	304.37		(73)
6. Solar ga													
Solar gains a		_	r flux from	Table 6a			tions to	convert to the	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ix ble 6a		g_ Table 6b	т	FF able 6c		Gains	
					ı a	DIE Ga	, –	Table ob	_ '	able 60		(W)	7
Southeast 0.9		X	6.0)9	X 3	36.79	_ x	0.63	x	0.7	=	68.48	(77)
Southeast 0.9		X	6.0)9	x 6	62.67	X	0.63	x	0.7	_ =	116.65	(77)
Southeast 0.9	0.77	X	6.0)9	X 8	35.75	X	0.63	x	0.7	=	159.6	(77)
Southeast 0.9		X	6.0)9	x 1	06.25	X	0.63	X	0.7	=	197.75	(77)
Southeast 0.9	× 0.77	X	6.0	9	x 1	19.01	X	0.63	x	0.7	=	221.5	(77)

F		_			_		1		_				_
Southeast 0.9x	0.77	X	6.0)9	x	118.15	X	0.63	X	0.7	=	219.9	(77)
Southeast 0.9x	0.77	X	6.0)9	X	113.91	X	0.63	X	0.7	=	212.01	(77)
Southeast _{0.9x}	0.77	X	6.0)9	x	104.39	X	0.63	X	0.7	=	194.29	(77)
Southeast _{0.9x}	0.77	X	6.0)9	X	92.85	X	0.63	X	0.7	=	172.81	(77)
Southeast 0.9x	0.77	X	6.0)9	x	69.27	x	0.63	X	0.7	=	128.92	(77)
Southeast _{0.9x}	0.77	X	6.0)9	x	44.07	x	0.63	X	0.7	=	82.02	(77)
Southeast 0.9x	0.77	X	6.0)9	x	31.49	x	0.63	X	0.7	=	58.6	(77)
Southwest _{0.9x}	0.77	X	5.4	15	x	36.79		0.63	X	0.7	=	61.28	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	62.67		0.63	X	0.7	=	104.39	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	85.75]	0.63	x	0.7	=	142.83	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	106.25		0.63	x	0.7	=	176.97	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	119.01		0.63	X	0.7	=	198.22	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	118.15]	0.63	x	0.7	=	196.79	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	113.91	Ī	0.63	x	0.7		189.73	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	104.39	ĺ	0.63	x	0.7		173.87	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	92.85	ĺ	0.63	x	0.7	=	154.65	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	69.27	Ī	0.63	x	0.7		115.37	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	44.07	ĺ	0.63	x	0.7		73.4	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	31.49	ĺ	0.63	x	0.7	=	52.45	(79)
Solar gains in (83)m= 129.76		culated 302.43	for eac 374.73	h month 419.72	416.	69 401.73	(<mark>83</mark>)m	n = Sum(74)m . .16 327.47	(82)m 244.29	9 155.43	111.05]	(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m ·	+ (83)m , watts		!	!			J	
(84)m= 441.84	531.47 6	603.42	660.61	690.55	672.	76 648.06	619	.21 586.13	518.23	3 446.91	415.42	1	(84)
7. Mean inter	nal temper				•	•		0000					(- ')
Temperature		rature ((heating	season			•	.2. 000.10		,			(= -)
•	during hea		`		<i>'</i>	ea from Tal	ole 9					21	(85)
Utilisation fac	ŭ	ating p	eriods ir	n the livi	ng ar		ole 9					21	_
Utilisation fac	ctor for gain	ating p	eriods ir	n the livi	ng ar	Table 9a)			Oct	Nov	Dec	21	_
	ctor for gain	ating pons	eriods ir iving are	n the livi	ng ar	Table 9a) in Jul		, Th1 (°C)	Oct	Nov 0.97	Dec 0.99	21	_
(86)m= Jan 0.99	Feb 0.97	ating pons for li	eriods ir iving are Apr 0.85	n the living the hand	ng ard (see Ju	Table 9a) In Jul 3 0.38	A 0.4	, Th1 (°C) ug Sep	_	+	 	21	(85)
Jan	Feb 0.97 temperatu	ating pons for li	eriods ir iving are Apr 0.85	n the living the hand	ng ard (see Ju	Table 9a) In Jul 3 0.38 Steps 3 to 7	A 0.4	Table 9c)	_	0.97	 	21	(85)
(86)m= 0.99 Mean interna (87)m= 19.95	retor for gain Feb 0.97 I temperatu 20.18	ns for li Mar 0.94 ure in l	eriods ir iving are Apr 0.85 living are 20.74	n the living the hand	y (see Ju 0.5 ollow 20.9	Table 9a) In Jul 3 0.38 Steps 3 to 7	7 in T	Sep 12 0.64 Table 9c)	0.89	0.97	0.99	21	(85)
Jan (86)m= 0.99 Mean interna (87)m= 19.95 Temperature	retor for gain Feb 0.97 I temperatu 20.18 2 during hea	ns for ling pons for ling Mar 0.94 ure in lace 120.45 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 ating pons for lace 1.5 at 1.5	eriods ir iving are Apr 0.85 living are 20.74 eriods ir	n the living the hand may 0.71 ea T1 (for 20.92 en rest of	ng ard (see Ju 0.5 ollow 20.9	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 ling from Ta	A 0.47 in T 2 able 9	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C)	20.73	0.97	0.99	21	(85) (86) (87)
Jan (86)m= 0.99	retor for gain Feb 0.97 I temperatu 20.18 2 during hea 19.92 1	ns for ling points for ling Mar 0.94 ure in lagrange ating points 19.92	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94	m the living the sea, h1,m May 0.71 the a T1 (for 20.92 the rest of 19.94	ng ard (see Jule 0.5 ollow 20.9 dwell 19.9	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 ling from Ta 95 19.95	A 0.47 in T 2 able 9 19.	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C)	0.89	0.97	0.99	21	(85)
Jan (86)m= 0.99 Mean interna (87)m= 19.95 Temperature (88)m= 19.91 Utilisation fac	tor for gain Feb 0.97 I temperatu 20.18 2 during hea 19.92 1 terr for gain	ns for ling per ns for ling per ns for r	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94	n the living the sea, h1,mmm May 0.71 ea T1 (for 20.92 n rest of 19.94 welling,	ng ard (see Ju 0.5 ollow 20.9 dwell 19.9	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 Iling from Ta 95 19.95 (see Table	A 0.47 in T 2 able 9 19.	Sep 12 0.64 Table 9c) 1 20.96 1 20.96 1 19.95	0.89 20.73 19.94	0.97	0.99 19.92	21	(85) (86) (87) (88)
Jan (86)m= 0.99	tor for gain Feb 0.97 I temperatu 20.18 2 during hea 19.92 tor for gain 0.96	ns for ling per series of the	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of do	m the living the sea, h1,mm and may 0.71 the sea T1 (for 20.92 the rest of 19.94 the sea T1 (sea T1) and s	ng ard (see Jul 0.5 ollow 20.5 dwell 19.5 h2,m 0.4	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 Steps 19.95 (see Table 5 0.29	A 0.47 in T 2 able 9 19. 9a) 0.3	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95	0.89 20.73 19.94	0.97	0.99	21	(85) (86) (87)
Jan (86)m= 0.99 Mean interna (87)m= 19.95 Temperature (88)m= 19.91 Utilisation fac (89)m= 0.99 Mean interna	tor for gain Feb 0.97 I temperatu 20.18 2 during hea 19.92 1 tor for gain 0.96 I temperatu	ns for ling points for ling points for rough line in the line line line line line line line lin	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of de 0.82 the rest	n the living the hand the living the hand the ha	ng ard (see Ju 0.5 ollow 20.9 dwell 19.9 h2,m 0.4 ing T2	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 Ing from Ta 95 19.95 (see Table 5 0.29 2 (follow ste	A 0.27 in T 2 able 9 19. 9a) 0.3	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95 10 7 in Table	0.89 20.73 19.94 0.85 e 9c)	0.97	0.99 19.92 19.93	21	(85) (86) (87) (88) (89)
Jan (86)m= 0.99	tor for gain Feb 0.97 I temperatu 20.18 2 during hea 19.92 1 tor for gain 0.96 I temperatu	ns for ling per series of the	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of do	m the living the sea, h1,mm and may 0.71 the sea T1 (for 20.92 the rest of 19.94 the sea T1 (sea T1) and s	ng ard (see Jul 0.5 ollow 20.5 dwell 19.5 h2,m 0.4	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 Ing from Ta 95 19.95 (see Table 5 0.29 2 (follow ste	A 0.47 in T 2 able 9 19. 9a) 0.3	Table 9c) 1 20.96 2 0.55 1 0.55 1 19.92	0.89 20.73 19.94 0.85 le 9c)	0.97 20.29 19.93 0.97	0.99 19.92 19.93 0.99		(85) (86) (87) (88) (89)
Jan (86)m= 0.99 Mean interna (87)m= 19.95 Temperature (88)m= 19.91 Utilisation fac (89)m= 0.99 Mean interna	tor for gain Feb 0.97 I temperatu 20.18 2 during hea 19.92 1 tor for gain 0.96 I temperatu	ns for ling points for ling points for rough line in the line line line line line line line lin	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of de 0.82 the rest	n the living the hand the living the hand the ha	ng ard (see Ju 0.5 ollow 20.9 dwell 19.9 h2,m 0.4 ing T2	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 Ing from Ta 95 19.95 (see Table 5 0.29 2 (follow ste	A 0.27 in T 2 able 9 19. 9a) 0.3	Table 9c) 1 20.96 2 0.55 1 0.55 1 19.92	0.89 20.73 19.94 0.85 le 9c)	0.97	0.99 19.92 19.93 0.99	21	(85) (86) (87) (88) (89)
Jan (86)m= 0.99 Mean interna (87)m= 19.95 Temperature (88)m= 19.91 Utilisation fac (89)m= 0.99 Mean interna (90)m= 18.55	tor for gain Feb 0.97 I temperatu 20.18 20.18 19.92 1 tor for gain 0.96 I temperatu 18.88 1 I temperatu	ns for li Mar 0.94 ure in l 20.45 ating per 19.92 ns for r 0.92 ure in t 19.27 ure (for	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of dr 0.82 the rest 19.66 r the wh	n the living the harmonic manner of the living the harmonic manner of the harmonic manner o	Ju 0.5	Table 9a) In Jul 3 0.38 Steps 3 to 7 198 21 Iling from Ta 195 19.95 (see Table 5 0.29 2 (follow steps) 4 19.95 = fLA × T1	A 0.4 7 in T 2 able 9 19. 9a) 0.3 eps 3	Th1 (°C) ug Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95 to 7 in Table 95 19.92 f LA) × T2	0.89 20.73 19.94 0.85 19.66 19.66 FLA = Liv	0.97 20.29 19.93 0.97 19.06 ving area ÷ (-	0.99 19.92 19.93 0.99 18.51 4) =		(85) (86) (87) (88) (89) (90) (91)
Jan (86)m= 0.99 Mean internal (87)m= 19.95 Temperature (88)m= 19.91 Utilisation fact (89)m= 0.99 Mean internal (90)m= 18.55	tor for gain Feb 0.97 I temperatu 20.18 20.18 19.92 tor for gain 0.96 I temperatu 18.88 I temperatu 19.52 1	ns for ling persons for rouge in the state of the state o	eriods ir iving are Apr 0.85 living are 20.74 eriods ir 19.94 rest of dr 0.82 the rest 19.66 r the wh	n the living the harmonic the living the harmonic the har	dwell 19.9 19.9 19.9 19.9 19.9 19.9 19.9 19	Table 9a) In Jul 3 0.38 Steps 3 to 7 98 21 Iling from Ta 95 19.95 (see Table 5 0.29 2 (follow steps 94 19.95 = fLA × T1 46 20.47	A 0.4 7 in T 2 able 9 9a) 0.3 19. + (1 20.	Sep 12 0.64 Table 9c) 1 20.96 9, Th2 (°C) 96 19.95 to 7 in Table 95 19.92 f -fLA) × T2 47 20.44	0.89 20.73 19.94 0.85 e 9c) 19.66 fLA = Liv	0.97 20.29 19.93 0.97 19.06 ving area ÷ (0.99 19.92 19.93 0.99		(85) (86) (87) (88) (89)

(00)	40.05	40.50	40.00	20.0	20.20	20.40	20.47	20.47	20.44	20.40	40.07	40.04		(93)
(93)m=	19.25	19.52	19.86	20.2	20.39	20.46	20.47	20.47	20.44	20.19	19.67	19.21		(93)
			uirement				44 -4	Table O	41	4 T: /	70)	-11-	late	
			or gains			ed at ste	ер ттог	rable 9i	o, so tha	t 11,m=(rojin an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm					,						
(94)m=	0.98	0.96	0.92	0.83	0.68	0.49	0.34	0.37	0.59	0.86	0.96	0.99		(94)
Usefu			W = (94)				ı	,			1	1	1	
(95)m=		510.71	553.96	545.79	467.37	327.35	218.89	229.22	348.34	444.13	430.33	409.63		(95)
		age exte	rnal tem	perature			•	,						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat			i				- ` 	- ` 	– (96)m					
(97)m=	885.41	862.97	785.37	652.83	500.34	332.38	219.54	230.24	361.63	552.53	728.96	876.25		(97)
Space			ı	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		ı	
(98)m=	335.86	236.72	172.17	77.07	24.53	0	0	0	0	80.65	215.01	347.16		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1489.17	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								30.42	(99)
9a En	erav rec	wiremer	nts – Indi	ividual h	eating sy	vstems i	ncluding	ı micro-C	:HP)					
	e heatir		no ma	Madain	oainig o	y otorno r	noraanig	, moro c)					
•		•	at from s	econdar	v/supple	mentary	system						0	(201)
	•		at from m			,	•	(202) = 1	- (201) =				1] (202)
	•		ng from	-	. ,			(204) = (2	02) × [1 –	(203)] =			1] (204)
			ace heat	-					, -	` '-			93.5	(206)
	•	-	ry/supple			n eveten	n %						0	(208)
Lillon		Feb		·		-		Aug	Con	Oct	Nov	Doo		J` ′
Snac	Jan		Mar ement (c	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar .
Opac	335.86	236.72	172.17	77.07	24.53	0	0	0	0	80.65	215.01	347.16		
(044)			<u> </u>	<u> </u>		Ů			Ŭ	00.00	210.01	047.10		(0.1.1)
(211)m		•	(4)] } x 1	· `				I 0		00.00	000.00	074.0		(211)
	359.21	253.18	184.14	82.42	26.23	0	0	O Tota	0 II (kWh/yea	86.26	229.96	371.3		7(044)
								TOTA	ii (KVVII/yea	ar) =Surri(2	2 1) _{15,1012}	F	1592.7	(211)
•		`	econdar	• / ·	month									
			00 ÷ (20	r	0	0		Ι ο		_				
(215)m=	0	0	0	0	0	0	0	O Tota	0 II (kWh/yea	0	0	0		7(045)
								TOTA	ii (KVVII/yea	ar) =Surri(2	213) _{15,1012}	F	0	(215)
	heating													
Output	166.68	ater hea 147.11	ter (calc 154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	1	
Efficio	ncy of w			139.30	137.20	123.33	119.09	129.76	129.27	144.7	132.10	102.09	70.0	(216)
				00.0	04.00	70.0	70.0	70.0	70.0	00.00	05.74	00.70	79.8	(217)
(217)m=		86.08	85.09	83.3	81.26	79.8	79.8	79.8	79.8	83.33	85.74	86.78		(217)
		•	kWh/mo (217) ÷ (
,	192.37	170.91	182.12	167.55	168.92	154.54	149.24	162.64	162	173.66	177.5	187.7		
. ,			<u> </u>	<u> </u>		<u> </u>	<u> </u>		I = Sum(2		<u> </u>	<u> </u>	2049.14	(219)
Annus	al totals								•		Wh/year	•	kWh/year	١,,
		fuel use	ed, main	system	1					, a	<i></i>		1592.7	1
•	J			-									<u> </u>	_

					-
Water heating fuel used				2049.14	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	i)(230g) =		75	(231)
Electricity for lighting				227.56	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			3944.39	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy	Emission fa	ctor	Emissions	
	kWh/year	kg CO2/kWh		kg CO2/yea	ar
Space heating (main system 1)	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (main system 1) Space heating (secondary)	·				_
	(211) x	0.216	=	344.02	(261)
Space heating (secondary)	(211) x (215) x	0.216	=	344.02	(261)
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216	=	344.02 0 442.61	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	= = =	344.02 0 442.61 786.64	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= = =	344.02 0 442.61 786.64 38.93	(261) (263) (264) (265) (267)

TER =

(273)

19.27

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:04:27

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 53.46m²Site Reference:Highgate Road - GREENPlot Reference: 03 - B

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

18.07 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.38 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.0 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	9.56m²	
Windows facing: North West	3.98m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		Llco	r Details:						
A a a a a a a a a a Maria a a	Na il la ala ava	USE		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012)	Stroma Softwa					010943 on: 1.0.5.50	
Continui o Humo.			ty Address:		0.011.		7 0 10 10	11010100	
Address :		·							
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m ³	(3a)
	-) . (4 -) . (4 -) . (4 -) . (4 -)	. (4.5)		(1a) x	2	65	(2a) =	141.67	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	53.46	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	141.67	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	ır
Number of allipsychia	heating he	eating		,			40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				Ĺ	2		10 =	20	(7a)
Number of passive vents	;			L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)+(6b)+(7a)+(7b	o)+(7c) =	Г	20		÷ (5) =	0.14	(8)
	peen carried out or is intended			ontinue fr			. (0) –	0.14	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fr resent, use the value corresp			•	ruction			0	(11)
deducting areas of openii		onaing to the gi	realer wall are	a (aner					
If suspended wooden t	floor, enter 0.2 (unseale	ed) or 0.1 (se	aled), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
· ·	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubi	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	lity Value, then (16) = I(17) es if a pressurisation test has				is boing u	sod		0.39	(18)
Number of sides sheltere		been done or a	degree all per	meability	is being u	seu		0	(19)
Shelter factor	-		(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.39	(21)
Infiltration rate modified f	or monthly wind speed						'		
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08	0.95 0.99	5 0.92	1	1.08	1.12	1.18		
` '					L			J	

Adjusted infiltration	n rate (alle	owing for s	nelter an	nd wind s	peed) =	(21a) x	(22a)m					
0.5 0.	49 0.4	8 0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46		
Calculate effective		ge rate for	he appli	cable ca	se	•	•	•	•	•	•	— ,
If mechanical ve		\nnondiv N ()2h) _ (22a	a) v Emy (c	auation (VEVV otho	nuico (22h) - (22a)			0	(23
If exhaust air heat p) = (23a)			0	<u></u> (23
If balanced with hea	-	-	_					21.) (4 (00.)	0	(2:
a) If balanced m	ecnanica 0 0	1	with nea	at recove	ery (IVIVI	$\frac{HR}{0}$ (248	$\int_{0}^{1} 0$	2b)m + (0	$\frac{230) \times [}{0}$	1 – (23c) 1 ₀	i ÷ 100] I	(24
′										0		(2.
b) If balanced m	ecnanica 0 0		Without	neat rec	overy (r	VIV) (240 1 0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	2b)m + (. 0	23b) ₀	1 0	1	(2
,								0	0	0		(2
c) If whole hous			•	•				.5 × (23b	p)		1	
24c)m= 0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural ven if (22b)m =								0.5]				
24d)m= 0.62 0.	62 0.6	1 0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(2
Effective air cha	nge rate	enter (24a	n) or (24k	o) or (24	c) or (24	d) in bo	(25)					
(25)m= 0.62 0.	62 0.6	1 0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(2
3. Heat losses ar	d heat lo	ss paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val		A X U (W/		k-value kJ/m²-l		X k J/K
Vindows Type 1	,			9.44		/[1/(1.4)+		12.52	$\stackrel{\prime}{\Box}$			(2
Vindows Type 2				3.93		/[1/(1.4)+	0.04] =	5.21	=			(2
Walls Type1	40.04	13.3	7	26.67		0.18		4.8	=) (2
Valls Type2	12.16	0	<u>-</u>	12.16	=	0.18	=	2.19	_			(2
Total area of elem				52.2	<u>'</u>	0.16		2.19				(2 (3
	Citto, iii				=		_	0	— r			
Party wall				27.88	=	0	=	0				(3
Party floor				53.46	=				<u> </u>			(3.
Party ceiling				53.46							_	(3
nternal wall **				102.0								(3
for windows and roof it include the areas on					ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
abric heat loss, V						(26)(30)	+ (32) =				24.71	(3
Heat capacity Cm	,	,					((28)	(30) + (32	2) + (32a).	(32e) =	9848.67	<u> </u>
· Thermal mass par	•	•	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium	, ,	250	<u> </u>
- For design assessmen can be used instead of	ts where the	e details of the	,			recisely the	indicative	e values of	TMP in T	able 1f		`
hermal bridges :	S (L x Y)	calculated	using Ap	pendix ł	<						6.09	(3
details of thermal brid otal fabric heat lo		ot known (36)	= 0.05 x (3	31)			(33) +	(36) =			30.81	
entilation heat lo	ss calcula	ited monthl	y				(38)m	= 0.33 × ((25)m x (5)		
	eb Ma		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
38)m= 29.19 28	.96 28.7	 	27.51	26.6	26.6	26.44	26.95	27.51	27.9	28.31		(3
Heat transfer coef	icient. W	 /K	•	•		•	(39)m	= (37) + (38)m	•	•	
	.77 59.5		58.31	57.41	57.41	57.24	57.76	58.31	58.71	59.12]	
00/111-												

eat lo	ss para	meter (H	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
0)m=	1.12	1.12	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.1	1.11		
			-41- / T -1-	la 4a\						Average =	Sum(40) ₁	12 /12=	1.09	(40
umbe	ı i		nth (Tab		N.A	1	11	Δ	0	0-4	N ₁			
4\	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(4
1)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
4. Wa	ter heat	ing ene	gy requi	rement:								kWh/ye	ar:	
		pancy, l										79		(4
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13	.9)			
		•	ater usad	ne in litre	s ner da	ıv Vd av	erage =	(25 x N)	+ 36		76	5.76		(4
educe	the annua	ıl average	hot water	usage by	5% if the a	welling is	designed t			se target o		0.76		(4
ot more	that 125	litres per _l	person pei	day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m=	84.44	81.37	78.3	75.23	72.16	69.09	69.09	72.16	75.23	78.3	81.37	84.44		
											m(44) ₁₁₂ =	L	921.15	(4
nergy (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
5)m=	125.22	109.52	113.01	98.53	94.54	81.58	75.6	86.75	87.78	102.3	111.67	121.27		
· •				-1		()		h (40		Total = Su	m(45) ₁₁₂ =	= [1207.78	(4
instant		ater neatii	ng at point		not water	storage),	enter 0 in	DOXES (46)) to (61)					
6)m=	18.78	16.43	16.95	14.78	14.18	12.24	11.34	13.01	13.17	15.35	16.75	18.19		(4
	storage		includir	na anv eo	olar or M	/\//HRS	storage	within es	ama vas	امء		450		(4
_		` ,		•			_		arric vos	001		150		(4
	-	_			_		litres in neous co	' '	ers) ente	er 'O' in <i>(</i>	(47)			
	storage		not wate	, (uno ii	10144001	notantai	10000 00	11101 0011	010) 01110	31 0 111 (,			
	-		eclared I	oss facto	or is kno	wn (kWh	n/day):				1.	39		(4
empe	rature fa	actor fro	m Table	2b							0.	54		(4
-				, kWh/ye	ear			(48) x (49)) =			75		(5
٠.			·	ylinder l		or is not	known:							•
		•		om Tabl	e 2 (kW	h/litre/da	ıy)					0		(5
	-	_	ee secti	on 4.3										
		from Ta	ole 2a m Table	2h								0		(5
•									> .	>		0		(5
٠.		m water 54) in (5	•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(5
	. , .	,	•					((EC) (EE) (44).		0.	75		(5
		ioss cai	culated	or each	month		1	((56)m = (55) × (41)	m •	r			
6)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Appendi	хH	
7)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
rimar	y circuit	loss (ar	nual) fro	m Table	3							0		(5
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	om Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
9)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(!

Combi loss	ooloulotod	for oach	month ((61)m -	(60) · 2(SE (41	\m						
(61)m= 0	0 0	0	0	0	00) + 30	05 x (41)	0	0	0	0	0	1	(61)
		ļ					<u> </u>	<u> </u>		<u> </u>		J (59)m + (61)m	(0.1)
(62)m= 171.8	<u> </u>	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	(59)111 + (61)1111	(62)
Solar DHW inp						<u> </u>						l	(- /
(add addition										.o to mate	5ag/		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ter				ļ.	Į.				l	ı	
(64)m= 171.8	-	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86]	
	'						Out	out from w	ater heate	r (annual)₁	12	1756.39	(64)
Heat gains f	rom water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 78.9	1 70.08	74.85	68.83	68.71	63.2	62.41	66.12	65.26	71.29	73.2	77.6	1	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	om com	munity h	reating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic ga	ains (Table	e 5), Wat	ts									_	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 89.6	1 89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 13.9	3 12.37	10.06	7.62	5.69	4.81	5.19	6.75	9.06	11.5	13.43	14.31		(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	-		
(68)m= 156.2	21 157.83	153.74	145.05	134.07	123.75	116.86	115.24	119.33	128.02	139	149.32		(68)
Cooking gai	ns (calcula	ated in A	opendix	L, equat	ion L15	or L15a), also s	ee Table	5	-	-		
(69)m= 31.9	6 31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96		(69)
Pumps and	fans gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (nega	ive valu	es) (Tab	le 5)	-	-		-		-		
(71)m= -71.6	8 -71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68		(71)
Water heating	ng gains (1	Table 5)											
(72)m= 106.0	06 104.29	100.61	95.6	92.35	87.78	83.89	88.87	90.64	95.82	101.67	104.3		(72)
Total intern	al gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m		
(73)m= 329.0	08 327.37	317.29	301.15	285	269.22	258.82	263.74	271.91	288.23	306.98	320.81		(73)
6. Solar ga	ins:												
Solar gains ar		Ü	r flux from	Table 6a			itions to co	onvert to th	ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a	7	g_ able 6b	т	FF able 6c		Gains	
					Tal	DIE Ga	, —	able ob	_ '	able 60		(W)	,
Southwest _{0.9}		X	9.4	14	x 3	36.79	<u> </u>	0.63	x	0.7	=	106.15	(79)
Southwest _{0.9}	•	X	9.4	14	x 6	62.67	<u> </u>	0.63	x	0.7	=	180.81	(79)
Southwest _{0.9}	• • • • • • • • • • • • • • • • • • • •	X	9.4	14	x8	35.75	! <u> </u>	0.63	x	0.7	=	247.4	(79)
Southwest _{0.9}		Х	9.4	14	x 1	06.25	ļ <u>L</u>	0.63	x	0.7	=	306.53	(79)
Southwest _{0.9}	x 0.77	X	9.4	14	x 1	19.01		0.63	x	0.7	=	343.34	(79)

_		_			_		_						_
Southwest _{0.9x}	0.77	X	9.4	14	x L	118.15	╛	0.63	X	0.7	=	340.86	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	113.91		0.63	X	0.7	=	328.63	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	104.39		0.63	X	0.7	=	301.16	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	92.85		0.63	x	0.7	=	267.88	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	69.27		0.63	x	0.7	=	199.84	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	44.07		0.63	x	0.7	=	127.14	(79)
Southwest _{0.9x}	0.77	X	9.4	14	x	31.49		0.63	х	0.7	=	90.84	(79)
Northwest _{0.9x}	0.77	X	3.9	93	x	11.28	x	0.63	x	0.7	=	13.55	(81)
Northwest _{0.9x}	0.77	X	3.9	93	x	22.97	x	0.63	x	0.7	=	27.58	(81)
Northwest 0.9x	0.77	X	3.9	93	x [41.38	x	0.63	x	0.7	=	49.7	(81)
Northwest _{0.9x}	0.77	X	3.9	93	x	67.96	×	0.63	x	0.7	=	81.62	(81)
Northwest _{0.9x}	0.77	X	3.9	93	x	91.35	×	0.63	x	0.7	-	109.71	(81)
Northwest 0.9x	0.77	X	3.9	93	x	97.38	X	0.63	x	0.7	=	116.96	(81)
Northwest 0.9x	0.77	X	3.9	93	x	91.1	x	0.63	x	0.7	=	109.42	(81)
Northwest 0.9x	0.77	×	3.9	93	x	72.63	x	0.63	x	0.7	=	87.23	(81)
Northwest 0.9x	0.77	= x	3.9	93	x	50.42	×	0.63	x	0.7	=	60.56	(81)
Northwest 0.9x	0.77	X	3.9	93	x [28.07	x	0.63	x	0.7	=	33.71	(81)
Northwest 0.9x	0.77	×	3.9	93	x	14.2	x	0.63	x	0.7	=	17.05	(81)
Northwest 0.9x	0.77	= x	3.9	93	x	9.21	×	0.63	x	0.7	=	11.07	(81)
Solar gains in (83)m= 119.7		lated	for eac	h month 453.06		7.83 438.04	- ` 	n = Sum(74)m .39 328.43	(82)m	5 144.19	101.91	1	(83)
Total gains – i	nternal and	solar	(84)m =	<u> </u>	<u>- (8</u> ;	3)m , watts	_ -				ļ	l	
(84)m= 448.78		4.39	689.3	738.05	·	7.04 696.8	_	.14 600.34	521.78	3 451.17	422.72		(84)
7. Mean inter	nal tempera	ture (heating	season	\ \							I	
Temperature	•				<i>'</i>	rea from T	able 9	Th1 (°C)				21	(85)
Utilisation fac	ŭ	٠.			•			, (3)					
Jan		Mar	Apr	May	r `	$\overline{}$	<i>,</i>						
(86)m= 0.99	 	-	, , , ,	, <u>~</u> ,		un I Jul	A	ua Sep	Oct	Nov	Dec	1	
		.94	0.85	0.69	 	un Jul .5 0.36	0.	ug Sep 4 0.64	Oct	Nov 0.98	Dec 0.99		(86)
Moon intorna	!I			ļ	0	.5 0.36	0.4	4 0.64	 	-			(86)
Mean interna	l temperatui	re in I	iving are	ea T1 (fo	0 ollow	.5 0.36 v steps 3 to	0.4 7 in T	4 0.64 able 9c)	0.9	0.98	0.99		
(87)m= 20.02	l temperatui 20.23 2	re in I	iving are	ea T1 (fo	0 Ollow 20	.5 0.36 v steps 3 to .99 21	0.4 7 in T	able 9c) 1 20.97	 	0.98			(86) (87)
(87)m= 20.02 Temperature	l temperatul 20.23 2 during heat	re in I	iving are 20.78 eriods ir	ea T1 (fo	0 20 dwe	.5 0.36 y steps 3 to .99 21 elling from	0.0 7 in T 2 Table 9	able 9c) 1 20.97 9, Th2 (°C)	20.75	0.98	0.99		(87)
(87)m= 20.02 Temperature (88)m= 19.98	l temperature 20.23 2 during heat 19.99 19	re in I 0.5 ing pe	20.78 eriods ir	ea T1 (for 20.94 n rest of 20.01	0 20 dwe	0.36 y steps 3 to 99 21 elling from 02 20.02	0.7 in T 2 Table 9 20.	able 9c) 1 20.97 9, Th2 (°C)	0.9	0.98	0.99		
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fac	temperature 20.23 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	re in I 0.5 ing pe	20.78 eriods ir 20.01 est of d	ea T1 (for 20.94 or rest of 20.01 welling,	ollow 20 dwe 20 h2,n	.5 0.36 v steps 3 to .99 21 elling from .02 20.02 n (see Tab	0.0 7 in T 2 2 Table 9 20.	7 able 9c) 1 20.97 9, Th2 (°C) 02 20.02	20.75	20.34	0.99		(87)
(87)m= 20.02 Temperature (88)m= 19.98	temperature 20.23 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	re in I 0.5 ing pe	20.78 eriods ir	ea T1 (for 20.94 n rest of 20.01	ollow 20 dwe 20 h2,n	0.36 y steps 3 to 99 21 elling from 02 20.02	0.7 in T 2 Table 9 20.	7 able 9c) 1 20.97 9, Th2 (°C) 02 20.02	20.75	0.98	0.99		(87)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fac	during heat 19.99 19 tor for gains 0.97 0	re in I 0.5 ing po 9.99	20.78 eriods ir 20.01 est of d	ea T1 (for 20.94 in rest of 20.01 welling, 0.63	0 20 dwe 20 h2,n 0.	0.36 v steps 3 to 0.99 21 elling from 0.02 20.02 n (see Tab 43 0.28	0.4 7 in T 2 Table 9 20.4 10 9a) 0.3	7 able 9c) 1 20.97 9, Th2 (°C) 02 20.02	20.75 20.01 0.86	20.34	0.99		(87)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation factors (89)m= 0.99	during heat 19.99 19 tor for gains 0.97 0 I temperature	re in I 0.5 ing po 9.99	20.78 eriods ir 20.01 est of d	ea T1 (for 20.94 in rest of 20.01 welling, 0.63	0 20 dwe 20 h2,n 0.	0.36 v steps 3 to 0.99 21 elling from 0.02 20.02 n (see Tab 43 0.28	0.0 7 in T 2 Γable 9 10 0.3 steps 3	Table 9c) 1 20.97 9, Th2 (°C) 02 20.02 20.56 to 7 in Tab 02 20	0.9 20.75 20.01 0.86 le 9c) 19.75	0.98 20.34 20 0.97	0.99 19.98 20 0.99		(87) (88) (89) (90)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fact (89)m= 0.99 Mean internal	during heat 19.99 19 tor for gains 0.97 0 I temperature	re in I 0.5 ing po 0.99 s for re .93	20.78 eriods ir 20.01 est of do 0.81 he rest	ea T1 (for 20.94 in rest of 20.01 welling, 0.63 of dwelling	0 20 dwe 20 h2,n 0.	0.36 y steps 3 to 99 21 elling from 02 20.02 n (see Tab 43 0.28	0.0 7 in T 2 Γable 9 10.3 teps 3	Table 9c) 1 20.97 9, Th2 (°C) 02 20.02 20.56 to 7 in Tab 02 20	0.9 20.75 20.01 0.86 le 9c) 19.75	20.34	0.99 19.98 20 0.99	0.45	(87) (88) (89)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fact (89)m= 0.99 Mean internal	during heat 19.99 19 tor for gains 0.97 0 I temperatur	re in l 0.5 ing po 0.99 s for r .93	eriods ir 20.01 est of dr 0.81 he rest	ea T1 (for 20.94 in rest of 20.01 welling, 0.63 of dwelling)	0 20 dwe 20 h2,n 0.	0.36 v steps 3 to 0.99 21 elling from 0.02 20.02 n (see Tab 43 0.28 72 (follow see Tab 0.02 20.02	0.0 7 in T 2 20. le 9a) 0.3 steps 3	7 able 9c) 1 20.97 20.97 20.02 20.02 20.02 20.02 20.02 20.02 20.02	0.9 20.75 20.01 0.86 le 9c) 19.75 fLA = Liv	0.98 20.34 20 0.97	0.99 19.98 20 0.99	0.45	(87) (88) (89) (90)
(87)m= 20.02 Temperature (88)m= 19.98 Utilisation fact (89)m= 0.99 Mean internation (90)m= 18.7	during heat 19.99 19 tor for gains 0.97 0 I temperatur 19 19	re in l 0.5 ing po 0.99 s for r .93	eriods ir 20.01 est of dr 0.81 he rest	ea T1 (for 20.94 in rest of 20.01 welling, 0.63 of dwelling)	0 20 dwe 20 0	0.36 v steps 3 to 0.99 21 elling from 0.02 20.02 n (see Tab 43 0.28 72 (follow see Tab 0.02 20.02	0.0 7 in T 2 Table 9 20.1 le 9a) 0.3 steps 3 20.1	4 0.64 Table 9c) 1 20.97 9, Th2 (°C) 02 20.02 12 0.56 15 7 in Tab 02 20 - fLA) × T2	0.9 20.75 20.01 0.86 le 9c) 19.75 fLA = Liv	0.98 20.34 20 0.97	0.99 19.98 20 0.99	0.45	(87) (88) (89) (90)
Temperature (88)m= 19.98 Utilisation fac (89)m= 0.99 Mean interna (90)m= 18.7	temperature 20.23	re in l 0.5 ing po 0.99 s for r .93 re in t 0.38	est of do 0.81 he rest 19.77 the wh	ea T1 (for 20.94 in rest of 20.01 welling, 0.63 of dwelling 19.96 ole dwe 20.4	0 0 0 0 0 0 0 0 0 0	0.36 v steps 3 to .99 21 elling from .02 20.02 n (see Tab 43 0.28 T2 (follow s .02 20.02) = fLA × T .46 20.46	0.0 7 in T 2 20. le 9a) 0.3 steps 3 20. 1 + (1 20.	7 able 9c) 1 20.97 20.97 20.02 20.02 20.02 20.02 20 46 20.44	0.9 20.75 20.01 0.86 le 9c) 19.75 fLA = Liv	0.98 20.34 20 0.97 19.17 ring area ÷ (4)	0.99 19.98 20 0.99 18.66 4) =	0.45	(87) (88) (89) (90) (91)

(00)	1 40 55	10.00	00.00		00.40	00.40	00.40	00.44	22.2	1	40.00	[(93)
(93)m= 19.29	19.55	19.89	20.23	20.4	20.46	20.46	20.46	20.44	20.2	19.7	19.26		(93)
8. Space hea				ro obtoin	ad at at	nn 11 of	Table 0	o oo tha	tTim (76\m an	d ro oolo	uloto	
Set Ti to the the utilisation			•		eu ai sii	эр 11 01	Table 9	o, so ina	t 11,111=(70)III aII	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:									ı	
(94)m= 0.99	0.97	0.93	0.82	0.65	0.46	0.32	0.36	0.59	0.87	0.97	0.99		(94)
Useful gains,	1	<u>`</u>	<u> </u>							·		1	(05)
(95)m= 442.32	518.28	568.34	567.06	482.79	333.19	221.4	231.97	355.02	452.87	437.17	418.01		(95)
Monthly aver		1				40.0	10.4	444	40.0	7.4	4.0		(06)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea	1	ai tempe	507.38	_m , vv = 336.22	=[(39)m 221.74	x [(93)m 232.59	- (96)m 365.95	559.92	739.61	800.2		(97)
(97)m= 899.43		797.14								ļ	890.2		(97)
Space heatin (98)m= 340.09	240.21	170.23	r each n	18.29	0	n = 0.02	24 X [(97])m – (95)	79.64	217.76	351.31		
(98)111= 340.09	240.21	170.23	09	10.29	0	U				ļ	<u> </u>	1486.54	(98)
							Tota	l per year	(Kvvn/yeai	r) = Sum(9	O) _{15,912} =	1400.04	╡``
Space heatin	g require	ement in	kWh/m²	² /year								27.81	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heati	ng:												_
Fraction of sp	pace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of sp	pace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin	g require	ement (c	alculate	d above)							•	ı	
340.09	240.21	170.23	69	18.29	0	0	0	0	79.64	217.76	351.31		
$(211)m = \{[(98)$	3)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
363.74	256.91	182.06	73.8	19.56	0	0	0	0	85.18	232.89	375.73		
							Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	F	1589.89	(211)
Space heatin	g fuel (s	econdar	y), kWh/	month							•		_
$= \{[(98) \text{m x } (20)]\}$	01)] } x 1	00 ÷ (20	8)									1	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating	9												
Output from w	1									ı		1	
171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86		_
Efficiency of w	ater hea	iter					,					79.8	(216)
(217)m= 86.6	86.04	84.99	82.98	80.9	79.8	79.8	79.8	79.8	83.23	85.69	86.74		(217)
Fuel for water	•												
(219)m = (64) (219)m = 198.4	m x 100 176.21) ÷ (217) 187.81	m 173.07	174.46	158.74	153.12	167.1	166.51	178.9	182.94	193.53		
(210)111-1130.4	1,10.21	107.01	170.07	1,4.40	100.74	100.12		I = Sum(2		102.34	100.00	2110.78	(219)
Annual totals							, 0.00			Whhaa			
Space heating		ed, main	system	1					ĸ	Wh/year		kWh/yeai 1589.89	٦
,	,	,	,										_

Water heating fuel used				2110.78	٦
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				245.94	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4021.61	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy	Emission fac	tor	Emissions	
	kWh/year	kg CO2/kWh		kg CO2/ye	ar
Space heating (main system 1)	(211) ×	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (main system 1) Space heating (secondary)	•		=		_
	(211) x	0.216		343.42	(261)
Space heating (secondary)	(211) x (215) x	0.216	=	343.42	(261)
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216	=	343.42 0 455.93	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	=	343.42 0 455.93 799.34	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= =	343.42 0 455.93 799.34 38.93	(261) (263) (264) (265) (267)

TER =

(273)

18.07

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:04:18

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:**

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.62m2 Plot Reference: Site Reference : Highgate Road - GREEN 03 - C

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

18.46 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 15.74 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 42.5 kWh/m²

OK

2 Fabric U-values

Element Average Highest 0.18 (max. 0.70) External wall 0.18 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK**

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.71m²	
Windows facing: North West	3.46m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	03 - C					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			72.62	(1a) x	2	2.65	(2a) =	192.44	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	72.62	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	192.44	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	_ + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns	_		Ī	3	x ′	10 =	30	(7a)
Number of passive vents				Ī	0	x ²	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
•	ys, flues and fans = (6a)+(6b)+(neen carried out or is intended, proced			ontinuo fr	30		÷ (5) =	0.16	(8)
Number of storeys in the		eu 10 (17),	ourerwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pu deducting areas of openir	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250 amaza dia adia adia ada		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$	•	•	•	etre or e	envelope	area	5	(17)
•	es if a pressurisation test has been do				is being u	sed		0.41	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.41	(21)
Infiltration rate modified for	- 1 	1	1 4	0.5.5	0-4	Nan	Data	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
(<u></u> /	5.0	1 0.0	1	<u> </u>	I	I	I	I	
Wind Factor (22a)m = (22	' 		1					1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.52	0.51	0.5	0.45	0.44	0.39	0.39	0.38	0.41	0.44	0.46	0.48		
Calculate effe If mechanic		•	rate for t	he appli	cable ca	se	-	-	-	-	-		
If exhaust air h			endix N (2	3h) <i>– (2</i> 3a	ı) x Fmv (e	equation (N	NS)) othe	rwise (23h) = (23a)			0	(23
If balanced with) = (23a)			0	(23
		•	•	_					2h\m . (22h) v [1 (220)	0 . 1001	(23
a) If balance 24a)m= 0		o lical ve	0	0	0	0	1K) (24a	0	0	230) x [$\frac{1 - (230)}{1}$	- 100] 	(24
b) If balance				-								J	(-
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole h				,								J	,-
,	n < 0.5 ×			•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural					•				0.51	•		-	
24d)m= 0.63	n = 1, th 0.63	0.62	0.6	0.6	0.57	0.57	0.5 + [(2	0.58	0.5]	0.6	0.61]	(2
									0.0	0.0	0.01	J	(2
Effective air 25)m= 0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	1	(2
23)111= 0.03	0.03	0.02	0.0	0.0	0.57	0.57	0.57	0.30	0.0	0.0	0.01		(2)
3. Heat losse	es and he	eat loss p	paramete	er:									
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		AXk J/K
Vindows Type	e 1				12.71	x1.	/[1/(1.4)+	0.04] =	16.85				(2
Vindows Type	e 2				3.46	x1.	/[1/(1.4)+	0.04] =	4.59				(2
Valls Type1	72.6	62	16.17	7	56.45	, x	0.18	i	10.16				(2
Valls Type2	17.7	'8	0		17.78	x	0.18	<u> </u>	3.2			7 F	(2
Total area of e	elements	, m²			90.4								 (3
Party wall					30.32	<u> </u>	0		0				(3
Party floor					72.62	=						5 H	(3.
Party ceiling					72.62	=				[╡	(3.
nternal wall **	ŧ				146.1	_				[-	(3)
for windows and		ows. use e	ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	l as aiven in	paragraph	 1.3.2	(0
* include the area									,	3	, p = 1 = 3 = p =		
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				34.8	(3
Heat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	12217.13	(3
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	ı kJ/m²K			Indica	tive Value	: Medium		250	(3
For design asses: an be used inste				constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						7.11	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he								(33) +	(36) =			41.91	(3
entilation hea	at loss ca	alculated	monthly	/			ı		= 0.33 × ((25)m x (5	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 40.26	39.93	39.6	38.08	37.8	36.47	36.47	36.23	36.98	37.8	38.37	38.98		(3
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m			
39)m= 82.16	81.83	81.51	79.99	79.71	78.38	78.38	78.14	78.89	79.71	80.28	80.88		
Stroma FSAP 201	12 Version	: 1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39)	₁₁₂ /12=	79.9 ⊝ aç	<u>e 2 of </u> 3

leat loss para	meter (I	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
1.13	1.13	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11		
lumber of day	rs in mo	nth (Tab	lo 10)			<u>!</u>		'	Average =	Sum(40) ₁ .	12 /12=	1.1	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
11)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•				•	•	•	•	•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		31		(42)
Annual averag Reduce the annua ot more that 125	e hot wa Il average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.02		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot water usage ir	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•					
14)m= 97.92	94.36	90.8	87.24	83.67	80.11	80.11	83.67	87.24	90.8	94.36	97.92		_
nergy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	L	1068.18	(44
15)m= 145.21	127	131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63		
		ı			l	l	l		Total = Su	m(45) ₁₁₂ =	=	1400.56	(45
instantaneous w									1	1			
16)m= 21.78 Vater storage	19.05	19.66	17.14	16.44	14.19	13.15	15.09	15.27	17.8	19.42	21.09		(46
Storage volum) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47
community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Vater storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48
emperature fa					`	,					54		(49
nergy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50
o) If manufact			-										<i>.</i>
lot water stora community h	J			e 2 (KVV	n/litre/da	ay)					0		(51
olume factor	_		311 1.0								0		(52
emperature fa	actor fro	m Table	2b							—	0		(53
nergy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter (50) or (54) in (5	55)								0.	75		(55
Vater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56
cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57
rimary circuit	loss (ar	nual) fro	m Table	3							0		(58
rimary circuit				,	•	. ,	, ,						
(modified by					ı —			<u> </u>		<u> </u>			
59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59

Combi loss (a a la ulata d	for oach	month /	(64)m	(CO) + 2(SE (41)	١,,,,						
Combi loss of (61)m= 0	o localizated	o each	0	0	00) - 30	05 × (41)	0	0	0	0	0	1	(61)
	!						ļ	ļ		<u> </u>	<u> </u>	(50)== : (61)==	(01)
(62)m= 191.8	-i	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	· (59)m + (61)m]	(62)
Solar DHW inpu]	(02)
(add addition									i contribut	ion to wate	er neating)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	1	(63)
Output from	l		-									J	` ,
(64)m= 191.8		177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22]	
` '	_ l					l	<u> </u>	put from w		ļ	I12	1949.18	(64)
Heat gains f	rom water	heating.	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)r	nl + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	_
(65)m= 85.56	_	80.85	74.06	73.73	67.53	66.42	70.72	69.92	76.72	79.13	84.03]	(65)
include (5	L 7)m in cal	culation o	of (65)m	only if c	vlinder i	ເ s in the ເ	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal	<u> </u>			•	y		z c					9	
Metabolic ga				, •									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m= 115.4	1 115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 18.13	ì	13.09	9.91	7.41	6.26	6.76	8.79	11.79	14.97	17.48	18.63	1	(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			4	
(68)m= 203.3	<u> </u>	200.13	188.81	174.52	161.09	152.12	150.01	155.32	166.64	180.93	194.36	1	(68)
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a	, also s	ee Table	5			•	
(69)m= 34.54	<u> </u>	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	1	(69)
Pumps and	fans gains	(Table 5	ia)									1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)		Į.			!	!		
(71)m= -92.3	2 -92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32]	(71)
Water heating	ng gains (T	able 5)				!			!			•	
(72)m= 115	112.94	108.67	102.87	99.1	93.79	89.28	95.06	97.11	103.12	109.9	112.95]	(72)
Total intern	al gains =				(66))m + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 397.0	8 395.1	382.51	362.21	341.65	321.75	308.78	314.47	324.85	345.36	368.93	386.56]	(73)
6. Solar gai	ins:									•	•		
Solar gains ar	e calculated	using sola	flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ 	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast 0.9		Х	12.	71	x 1	1.28	х	0.63	x	0.7	=	43.83	(75)
Northeast 0.9	0	Х	12.	71	x 2	22.97	х	0.63	x	0.7	=	89.21	(75)
Northeast 0.9	0	х	12.	71	X 4	11.38	х	0.63	x	0.7	=	160.73	(75)
Northeast 0.9		X	12.	71	× 6	67.96	x	0.63	x	0.7	=	263.96	(75)
Northeast 0.93	× 0.77	X	12.	71	x g	91.35	Х	0.63	х	0.7	=	354.82	(75)

		_					, ,		_				_
Northeast _{0.9x}	0.77	X	12.	71	X	97.38	_ x	0.63	X	0.7	=	378.27	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	91.1	X	0.63	X	0.7	=	353.87	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	72.63	X	0.63	X	0.7	=	282.11	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	50.42	X	0.63	X	0.7	=	195.85	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	28.07	X	0.63	X	0.7	=	109.02	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	14.2	X	0.63	X	0.7	=	55.15	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	9.21	x	0.63	X	0.7	=	35.79	(75)
Northwest 0.9x	0.77	x	3.4	l 6	x	11.28	x	0.63	X	0.7	=	11.93	(81)
Northwest _{0.9x}	0.77	x	3.4	16	X	22.97	X	0.63	X	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.4	16	X .	41.38	x	0.63	X	0.7	=	43.75	(81)
Northwest _{0.9x}	0.77	×	3.4	16	X	67.96	x	0.63	x	0.7		71.86	(81)
Northwest _{0.9x}	0.77	×	3.4	16	X	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest _{0.9x}	0.77	×	3.4	16	X	97.38	x	0.63	x	0.7	_ =	102.98	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x	91.1	x	0.63	x	0.7	_ =	96.33	(81)
Northwest _{0.9x}	0.77	×	3.4	16	X	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	×	3.4	16	X	50.42	х	0.63	x	0.7	=	53.32	(81)
Northwest 0.9x	0.77	×	3.4	16	X	28.07	х	0.63	x	0.7	=	29.68	(81)
Northwest 0.9x	0.77	×	3.4	16	х	14.2	х	0.63	x	0.7	=	15.01	(81)
Northwest 0.9x	0.77	×	3.4	16	X	9.21	x	0.63	x	0.7	=	9.74	(81)
-													
Solar gains in	watts, calcu	ılated	for eac	h month			(83)m	= Sum(74)m .	(82)m			•	
(83)m= 55.76	<u> </u>)4.48	335.82	451.41	481.25	450.2	358	3.9 249.17	138.7	70.16	45.53		(83)
Total gains – i				<u> </u>	`	, watts						1	
(84)m= 452.84	508.6 58	36.99	698.03	793.06	803.01	758.98	673.	.38 574.02	484.0	439.09	432.1		(84)
7. Mean inter	nal tempera	ature ((heating	season	1)								
Temperature	during heat	ting p	eriods ir	n the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for l	iving are	ea, h1,m	(see Ta	able 9a)				_		1	
Jan	Feb I	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 1	1 0).99	0.94	0.81	0.6	0.45	0.5	0.82	0.97	1	1		(86)
Mean_interna	l temperatu	re in l	iving are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)			-	_	
(87)m= 19.81	19.95 20	0.22	20.59	20.87	20.98	21	20.9	99 20.9	20.53	20.11	19.79		(87)
Temperature	during heat	ting p	eriods ir	n rest of	dwelling	g from Ta	able 9	9, Th2 (°C)					
(88)m= 19.98	19.98 19	9.98	20	20	20.02	20.02	20.0	02 20.01	20	20	19.99]	(88)
Utilisation fac	tor for gains	s for r	est of d	welling,	h2,m (s	ee Table	9a)	•		-		•	
(89)m= 1		0.98	0.92	0.75	0.52	0.35	0.4	2 0.74	0.96	0.99	1]	(89)
Mean interna	l temperatu	re in t	the rest	of dwell	ina T2 (f	follow ste	ne 3	to 7 in Tabl	 _ ()c)		!	J	
(90)m= 18.39	 	8.99	19.53	19.88	20	20.02	20.0		19.46	18.85	18.38]	(90)
()	1			L						ving area ÷ (0.38	(91)
Many late	l taman a mat	/5	n Alexa . !	الماما	II: \	: A . T.1	. /4			•			 ` ′
Mean interna	ı temperatu	re (to	r the wh	oie ame	iiing) = 1	LA X I1	+ (1	– TLA) × 12				•	
(02)m- 10 02	1 10 11 1 11	വംI	10.04	20.26	20.20	20.20	20.4	20 20 24	10 07	1004	10 00		(02)
(92)m= 18.93 Apply adjustr		9.46 mean	19.94	20.26	20.38	20.39	20.3		19.87		18.92		(92)

(93)m= 18.93 19.11 19.46 19.94 20.26 20.38 20.39 20.39 20.31 19.87 19.34 18.92 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	(93)
<u> </u>	
Set 11 to the mean internal temperature obtained at step 11 of 1 able 9b, so that 11,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	
(94)m= 1 0.99 0.98 0.92 0.77 0.55 0.39 0.46 0.77 0.96 0.99 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 450.87 504.39 573.79 641.97 610.85 443.15 296.05 309.09 440.19 464.28 435.34 430.62	(95)
Monthly average external temperature from Table 8	(00)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	(07)
(97)m= 1202.21 1163.16 1056.33 883.13 682.47 452.97 297.33 311.94 489.65 739.07 982.47 1190.69	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 558.99 442.69 359.01 173.64 53.28 0 0 0 0 204.44 393.93 565.49	
	7(00)
Total per year (kWh/year) = Sum(98) _{15,912} = 2751.48	(98)
Space heating requirement in kWh/m²/year 37.89	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	_
Fraction of space heat from secondary/supplementary system 0	(201)
Fraction of space heat from main system(s) (202) = 1 - (201) = 1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] = 1$	(204)
Efficiency of main space heating system 1 93.5	(206)
Efficiency of secondary/supplementary heating system, %	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/ye	⊐ ar
Space heating requirement (calculated above)	
558.99 442.69 359.01 173.64 53.28 0 0 0 0 204.44 393.93 565.49	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	(211)
597.85 473.47 383.97 185.71 56.99 0 0 0 218.66 421.32 604.8	
Total (kWh/year) =Sum(211) _{15,1012} = 2942.76	(211)
Space heating fuel (secondary), kWh/month	_
$= \{[(98)m \times (201)] \} \times 100 \div (208)$	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	
Total (kWh/year) =Sum(215) _{15,1012} = 0	(215)
Water heating	_
Output from water heater (calculated above)	
191.8 169.09 177.65 159.35 156.22 139.69 134.26 147.19 146.89 165.23 174.59 187.22	_
Efficiency of water heater 79.8	(216)
(217)m= 87.5 87.27 86.65 85.04 82.27 79.8 79.8 79.8 79.8 85.38 86.92 87.58	(217)
Fuel for water heating, kWh/month	
$(219) m = (64) m \times 100 \div (217) m$	
(219)m= 219.2 193.76 205.01 187.37 189.88 175.06 168.24 184.45 184.07 193.51 200.86 213.77	7 ,
Total = Sum(219a) ₁₁₂ = 2315.18	(219)
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 2942.76	٦
Space heating fuel used, main system 1 2942.76	╛

					_
Water heating fuel used				2315.18	╛
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				320.14	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			5653.09	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	635.64	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	500.08	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1135.72	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.15	(268)
					_
Total CO2, kg/year	sum	of (265)(271) =		1340.79	(272)

TER =

(273)

18.46

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:04:08*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 53.96m²Site Reference:Highgate Road - GREENPlot Reference: 03 - D

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.25 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.23 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 39.2 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.17 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Roof

Thermal bridging calculated from linear thermal transmittances for each junction

(no roof)

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
	400.00/	
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	ОК
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ОК
Based on:	Wedidiff	OK
	Avorago or unknown	
Overshading:	Average or unknown 12.07m²	
Windows facing: North East	· <u>-</u> ·•··	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	03 - D					
1. Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		;	53.96	(1a) x	2	2.65	(2a) =	142.99	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (53.96	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	142.99	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	x ′	10 =	20	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	20		÷ (5) =	0.14	(8)
Number of storeys in the		iu io (17),	ourerwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250 amaza dia adia adia mata		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	etre or e	envelope	area	5	(17)
•	s if a pressurisation test has been do				is being u	sed		0.39	(10)
Number of sides sheltere	d							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.39	(21)
Infiltration rate modified for		T	1 .			<u> </u>		1	
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0 4.4 4.3 3.8] 3.6	3.1	4	4.3	4.0	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4							1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.5 Calculate effe	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46]	
If mechanica		_	ale ioi i	пе арри	саын са	3E						0	(23a)
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)			0	(23b)
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	covery (N	/IV) (24b)m = (22	2b)m + (23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)r		tract ven (23b), t		•	-				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r		on or wh en (24d)							0.5]	•		•	
(24d)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6]	(24d)
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)		-	-		
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6		(25)
3. Heat losse	s and he	eat loss p	paramete	er:									
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
Windows					12.07	x1.	/[1/(1.4)+	0.04] =	16				(27)
Walls Type1	27.6	66	12.0	7	15.59) x	0.18		2.81				(29)
Walls Type2	24.2	24	0		24.24	X	0.18		4.36				(29)
Total area of e	lements	, m²			51.9								(31)
Party wall					31.67	, x	0	= [0				(32)
Party floor					53.96	5							(32a)
Party ceiling					53.96	5				[(32b)
Internal wall **					95.03	3				Ī		$\exists \ $	(32c)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	n 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				23.17	(33)
Heat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	8447.42	2 (34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge					-	<						6.04	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			29.21	(37)
Ventilation hea	at loss ca	alculated	monthly	/		•	•	(38)m	= 0.33 × ((25)m x (5)) •	•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ļ	
(38)m= 29.42	29.2	28.98	27.93	27.74	26.83	26.83	26.66	27.18	27.74	28.13	28.55]	(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m	,		
(39)m= 58.63	58.41	58.18	57.14	56.95	56.04	56.04	55.87	56.39	56.95	57.34	57.75		
									Average =	Sum(39)₁	12 /12=	57.14	(39)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.09	1.08	1.08	1.06	1.06	1.04	1.04	1.04	1.04	1.06	1.06	1.07		
` /				<u> </u>	<u> </u>	<u> </u>		<u> </u>	L Average =	Sum(40) ₁ .	12 /12=	1.06	(40)
Number of day	s in mo	nth (Tab	le 1a)							, ,	!		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ina ene	rav reaui	rement:								kWh/ye	ar.	
4. Water fleat	ing cho	igy roqui	TOTTIOTIC.								icvvii, y c	our.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		81		(42)
Annual average	ıl average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.11		(43)
not more that 125	litres per	person per	aay (ali w	ater use, i	not ana co	ia)			,	,	1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 84.82	81.74	78.65	75.57	72.49	69.4	69.4	72.49	75.57	78.65	81.74	84.82		_
Energy content of	hot water	used - cali	culated mo	onthly = 4	190 x Vd r	n x nm x F)Tm / 3600			m(44) ₁₁₂ =		925.35	(44)
(45)m= 125.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82		
(40)1112	110.02	110.00	00.00	04.07	01.00	70.04	07.14			m(45) ₁₁₂ =	l	1213.27	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar – ou	111(40)112 -		1210.21	()
(46)m= 18.87	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27		(46)
Water storage	loss:	<u> </u>					<u> </u>	!		<u> </u>	<u>[</u>		
Storage volume	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage		o alarad l	ooo foot	ar ia kaa	/Id\A/k	·/do://					1		(40)
a) If manufact				JI IS KIIO	WII (KVVI	i/day).					39		(48)
Temperature fa										0.	54		(49)
Energy lost from b) If manufaction		_	-		or is not		(48) x (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	-			`		,							,
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	- 3							0		(58)
Primary circuit	loss cal	culated f	or each	month (•	. ,	, ,						
(modified by	factor f	rom Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)	· · · · · ·		
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss c	alculated	for each	month ((61)m -	(60) · 3(85 × (41)	١m						
(61)m= 0	0	0	0	0	00) + 30	0 7 (41)	0	0	0	0	0	1	(61)
(1)							ļ	ļ		<u> </u>	<u> </u>	J · (59)m + (61)m	(-)
(62)m= 172.39	`	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	(39)III + (01)IIII]	(62)
Solar DHW inpu	Į]	(-)
(add addition									i ooninbat	ion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from v	vater hea	ter				Į	<u> </u>	!				ı	
(64)m= 172.39		160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	1	
` ′						<u> </u>	l Out	put from wa	t ater heate	<u>I</u> r (annual)₁	I12	1761.89	(64)
Heat gains fr	om water	heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	+ (61)r	nl + 0.8 x	(46)m	+ (57)m	+ (59)m	1	_
(65)m= 79.1	70.25	75.02	68.98	68.85	63.32	62.53	66.25	65.39	71.45	73.37	77.78]	(65)
include (57			of (65)m	only if c		s in the o	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal of	<u> </u>			•	y		z c					9	
Metabolic gai				, .									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	1	(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 14.04	· ·	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	1	(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m= 157.5	- ` `	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	1	(68)
Cooking gain	s (calcula	ited in Ar	pendix	L. eguat	ion L15	or L15a	. also s	ee Table	5	!	!	J	
(69)m= 32.03		32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	1	(69)
Pumps and fa	ans gains	(Table 5	ia)							•	•		
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)			-1		•	•		
(71)m= -72.27	 	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27]	(71)
Water heating	g gains (T	rable 5)				!						•	
(72)m= 106.32		100.84	95.81	92.55	87.95	84.04	89.05	90.83	96.03	101.91	104.55	1	(72)
Total interna	al gains =				(66))m + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	J	
(73)m= 330.96		319.1	302.84	286.57	270.67	260.21	265.15	273.38	289.81	308.7	322.63	1	(73)
6. Solar gair	ns:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orienta	tion.		
Orientation:			Area		Flu			g_		FF		Gains	
	Table 6d		m²		Tal	ble 6a	-	Table 6b	Т	able 6c		(W)	
Northeast 0.9x	0.77	X	12.	07	x 1	1.28	x	0.63	x [0.7	=	41.62	(75)
Northeast 0.9x	0.77	X	12.	07	x 2	22.97	x	0.63	x	0.7	=	84.72	(75)
Northeast 0.9x	0.77	X	12.	07	x 4	11.38	x	0.63	x	0.7	=	152.64	(75)
Northeast 0.9x	0.77	Х	12.	07	x 6	67.96	x	0.63	x	0.7	=	250.67	(75)
Northeast 0.9x	0.77	X	12.	07	x g	91.35	x	0.63	x	0.7	=	336.95	(75)

Northeast _{0.9x}	0.77	X	12.	07	x	97.38		x	0.63	x	0.7	=	359.23	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	91.1		x	0.63	x	0.7	=	336.05	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	72.63		x	0.63	x	0.7	=	267.9	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	50.42		x	0.63	X	0.7		185.99	(75)
Northeast _{0.9x}	0.77	X	12.	07	x [28.07		x	0.63	x	0.7	=	103.53	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	14.2		x	0.63	x	0.7	=	52.37	(75)
Northeast 0.9x	0.77	X	12.	07	x [9.21		x	0.63	x	0.7	=	33.99	(75)
Solar gains in v	Ī				1		Ť	33)m = 5	Sum(74)m .	(82)m			i	
(83)m= 41.62	84.72	152.64	250.67	336.95		9.23 336.		267.9	185.99	103.53	52.37	33.99		(83)
Total gains – in		-			·				1		1		Ī	(0.4)
(84)m= 372.58	413.97	471.74	553.51	623.52	62	9.9 596.	.26 5	533.05	459.37	393.35	361.07	356.62		(84)
7. Mean interr	nal temp	erature	(heating	season)									
Temperature	during h	eating p	eriods ir	the livi	ng a	rea from	Table	e 9, Tł	h1 (°C)				21	(85)
Utilisation fact	tor for g	ains for I	iving are	ea, h1,m	(se	e Table 9	a)						İ	
Jan	Feb	Mar	Apr	May	J	un Ju	ıl	Aug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.92	0.77	0.	56 0.4	.1	0.48	0.77	0.96	0.99	1		(86)
Mean internal	temper	ature in l	living are	ea T1 (fo	ollow	v steps 3	to 7 i	in Tab	le 9c)					
(87)m= 19.93	20.07	20.33	20.68	20.91	20	.99 21	1	21	20.93	20.62	20.22	19.91		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)														
(88)m= 20.01	20.02	20.02	20.03	20.04	20	.05 20.0	05	20.05	20.05	20.04	20.03	20.03		(88)
Utilisation fact	tor for a	ains for r	est of d	welling	h2 n	n (see Ta	ble 9) (a)	•					
(89)m= 0.99	0.99	0.97	0.9	0.71	г —	48 0.3		0.38	0.69	0.94	0.99	1		(89)
Mean internal	tompor	oturo in t	the rest	of dwalli	na T	F2 (fallow	cton	oc 2 to	7 in Tabl	0.00				
(90)m= 18.59	18.79	19.17	19.67	19.96	Ť	.04 20.0	— Ė	20.05	20	19.6	19.04	18.58		(90)
(65)						1				<u> </u>	ng area ÷ (4		0.47	(91)
						\ (I A	T 4	(4 6	. A\\			•		` ′
Mean internal (92)m= 19.22	tempera 19.4	19.72	r tne wn 20.15	20.41		$ \begin{array}{c c} $		20.5	LA) × 12	20.08	19.6	19.21		(92)
Apply adjustm					<u> </u>					l	19.0	19.21		(32)
(93)m= 19.22	19.4	19.72	20.15	20.41	_	.49 20.		20.5	20.44	20.08	19.6	19.21		(93)
8. Space heat							<u> </u>							. ,
Set Ti to the n				e obtair	ned a	at step 11	of T	able 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation									,		,		•	
Jan	Feb	Mar	Apr	May	J	un Ju	ıl	Aug	Sep	Oct	Nov	Dec		
Utilisation fact	Ť	i								i		ı	1	(- ·)
(94)m= 0.99	0.99	0.97	0.9	0.73	0.	52 0.3	7	0.43	0.72	0.94	0.99	0.99		(94)
Useful gains,	i		<u> </u>			- 04 047	or I /	207.04	222.4	274.02	250.45	054.70		(05)
(95)m= 370.17	409.06	457.35	497.41	457.34		5.31 217.	.05 2	227.64	332.1	371.03	356.45	354.76		(95)
Monthly avera	4.9	6.5	8.9	11.7	_	0 4.6 16.	<u>6 T</u>	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate										l	1 ""	٦.٢		(50)
(97)m= 874.98	846.6	769	642.6	495.76	_	$\frac{700}{30}$ 218.		228.93	357.48	540.07	716.56	866.86		(97)
Space heating)m] x (4	1)m	ļ	1	
(98)m= 375.57	294.03	231.87	104.53	28.59		0 0		0	0	125.77	259.28	381		
	!			·		<u> </u>					•		1	

Total per year (kWh/year)	= Sum(9	8)15,912 =	1800.63	(98)				
Space heating requirement in kWh/m²/year			33.37	(99)				
9a. Energy requirements – Individual heating systems including micro-CHP)								
Space heating:		г		7,				
Fraction of space heat from secondary/supplementary system		Ļ	0	(201)				
Fraction of space heat from main system(s) (202) = 1 - (201) =	Ĺ	1	(202)					
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$	1	(204)						
Efficiency of main space heating system 1	93.5	(206)						
Efficiency of secondary/supplementary heating system, %	0	(208)						
JanFebMarAprMayJunJulAugSepOct	Nov	Dec	kWh/ye	ar				
Space heating requirement (calculated above)								
375.57 294.03 231.87 104.53 28.59 0 0 0 0 125.77	259.28	381						
211)m = {[(98)m x (204)] } x 100 ÷ (206)				(211)				
401.68 314.47 247.99 111.8 30.57 0 0 0 134.51	277.3	407.49		_				
Total (kWh/year) =Sum(21	1) _{15,1012}	₂ =	1925.81	(211)				
Space heating fuel (secondary), kWh/month								
= {[(98)m x (201)] } x 100 ÷ (208)								
215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0		¬				
Total (kWh/year) =Sum(21	نارت) 15,1012	Į= L	0	(215)				
Water heating								
Dutput from water heater (calculated above) 172.39	157.27	168.42						
Efficiency of water heater		<u> </u>	79.8	(216)				
217)m= 86.84 86.54 85.8 83.97 81.42 79.8 79.8 79.8 79.8 84.36	86.14	86.93		(217)				
Fuel for water heating, kWh/month								
219)m = (64)m x 100 ÷ (217)m								
219)m= 198.52 175.75 186.62 171.56 173.88 159.2 153.55 167.59 167.01 177.06 Total = Sum(219a) ₁₁₂ =	182.58	193.74		٦,,,,				
	//- <i>/</i>	_ L	2107.07	(219)				
Annual totals Space heating fuel used, main system 1	h/year	Г	1925.81	<u></u>				
		L		╣				
Vater heating fuel used		L	2107.07					
Electricity for pumps, fans and electric keep-hot								
central heating pump:		30		(230				
boiler with a fan-assisted flue		45		(230				
Total electricity for the above, kWh/year sum of (230a)(230g) =			75	(231				
		Ī	247.96	(232				
Electricity for lighting								
Electricity for lighting Fotal delivered energy for all uses (211)(221) + (231) + (232)(237b) =		Γ	4355.84	(338)				

Energy kWh/year **Emissions**

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	415.98	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	455.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =			871.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	128.69	(268)
Total CO2, kg/year	sum	of (265)(271) =		1038.72	(272)

TER =

(273)

19.25

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:04:01

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:**

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.44m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 03 - E

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

16.69 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 14.29 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 33.7 kWh/m²

OK

2 Fabric U-values

Element Average Highest 0.18 (max. 0.70) External wall 0.18 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK**

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Windows facing: South West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers - mains gas		

		l Isar I	Details:								
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Number: STRO					010943 on: 1.0.5.50			
Property Address: 03 - E Address:											
Overall dwelling dime	nsions:										
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)		
Ground floor		(69.44	(1a) x	2	2.65	(2a) =	184.02	(3a)		
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (69.44	(4)							
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	184.02	(5)		
2. Ventilation rate:											
	main seconda heating heating	ry	other		total			m³ per hou	ır		
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)		
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)		
Number of intermittent fa	ns			Ī	2	x '	10 =	20	(7a)		
Number of passive vents				Ī	0	x -	10 =	0	(7b)		
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)		
				L				_			
				_			Air ch	nanges per ho	our —		
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	20		÷ (5) =	0.11	(8)		
Number of storeys in the		iu io (17),	ourerwise (onunue n	om (9) to	(10)		0	(9)		
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)		
	.25 for steel or timber frame o			•	ruction			0	(11)		
if both types of wall are prideducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after							
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)		
If no draught lobby, en	ter 0.05, else enter 0							0	(13)		
-	s and doors draught stripped							0	(14)		
Window infiltration			0.25 - [0.2	. ,	0	(15)					
Infiltration rate	250 amaza dia adia adia mata		(8) + (10)					0	(16)		
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	etre or e	envelope	area	5	(17)		
•	s if a pressurisation test has been do				is being u	sed		0.36	(10)		
Number of sides sheltere	d							0	(19)		
Shelter factor			(20) = 1 -		19)] =			1	(20)		
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.36	(21)		
Infiltration rate modified for		T	1 .			<u> </u>		1			
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1			
(22)m= 5.1 5	7.0 4.4 4.3 3.8] 3.6	3.1	4	4.3	4.0	4.1				
Wind Factor (22a)m = (22	2)m ÷ 4							1			
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18				

djusted infiltration rate (allowin			` 	`	` 		1			
0.46 0.45 0.44 Calculate effective air change ra	0.39 0.39 ate for the appli	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
If mechanical ventilation:	ato for the appli	000,000							0	(2
If exhaust air heat pump using Apper	ndix N, (23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)		j	0	(2
If balanced with heat recovery: efficient	ency in % allowing	for in-use f	actor (from	n Table 4h) =]	0	(2
a) If balanced mechanical ver	ntilation with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 - (23c)	÷ 100]	
(4a)m= 0 0 0	0 0	0	0	0	0	0	0	0		(2
b) If balanced mechanical ver	ntilation without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)			
(4b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(2
c) If whole house extract vent if $(22b)m < 0.5 \times (23b)$, the	•	•				5 × (23b))			
24c)m= 0 0 0	0 0	0	0	0	0	0	0	0		(2
d) If natural ventilation or who if (22b)m = 1, then (24d)n	•	•				0.5]				
24d)m= 0.6 0.6 0.6	0.58 0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(2
Effective air change rate - ent	ter (24a) or (24l	b) or (24	c) or (24	d) in box	(25)					
25)m= 0.6 0.6 0.6	0.58 0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(2
3. Heat losses and heat loss p	arameter:									
	Openings m²	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-k		X k J/K
indows Type 1		8.97		/[1/(1.4)+		11.89	$\stackrel{\prime}{\Box}$			(
/indows Type 2		2.92	x1,	/[1/(1.4)+	0.04] =	3.87				(:
/alls Type1 41.51	11.89	29.62	2 x	0.18	— լ՝	5.33	Ħ r		1) (2
/alls Type2 16.73	0	16.73	3 x	0.18	=	3.01	F i			(2
otal area of elements, m ²		58.24								
arty wall		40.43	3 x	0	=	0				(:
arty floor		69.44								
arty ceiling		69.44	=				Ī		i	
iternal wall **		136.2	<u>=</u>				Ī		1	
for windows and roof windows, use eff include the areas on both sides of int		alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] á	L as given in	paragraph	3.2	`
abric heat loss, W/K = S (A x L	J)			(26)(30)	+ (32) =				24.11	(
eat capacity Cm = S(A x k)					((28).	(30) + (32	2) + (32a).	(32e) =	10687.04	(
nermal mass parameter (TMP	= Cm ÷ TFA) ii	n kJ/m²K			Indica	tive Value	: Medium		250	<u> </u>
r design assessments where the deta n be used instead of a detailed calcul		tion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
nermal bridges : S (L x Y) calc		-	K					[6.83	(
details of thermal bridging are not kno stal fabric boot loss	wn(36) = 0.05 x(3)	31)			(33) 1	(26) -		Г		<u> </u>
otal fabric heat loss entilation heat loss calculated	monthly					$(36) =$ $= 0.33 \times ($	25)m v (F)	[30.94	(
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 36.71 36.47 36.22	35.09 34.88	33.89	33.89	33.7	34.27	34.88	35.31	35.76		(
, <u> </u>	0 1.00	1 -0.50	1 -5.50	I	<u> </u>	<u> </u>	<u> </u>	50		`
eat transfer coefficient, W/K 9)m= 67.65 67.4 67.16	66.03 65.82	64.83	64.83	64.64	(39)m 65.21	= (37) + (37) 65.82	66.25	66.69		
700 = 1 D/DO 1 D/4 1 D/1D 1	UD US I DS AZ	1 D4 6.3	1 D4 63	04.04	1 00 / 1	เบอ.ศ/	1 00.75	i nn ng l		

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.97	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96		
Number of day	re in mo	oth (Tabl	lo 10)					,	Average =	Sum(40) ₁	12 /12=	0.95	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
										•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13:		23		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the a	welling is	designed t			se target o		7.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ii	n litres per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)	-		!			
(44)m= 95.94	92.45	88.97	85.48	81.99	78.5	78.5	81.99	85.48	88.97	92.45	95.94		_
Energy content of	hot water	used - cal	culated mo	onthly = 4	190 x Vd r	n x nm x F	Tm / 3600			m(44) ₁₁₂ =	L	1046.65	(44)
(45)m= 142.28	124.44	128.41	111.95	107.42	92.7	85.9	98.57	99.74	116.24	126.89	137.79		
(10)111=	12	120.11	111.00	107.12	02.7	00.0	00.01			m(45) ₁₁₂ =		1372.32	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)		, ,	L		
(46)m= 21.34	18.67	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67		(46)
Water storage Storage volum		includin	a anv e	alar or M	/\//HRS	storage	within es	ama vas	امء		450		(47)
If community h	, ,		-			•		ATTIC VOO.	001		150		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost fro		_	-		or io not		(48) x (49)) =		0.	75		(50)
b) If manufactHot water stora			-								0		(51)
If community h	-			,		• /							
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	,					((50) (==> (44)		0.	75		(55)
Water storage						i	((56)m = (, , ,	ı	1			
(56)m= 23.33 If cylinder contains	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)ı	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Appendi	ix H	(56)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	3		<u> </u>			<u> </u>		0		(58)
Primary circuit	loss cal	culated f	or each	month (•	. ,	, ,						` '
(modified by						ı —			ı —	<u> </u>			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

On all land and later	1 ((04)	(00) 0	DE (44)	.						
Combi loss calculated $(61)m = \begin{bmatrix} 0 & 0 \end{bmatrix}$	o for each	montn ((61)m =	(60) ÷ 36	0 × (41))m 0	0	0	0	0		(61)
							<u> </u>		<u> </u>	ļ	(F0)m + (G1)m	(01)
Total heat required fo (62)m= 188.88 166.53	_	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	(59)111 + (61)111	(62)
Solar DHW input calculated						<u> </u>						(02)
(add additional lines in								ii continbut	ion to wate	er neating)		
(63)m = 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water he	 ater				<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>			, ,
(64)m= 188.88 166.53	_	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39		
`						<u> </u>	out from w	ater heate	I r (annual)₁	12	1920.94	(64)
Heat gains from wate	r heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)m	า] + 0.8 ว	x [(46)m	+ (57)m	+ (59)m	1	-
(65)m= 84.58 75.04	79.97	73.3	72.99	66.89	65.84	70.05	69.24	75.93	78.26	83.09		(65)
include (57)m in ca	culation (of (65)m	onlv if c	vlinder i	s in the	dwellina	or hot w	ater is fr	om com	munitv h	ı ıeatina	
5. Internal gains (se			•	,		J				• •	<u> </u>	
Metabolic gains (Tabl			,									
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 111.62 111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62		(66)
Lighting gains (calcula	ated in Ar	pendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5	•		•		
(67)m= 18 15.98	13	9.84	7.36	6.21	6.71	8.72	11.71	14.87	17.35	18.5		(67)
Appliances gains (cal	culated in	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m= 195.99 198.02	192.9	181.98	168.21	155.27	146.62	144.59	149.71	160.62	174.4	187.34		(68)
Cooking gains (calcul	ated in A	ppendix	L, equat	ion L15	or L15a), also se	ee Table	5		!		
(69)m= 34.16 34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16		(69)
Pumps and fans gain:	s (Table 5	Ба)				•		•	•	•		
(70)m= 3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. evaporati	on (negat	tive valu	es) (Tab	le 5)				•		•	•	
(71)m= -89.3 -89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3		(71)
Water heating gains (Table 5)					•		•		•	•	
(72)m= 113.69 111.67	107.49	101.8	98.11	92.91	88.49	94.15	96.16	102.05	108.7	111.68		(72)
Total internal gains	=			(66)	m + (67)m	n + (68)m +	+ (69)m +	(70)m + (7	1)m + (72))m	•	
(73)m= 387.16 385.17	372.87	353.12	333.17	313.88	301.31	306.95	317.07	337.03	359.93	377.01		(73)
6. Solar gains:												
Solar gains are calculated	_	r flux from	Table 6a	and assoc	iated equa	itions to co	nvert to th	ne applicat		tion.		
Orientation: Access		Area		Flu		-	g_ able 6b	_	FF		Gains	
Table 6	ı ———	m ²		Tai	ole 6a	,	able ob		able 6c		(W)	7
Northeast 0.9x 0.77	7 X	8.9)7	x 1	1.28	X	0.63	x	0.7	=	30.93	(75)
Northeast _{0.9x} 0.77	7 X	8.9	97	X 2	2.97	X	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x 0.77	7 X	8.9	97	X 4	1.38	X	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x 0.77	7 X	8.9	97	× 6	57.96	X	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x 0.77	7 X	8.9	97	x 9	1.35	x	0.63	x	0.7	=	250.41	(75)

AL OF A		_			_		,		_				_
Northeast _{0.9x}	0.77	X	8.9	97	X	97.38	X	0.63	X	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	91.1	X	0.63	X	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	72.63	X	0.63	X	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	50.42	X	0.63	X	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	X	8.9	97	X	28.07	X	0.63	X	0.7	=	76.94	(75)
Northeast _{0.9x}	0.77	X	8.9	97	X	14.2	X	0.63	Х	0.7	=	38.92	(75)
Northeast 0.9x	0.77	X	8.9	97	X	9.21	X	0.63	X	0.7	=	25.26	(75)
Southwest _{0.9x}	0.77	X	2.9	92	x	36.79]	0.63	X	0.7	=	32.83	(79)
Southwest _{0.9x}	0.77	X	2.9	92	x	62.67		0.63	X	0.7	=	55.93	(79)
Southwest _{0.9x}	0.77	X	2.9	92	x	85.75]	0.63	X	0.7	=	76.52	(79)
Southwest _{0.9x}	0.77	X	2.9	92	X ·	106.25		0.63	x	0.7	=	94.82	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x ·	119.01]	0.63	x	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x ·	118.15		0.63	x	0.7	=	105.44	(79)
Southwest _{0.9x}	0.77	X	2.9	92	x ·	113.91		0.63	х	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	X	2.9	92	x ·	104.39]	0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	92.85]	0.63	x	0.7	=	82.86	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	69.27	Ī	0.63	×	0.7		61.81	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	44.07	1	0.63	x	0.7		39.33	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	31.49	Ī	0.63	×	0.7	=	28.1	(79)
							_						
Solar gains in	watts, calc	ulated	for eac	h month			(83)m	n = Sum(74)m .	(82)m		i	1	
(83)m= 63.76		89.96	281.11	356.62	372.4	351.39	292	.25 221.08	138.7	78.25	53.36		(83)
Total gains – i			` '	<u> </u>	`	, watts							
(84)m= 450.92	504.05	.co oo I	634.22	689.78								7	
	304.03	62.83	034.22	009.70	686.28	652.7	599	9.2 538.15	475.78	3 438.18	430.36]	(84)
7. Mean inter					<u> </u>	652.7	599	9.2 538.15	475.7	3 438.18	430.36		(84)
7. Mean inter	rnal temper	rature ((heating	season)				475.78	3 438.18	430.36	21	(84)
Temperature Utilisation fac	rnal temper during hea ctor for gair	rature (ating pons ans for li	(heating eriods ir iving are	season the livil ea, h1,m) ng area (see Ta	from Tal		, Th1 (°C)			430.36	21	
Temperature	rnal temper during hea ctor for gair Feb	rature (ating po	(heating eriods ir iving are Apr	season the livii) ng area	from Tal	ble 9	, Th1 (°C)	475.78		430.36 Dec	21	(85)
Temperature Utilisation fac	rnal temper during hea ctor for gair Feb	rature (ating pons ans for li	(heating eriods ir iving are	season the livil ea, h1,m) ng area (see Ta	from Tal	ble 9	, Th1 (°C)				21	
Temperature Utilisation fac	rnal temper during hea ctor for gair Feb	rature (ating pons for li Mar 0.98	(heating eriods ir iving are Apr 0.93	season the living ea, h1,m May	ng area (see Ta Jun 0.59	from Tal able 9a) Jul 0.44	ble 9	, Th1 (°C) ug Sep 19 0.77	Oct	Nov	Dec	21	(85)
Temperature Utilisation fac	nal temper during hea ctor for gair Feb 0.99	rature (ating pons for li Mar 0.98	(heating eriods ir iving are Apr 0.93	season the living ea, h1,m May	ng area (see Ta Jun 0.59	from Tal able 9a) Jul 0.44	ble 9	, Th1 (°C) ug Sep 19 0.77 Table 9c)	Oct	Nov 0.99	Dec	21	(85)
Temperature Utilisation fac Jan (86)m= 1 Mean interna	rnal temper during heator for gair Feb 0.99 Il temperate 20.18	rature (ating points for li Mar 0.98 ure in l	(heating eriods ir iving are 0.93 iving are 20.71	season the livings, h1,m May 0.8 ea T1 (for 20.91	ng area (see Tall Jun 0.59 ollow ste	from Tal able 9a) Jul 0.44 eps 3 to 7	ble 9 A 0.4 7 in T	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95	Oct 0.96	Nov 0.99	Dec 1	21	(85)
Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 20.05	rnal temper during hea etor for gair Feb 0.99 Il temperate 20.18 2 during hea	rature (ating points for li Mar 0.98 ure in l	(heating eriods ir iving are 0.93 iving are 20.71	season the livings, h1,m May 0.8 ea T1 (for 20.91	ng area (see Tall Jun 0.59 ollow ste	from Tal able 9a) Jul 0.44 eps 3 to 7	ble 9 A 0.4 7 in T	s, Th1 (°C) ug Sep ug 0.77 able 9c) 1 20.95 9, Th2 (°C)	Oct 0.96	Nov 0.99	Dec 1	21	(85)
Temperature Utilisation fact Jan (86)m= 1 Mean internat (87)m= 20.05 Temperature (88)m= 20.1	rnal temper during hea ctor for gair Feb 0.99 al temperate 20.18 20.11	rature (ating points for li Mar 0.98 ure in l 20.41 ating points 20.11	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of	Jun 0.59 ollow ste 20.99 dwelling 20.14	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14	ble 9 A 0.4 7 in T 2 able 9	s, Th1 (°C) ug Sep ug 0.77 able 9c) 1 20.95 9, Th2 (°C)	Oct 0.96	Nov 0.99	Dec 1 20.03	21	(85) (86) (87)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature	rnal temper during hea eter for gair Feb 0.99 It temperate 20.18 20.11 20.11	rature (ating points for li Mar 0.98 ure in l 20.41 ating points 20.11	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of	Jun 0.59 ollow ste 20.99 dwelling 20.14	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14	ble 9 A 0.4 7 in T 2 able 9	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13	Oct 0.96	Nov 0.99	Dec 1 20.03	21	(85) (86) (87)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1	rnal temper during heat tor for gair Feb 0.99 lt temperate 20.18 2 during heat 20.11 2 ctor for gair 0.99	rature (ating points for li Mar 0.98 ure in li 20.41 ating points for ri 0.98	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of 20.13 welling, 0.75) ng area (see Ti Jun 0.59 cllow ste 20.99 dwelling 20.14 h2,m (s	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35	ble 9 A 0.4 7 in 1 2 20. 9a) 0.6	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13	Oct 0.96 20.68 20.13	Nov 0.99 20.32	Dec 1 20.03 20.12	21	(85) (86) (87) (88)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact	rnal temper during heat temperate 20.18 20.11 20.11 20.99	rature (ating points for li Mar 0.98 ure in li 20.41 ating points for ri 0.98	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of 20.13 welling, 0.75) ng area (see Ti Jun 0.59 cllow ste 20.99 dwelling 20.14 h2,m (s	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35	ble 9 A 0.4 7 in 1 2 20. 9a) 0.6	s, Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 19, Th2 (°C) 14 20.13 4 0.7 1 to 7 in Table	Oct 0.96 20.68 20.13	Nov 0.99 20.32 20.12	Dec 1 20.03 20.12		(85) (86) (87) (88)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation	rnal temper during heat temperate 20.18 20.11 20.11 20.99	rature (ating pens for li Mar 0.98 ure in l 20.41 ating pens for r 0.98 ure in t	cheating eriods ir o.93 iving are 20.71 eriods ir 20.12 est of do.91 the rest	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of 20.13 welling, 0.75 of dwelling) ng area (see Ti Jun 0.59 cllow ste 20.99 dwelling 20.14 h2,m (s 0.52	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35 follow ste	ble 9 A 0.4 7 in 1 2 able 9 9a) 0.	g Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 to 7 in Table 14 20.1	Oct 0.96 20.68 20.13 0.94 e 9c) 19.76	Nov 0.99 20.32 20.12	Dec 1 20.03 20.12 1 18.82	21	(85) (86) (87) (88) (89)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation (90)m= 18.84	rnal temper during heat tor for gair Feb 0.99 lt temperate 20.18 20.11 2	rature (ating points for li Mar 0.98 ure in li 20.41 ating points for ri 0.98 ure in til 19.36	(heating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91 the rest 19.79	season the living the) ng area (see Ti Jun 0.59 colors stee 20.99 dwelling 20.14 h2,m (see Ti 0.52 ng T2 (20.13	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35 follow ste 20.14	ble 9 A 0.4 7 in 1 2 20. 9a) 0.2 20.	g Sep 9 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 to 7 in Table 14 20.1	Oct 0.96 20.68 20.13 0.94 e 9c) 19.76	Nov 0.99 20.32 20.12 0.99	Dec 1 20.03 20.12 1 18.82		(85) (86) (87) (88) (89) (90)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation (90)m= 18.84 Mean internation	rnal temper during heat temperate 20.18 20.11 20.11 20.99 20	rature (ating pens for li Mar 0.98 ure in l 20.41 ating pens for r 0.98 ure in t 19.36 ure (for	cheating eriods ir o.93 iving are 20.71 eriods ir 20.12 est of do 0.91 che rest 19.79 r the wh	season the livin ea, h1,m May 0.8 ea T1 (for 20.91 rest of 20.13 welling, 0.75 of dwelling 20.05	mg area (see T Jun 0.59 ollow ste 20.99 dwelling 20.14 h2,m (s 0.52 ing T2 (20.13	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35 follow ste 20.14	A 0.4 7 in 1 2 able 9 0.4 0.4 7 in 2 20. 9a) 0.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	g Sep 9 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 1 to 7 in Table 14 20.1 - fLA) × T2	Oct 0.96 20.68 20.13 0.94 e 9c) 19.76 fLA = Liv	Nov 0.99 20.32 20.12 0.99 19.24 ving area ÷ (-	Dec 1 20.03 20.12 1 1 18.82 4) =		(85) (86) (87) (88) (89) (90) (91)
Temperature Utilisation fact Jan (86)m= 1 Mean internation (87)m= 20.05 Temperature (88)m= 20.1 Utilisation fact (89)m= 1 Mean internation (90)m= 18.84	rnal temper during heator for gair Feb 0.99 lt temperate 20.18 20.11 20.	rature (ating points for limited for limit	cheating eriods ir iving are 0.93 iving are 20.71 eriods ir 20.12 est of do 0.91 the rest 19.79 r the who 20.11	season the living the	ng area (see Tage of Jun 0.59) bllow sterms 20.99 dwelling 20.14 h2,m (som 0.52) ng T2 (com 20.13)	from Tal able 9a) Jul 0.44 eps 3 to 7 21 g from Ta 20.14 ee Table 0.35 follow ste 20.14 fLA × T1 20.43	bble 9 A 0.4 7 in 1 2 20. 9a) 0.4 1 20.	y Th1 (°C) ug Sep 19 0.77 Table 9c) 1 20.95 9, Th2 (°C) 14 20.13 4 0.7 1 to 7 in Table 14 20.1 - fLA) × T2 43 20.39	Oct 0.96 20.68 20.13 0.94 e 9c) 19.76 14.4 = Liv	Nov 0.99 20.32 20.12 0.99 19.24 ving area ÷ (-	Dec 1 20.03 20.12 1 18.82		(85) (86) (87) (88) (89) (90)

											,		ı	
(93)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24		(93)
			uirement											
			ternal ter or gains	•		ed at ste	ep 11 of	Table 9	b, so tha	ıt Ti,m=(76)m an	d re-calc	culate	
tric at	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	<u> </u>	<u> </u>	l mag	СОР		1 1101	200		
(94)m=	0.99	0.99	0.97	0.91	0.76	0.54	0.38	0.43	0.72	0.94	0.99	1		(94)
Usefu	∟——ıl gains,	hmGm	, W = (9 ⁴	4)m x (84	4)m		<u>!</u>			<u>!</u>			l	
(95)m=	448.52	498.69	547.41	578.07	525.27	372.74	248.03	259.75	387.12	448.63	433.16	428.57		(95)
Month	nly aver	age exte	ernal tem	perature	from Ta	able 8		•			•	•		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	-	<u> </u>		
(97)m=	1011.55	979.19	888.07	739.88	568.97	377.65	248.52	260.77	410.09	623.73	828.81	1002.75		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		1	
(98)m=	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19		_
								Tota	l per year	(kWh/yea	r) = Sum(9	18) _{15,912} =	1986.58	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								28.61	(99)
9a. En	erav red	uiremer	nts – Indi	vidual h	eating s	vstems i	ncluding	micro-C	CHP)					
	e heatir	•				,			,					
-		•	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main svs	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	-									93.5	(206)
		•	ry/suppl	-		a evetom	o 0/ ₋						0	(208)
LIIICIC						· ·		Ι	0					」 ` ′
Space	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	418.9	322.9	ement (c	116.5	32.51) 0	0	0	0	130.27	284.86	427.19		
(0.4.4)								<u> </u>		100.27	204.00	427.13		(0.4.4)
(211)m	- ``	<u> </u>)4)] } x 1	<u> </u>				Ι ο		420.00	1 204 67	450.00		(211)
	448.02	345.34	271.07	124.6	34.78	0	0	0 Tota	0 II (kWh/yea	139.32	304.67	456.89	0404.00	7(214)
•				\ 1\A/I /				1016	ii (KVVII/yea	ar) =50m/	211) _{15,1012}	2	2124.68	(211)
•		•	econdar 00 ÷ (20	• •	month									
- \[(30) (215)m=	<u> </u>	0	00 + (20	0	0	0	0	0	0	0	0	0		
(210)				Ů					l (kWh/yea				0	(215)
Water	heating								` ,	, ,	715,101	_		
	_		ter (calc	ulated al	hove)									
o disposi	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39		
Efficier	ncy of w	ater hea	ater			ļ.	ļ.	!	ļ.	ļ.	!		79.8	(216)
(217)m=	86.88	86.55	85.8	84.03	81.48	79.8	79.8	79.8	79.8	84.23	86.15	86.98		(217)
		heatina.	kWh/mo	onth					ı	ı		1		
(219)m	1 = (64)	•) ÷ (217)					1			1		ı	
(219)m=	217.4	192.4	203.97	186.89	189.02	172.67	166.03	181.91	181.5	193.33	199.62	211.98		_
								Tota	I = Sum(2	19a) ₁₁₂ =			2296.71	(219)
	l totals									k'	Wh/yeaı	r	kWh/year	7
Space	neating	tuel use	ed, main	system	1								2124.68	╛

Water heating fuel used				2296.71	1
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				317.84	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4814.23	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy	Emission fac	ctor	Emissions	
	kWh/year	kg CO2/kWh		kg CO2/yea	ar
Space heating (main system 1)	kWh/year (211) x	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (main system 1) Space heating (secondary)	•		=		_
	(211) x	0.216		458.93	(261)
Space heating (secondary)	(211) x (215) x	0.216	=	458.93	(261) (263)
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216	=	458.93 0 496.09	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	=	458.93 0 496.09 955.02	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= =	458.93 0 496.09 955.02 38.93	(261) (263) (264) (265) (267)

TER =

(273)

16.69

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:54*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 69.61m²Site Reference :Highgate Road - GREENPlot Reference: 03 - F

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

16.77 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.35 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 34.0 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Windows facing: South West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m ² K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	03 - F					
Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor			69.61	(1a) x	2	2.65	(2a) =	184.47	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	69.61	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	184.47	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	x '	10 =	20	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per he	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	20		÷ (5) =	0.11	(8)
Number of storeys in the		iu io (17),	otrierwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corresponding t gas): if equal user 0.35	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250 amaza dia adia adia mata		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	etre or e	envelope	area	5	(17)
•	s if a pressurisation test has been do				is being u	sed		0.36	(10)
Number of sides sheltere	d							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.36	(21)
Infiltration rate modified for		1	1 .			<u> </u>		1	
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0 4.4 4.3 3.8	J 3.6	3.1	4	4.3	4.0	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4	_						,	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

· -		<u> </u>					(21a) x	` 	T	T			
0.46 Calculate effe	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
If mechanica		•	ale ioi i	пе аррп	саыс са	3 C					Ī	0	(2
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)		i	0	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =			i	0	(2
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [ı (23c) – 1	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b)m = (22	2b)m + (23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ver	tilation o	or positiv	e input v	ventilatio	n from c	utside	•	•			
if (22b)n	n < 0.5 ×	(23b), t	hen (24	c) = (23b); other	wise (24	c) = (22b	o) m + 0.	.5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n				•	•				0.5]				
24d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
3. Heat losse	o ond be	at loss r	oromot	241			•		•	•			
LEMENT	S and ne	_	Openin		Net Ar	A2	U-valı	IΩ	AXU		k-value	Δ Δ	Χk
LEWEN	area	_	m		A,r		W/m2		(W/		kJ/m²-k		J/K
/indows Type	. 1				8.97	x1	/[1/(1.4)+	0.04] =	11.89				(2
/indows Type	2				2.92	x1.	/[1/(1.4)+	0.04] =	3.87	\equiv			(2
Valls Type1	41.5	59	11.89	€	29.7	x	0.18	ˈ = i	5.35	Ħ ſ			(2
Valls Type2	18.4	ļ1	0		18.41	X	0.18	<u> </u>	3.31	=		ī	<u> </u>
otal area of e	lements	, m²			60								 (3
arty wall					38.68	x	0		0				(3
arty floor					69.61		<u> </u>					i	(3
arty ceiling					69.61	=						╡ ├─	— `(3
nternal wall **					136.2	_						╣	(3
for windows and		ows. use e	ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	L as aiven in	n paragraph		(
include the area								2(, ,	3	7-1-3-17		
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				24.42	(3
leat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	10725.79	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assess an be used inste				construct	ion are noi	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
hermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix I	<						6.83	(:
details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he								(33) +	(36) =		l	31.26	(;
entilation hea	i				<u> </u>		ī		= 0.33 × (
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	36.55	36.3	35.17	34.96	33.97	33.97	33.78	34.35	34.96	35.39	35.84		(3
8)m= 36.79	<u> </u>					l		l					
8)m= 36.79 eat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m			

Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.98	0.97	0.97	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.96	0.96		
Number of day	s in ma	nth (Tab	lo 10)					,	Average =	Sum(40) ₁ .	12 /12=	0.95	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		24		(42)
if TFA £ 13.9 Annual averag	•	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		87	.32		(43)
Reduce the annua							ò achieve	a water us	se target o				
not more that 125								_					
Jan Hot water usage ii	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	,				1			05.57	00.07	00.50	00.05		
(44)m= 96.05	92.56	89.07	85.57	82.08	78.59	78.59	82.08	85.57	89.07	92.56	96.05	4047.04	7(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1047.84	(44)
(45)m= 142.44	124.58	128.56	112.08	107.54	92.8	85.99	98.68	99.86	116.37	127.03	137.95		
(10)										m(45) ₁₁₂ =	l l	1373.88	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(- /			
(46)m= 21.37	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69		(46)
Water storage					Į	Į	Į						
Storage volum	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '	\	(01: /	47)			
Otherwise if no Water storage		not wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWh	n/dav).				1	39		(48)
Temperature fa				51 10 Mile	("uay).					54		(49)
Energy lost fro				ear			(48) x (49)) <u>=</u>					(50)
b) If manufact		_	-		or is not		(40) X (40)	, –		0.	75		(30)
Hot water store	age loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	ıy)					0		(51)
If community h	_		on 4.3										
Volume factor			Ol-							—	0		(52)
Temperature fa											0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (. , .	,					((50) (EE) (44)		0.	75		(55)
Water storage		culated i				i	((56)M = (55) × (41)ı	n ——	,			
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Append	IX H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	•	•									0		(58)
Primary circuit				•	•	. ,	, ,						
(modified by					ı —	ı —				<u> </u>			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month (61)m = (60) \div 365 × (41)m														
(61)m= 0	0	0	0	0	0	0) 0		0	0	0	0]	(61)
	uired for	water h	L eating ca	Lalculated	L I for ea	 ch month	(62)	— m =	0.85 × (′45)m +		(57)m +	ו · (59)m + (61)m	
(62)m= 189.04	166.67	175.15	157.17	154.14	137.89		145	_	144.95	162.97	172.12	184.54]	(62)
Solar DHW input	calculated	using App	endix G o	r Appendix	H (nega	tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	1	
(add additiona												0,		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0	1	(63)
Output from w	ater hea	ter				•					•	!	•	
(64)m= 189.04	166.67	175.15	157.17	154.14	137.89	132.59	145	.27	144.95	162.97	172.12	184.54]	
						•		Outp	out from wa	ater heate	er (annual)	112	1922.5	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	n]	
(65)m= 84.64	75.09	80.02	73.34	73.03	66.93	65.87	70.	09	69.28	75.97	78.31	83.14]	(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):										
Metabolic gair	ns (Table	5). Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.83	111.83	111.83	111.83	111.83	111.83	111.83	111	.83	111.83	111.83	111.83	111.83	1	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5		•		•	
(67)m= 18.04	16.02	13.03	9.87	7.37	6.23	6.73	8.7	'4	11.74	14.9	17.39	18.54]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 196.39	198.42	193.29	182.36	168.55	155.58	146.92	144	.88	150.02	160.95	174.75	187.72]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	or L15a), als	o se	e Table	5	•		•	
(69)m= 34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.	18	34.18	34.18	34.18	34.18]	(69)
Pumps and fa	ns gains	(Table 5				•							•	
(70)m= 3	3	3	3	3	3	3	3	1	3	3	3	3]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)	•					•		•	
(71)m= -89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.	.46	-89.46	-89.46	-89.46	-89.46]	(71)
Water heating	gains (T	able 5)									•		•	
(72)m= 113.76	111.74	107.55	101.86	98.16	92.96	88.53	94.	.2	96.22	102.11	108.77	111.75]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m	•	
(73)m= 387.74	385.74	373.42	353.63	333.64	314.32	301.73	307	.38	317.52	337.51	360.46	377.56]	(73)
6. Solar gain	s:					•					•			
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica	ble orienta	tion.		
Orientation:			Area			ux		_	g_	-	FF		Gains	
_	Table 6d		m²			able 6a			able 6b	_ ' 	able 6c		(W)	_
Northeast _{0.9x}	0.77	Х	8.9	97	х	11.28	X		0.63	x	0.7	=	30.93	(75)
Northeast _{0.9x}	0.77	X	8.8	97	х	22.97	X		0.63	x	0.7	=	62.96	(75)
Northeast _{0.9x}	0.77	X	8.8	97	x	41.38	X		0.63	x	0.7	=	113.43	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	67.96	X		0.63	x	0.7	=	186.29	(75)
Northeast _{0.9x}	0.77	X	8.9	97	X	91.35	X		0.63	X	0.7	=	250.41	(75)

Northeast 0.5%			_			_		,		_				_
Northeast 0.ax	Northeast _{0.9x}	0.77	X	8.9	7	x	97.38	X	0.63	X	0.7	=	266.96	(75)
Northeast 0, 8x	L	0.77	X	8.9)7	x	91.1	X	0.63	X	0.7	=	249.74	(75)
Northeast 0.8x	<u>L</u>	0.77	X	8.9)7	x	72.63	X	0.63	X	0.7	=	199.1	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	8.9)7	X	50.42	X	0.63	X	0.7	=	138.22	(75)
Northeast 0.9x	Northeast _{0.9x}	0.77	X	8.9)7	x	28.07	X	0.63	X	0.7	=	76.94	(75)
Southwesto, 9x	Northeast _{0.9x}	0.77	X	8.9)7	x	14.2	X	0.63	X	0.7	=	38.92	(75)
Southwesto, 9x	Northeast 0.9x	0.77	X	8.9)7	x	9.21	X	0.63	x	0.7	=	25.26	(75)
Southwesto.9x	Southwest _{0.9x}	0.77	X	2.9)2	x	36.79]	0.63	x	0.7	=	32.83	(79)
Southwesto 9x	Southwest _{0.9x}	0.77	X	2.9)2	x	62.67]	0.63	x	0.7	=	55.93	(79)
Southwesto.9x	Southwest _{0.9x}	0.77	X	2.9)2	x	85.75]	0.63	x	0.7	=	76.52	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	x	2.9)2	x	106.25		0.63	х	0.7	=	94.82	(79)
Southwesto.9x	Southwest _{0.9x}	0.77	X	2.9)2	x	119.01		0.63	х	0.7	=	106.2	(79)
Southwest0,9x	Southwest _{0.9x}	0.77	x	2.9)2	x	118.15	Ī	0.63	x	0.7		105.44	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	x	2.9)2	x	113.91	Ī	0.63	x	0.7		101.65	(79)
Southwest0.9x	Southwest _{0.9x}	0.77	x	2.9)2	x	104.39	Ī	0.63	x	0.7	=	93.16	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	x	2.9)2	x	92.85	Ī	0.63	x	0.7		82.86	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 63.76	Southwest _{0.9x}	0.77	x	2.9)2	x	69.27	Ī	0.63	x	0.7		61.81	(79)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 63.76 118.89 189.96 281.11 356.62 372.4 351.39 292.25 221.08 138.76 78.25 53.36 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.93 0.8 0.6 0.44 0.49 0.77 0.96 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.12 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) #IA = Living area + (4) = 0.38 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.46 20.42 20.11 19.64 19.27	Southwest _{0.9x}	0.77	x	2.9)2	x	44.07	ĺ	0.63	x	0.7		39.33	(79)
(83)m= 63.76 118.89 189.96 281.11 356.62 372.4 351.39 292.25 221.08 138.76 78.25 53.36 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	Southwest _{0.9x}	0.77	x	2.9)2	x	31.49	ĺ	0.63	×	0.7	╡ -	28.1	(79)
(83)m= 63.76 118.89 189.96 281.11 356.62 372.4 351.39 292.25 221.08 138.76 78.25 53.36 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	•							_						
(83)m= 63.76 118.89 189.96 281.11 356.62 372.4 351.39 292.25 221.08 138.76 78.25 53.36 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 451.5 504.63 563.38 634.74 690.26 686.72 653.12 599.63 538.6 476.27 438.71 430.92 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	Solar gains in	watts, cale	culated	for eac	h month			(83)m	n = Sum(74)m .	(82)m				
Ref Ref	<u> </u>	1 1					351.39	292	.25 221.08	138.7	6 78.25	53.36		(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.93 0.8 0.6 0.44 0.49 0.77 0.96 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.13 20.14 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	Total gains – i	nternal an	d solar	(84)m =	= (73)m	+ (83)	n , watts		•	•	•	•	-	
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.98 0.93 0.8 0.6 0.44 0.49 0.77 0.96 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	(84)m= 451.5	504.63	563.38	634.74	690.26	686.7	2 653.12	599	.63 538.6	476.2	7 438.71	430.92		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean inter	nal tempe	rature	(heating	season)								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				`		,	a from Ta	ble 9	, Th1 (°C)				21	(85)
(86)m= 1 0.99 0.98 0.93 0.8 0.6 0.44 0.49 0.77 0.96 0.99 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	Utilisation fac	ctor for gai	ns for I	iving are	ea, h1,m	(see	Table 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.04	Jan	Feb	Mar	Apr	May	Jur	n Jul	A	ug Sep	Oct	Nov	Dec		
(87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	(86)m= 1	0.99	0.98	0.93	0.8	0.6	0.44	0.4	19 0.77	0.96	0.99	1		(86)
(87)m= 20.04 20.18 20.41 20.71 20.91 20.99 21 21 20.95 20.68 20.31 20.03 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	Mean interna	l temperat	ture in l	living ar	ea T1 (fo	ollow s	tens 3 to	7 in T	able 9c)	•		•		
(88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)		г - т	T I		· `	1	-i	_		20.68	20.31	20.03]	(87)
(88)m= 20.1 20.11 20.11 20.12 20.12 20.14 20.14 20.14 20.13 20.12 20.12 20.11 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	Tomporatura	during ho	ating n	oriode ir	roct of	dwolli	og from T	abla (Th2 (°C)	<u>!</u>	_!	<u>!</u>	ı	
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	·	, <u> </u>				1	<u> </u>	_		20.12	20.12	20.11]	(88)
(89)m= 1 0.99 0.98 0.91 0.75 0.52 0.35 0.4 0.7 0.94 0.99 1 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.83 19.02 19.35 19.78 20.04 20.13 20.14 20.14 20.09 19.75 19.23 18.81 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	` ′						I				1 -5			, ,
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= $\begin{bmatrix} 18.83 & 19.02 & 19.35 & 19.78 & 20.04 & 20.13 & 20.14 & 20.14 & 20.09 & 19.75 & 19.23 & 18.81 & (90) \\ & & & & & & & & & & & & & & & & & & $, <u> </u>	i			1	1	T _	4 0.7		1 0 00	<u> </u>	1	(90)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(89)m= 1	0.99	0.98	0.91	0.75	0.52	0.35	0.	4 0.7	0.94	0.99	1		(69)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)		l temperat	ture in t	the rest	of dwell	ing T2	(follow ste	eps 3	to 7 in Tab	le 9c)		1	1	
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)	(90)m= 18.83	19.02	19.35	19.78	20.04	20.13	20.14	20.				<u> </u>		_ ` ′
(92)m= 19.29 19.46 19.75 20.13 20.37 20.46 20.46 20.46 20.42 20.11 19.64 19.27 (92)									•	tLA = Liv	/ing area ÷ (4) =	0.38	(91)
	Mean_interna	l temperat	ture (fo	r the wh	ole dwe	lling) =	= fLA × T1	+ (1	– fLA) × T2				_	
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	(92)m= 19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.	46 20.42	20.11	19.64	19.27		(92)
	Apply adjustr	ment to the	e mean	interna	temper	ature 1	rom Table	e 4e,	where appr	opriate				

(02)	40.00	40.40	40.75	20.42	20.27	20.40	20.40	00.40	20.40	00.44	40.04	40.07		(93)
(93)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27		(93)
			uirement				44 -4	Table 0	41	4 T: /	70)	-11-	late	
			or gains			ed at ste	ер ттог	rable 9	o, so tha	t 11,m=(rojm an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	:			,							
(94)m=	0.99	0.99	0.97	0.91	0.77	0.55	0.39	0.44	0.72	0.94	0.99	1		(94)
Usefu			, W = (9 ²	<u> </u>			T	,	1		1	1	ı	
(95)m=	449.14	499.38	548.31	579.82	528.59	376.65	251.51	263.23	390.23	449.79	433.81	429.17		(95)
	nly aver	age exte	rnal tem	perature			•	,				,	1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
							-``	- ` 	– (96)m					
	1020.07		895.47	746.2	574.32	381.94	252.05	264.36	414.51	629.39	836	1011.25		(97)
Space			ı		nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	r		1	
(98)m=	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07		_
								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	2021.06	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								29.03	(99)
0a En	eray rea	uiremer	nts – Indi	vidual b	eating s	veteme i	ncluding	micro-C	'HDI					
	e heatir		its — iridi	viduai II	eating s	y Sterris i	ricidaling	i illicio-c) II <i>)</i>					
•		•	at from s	econdar	v/supple	mentarv	svstem						0	(201)
	•		at from m			,	•	(202) = 1	- (201) =			-	1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	-									93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin	g require	ement (c	alculate	d above))								
	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07		
(211)m	n = {[(98)m x (20	(4)] } x 1	00 ÷ (20)6)								l	(211)
(=)	454.3	350.72	276.24	128.12	36.39	0	0	0	0	142.92	309.71	463.17		()
								Tota	l I (kWh/yea	ar) =Sum(2	1 211), _{510 10}	<u> </u> ,=	2161.56	(211)
Space	o hoatin	a fual (e	econdar	v) k\//b/	month						7 10, 10 12		2.000	」` ′
•		`	00 ÷ (20	• , .	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
(- /		_							l (kWh/yea	ar) =Sum(2	1 215), _{540 4} ,	=	0	(215)
Motor	hootine									(- /15,1012	2	0	_(=:0)
	heating		ter (calc	اد امطواریا	hove)									
Output	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54		
Efficier	ncy of w	ater hea					<u> </u>		l		l		79.8	(216)
(217)m=		86.59	85.85	84.1	81.54	79.8	79.8	79.8	79.8	84.29	86.19	87.01	. 6.6	」` ′ (217)
, ,			kWh/mo		01.01	70.0	10.0	7 0.0	7 0.0	01.20	00.10	07.01		()
		•) ÷ (217)											
	217.51	192.48	204.02	186.88	189.02	172.8	166.15	182.05	181.64	193.34	199.7	212.08		
							•	Tota	I = Sum(2	19a) ₁₁₂ =		•	2297.68	(219)
Annua	al totals									k\	Wh/year	·	kWh/year	
		fuel use	ed, main	system	1						•		2161.56	1
													<u> </u>	_

Water heating fuel used				2297.68	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting				318.62	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4852.86	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	<u>_</u>				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)			ctor =		
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar ¬
	kWh/year	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 466.9 0 496.3	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= =	kg CO2/yea 466.9 0 496.3 963.2	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.519	= = =	kg CO2/yea 466.9 0 496.3 963.2 38.93	(261) (263) (264) (265) (267)

TER =

(273)

16.77

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:48*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 50.62m²Site Reference:Highgate Road - GREENPlot Reference: 03 - G

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

19.64 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.45 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

48.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 38.7 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.17 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		Heor	Details:						
Access an Name	Nail In ah am	OSEI		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Continui o Italiio:		Property	/ Address:		0.011.		7 0 10 10	711 11010100	
Address :		·							
1. Overall dwelling dime	ensions:								
Ground floor		Ar	ea(m²)	(10) ×		ight(m)	(2a) =	Volume(m ³	(3a)
	a) . (4 la) . (4 a) . (4 a) . (4 a) .	(4.5)		(1a) x	2	65	(2a) =	134.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	·(1n)	50.62	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	134.14	(5)
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	ır
Number of altimospess	heating hea	ating		1			40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				L	2		10 =	20	(7a)
Number of passive vents					0	X '	10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs. flues and fans = $(6a)$ +	+(6b)+(7a)+(7b)	+(7c) =	Г	20		÷ (5) =	0.15	(8)
•	peen carried out or is intended,			ontinue fr			. (0) –	0.13	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fra resent, use the value correspon			•	ruction			0	(11)
deducting areas of opening		naing to the gre	aler wall are	a (anter					
If suspended wooden f	floor, enter 0.2 (unsealed	d) or 0.1 (sea	led), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
ŭ	s and doors draught strip	ped						0	(14)
Window infiltration			0.25 - [0.2		_	()		0	(15)
Infiltration rate			(8) + (10)	, , ,	, , ,	, ,		0	(16)
	q50, expressed in cubic	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has be				is heina u	sed		0.4	(18)
Number of sides sheltere		con done or a a	ogree an per	modelinty	io boilig a	50 u		0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.4	(21)
Infiltration rate modified f	or monthly wind speed						'		
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	´	0.95 0.95	0.92	1	1.08	1.12	1.18]	
, .,				-		L <u>-</u>		J	

0.51	0.5	0.49	0.44	0.43	0.38	0.38	0.37	(22a)m _{0.4}	0.43	0.45	0.47		
Calculate effe			-		1		0.01	0.1	0.10	0.10	0.17		
If mechanic												0	(23
If exhaust air h		0		, ,	,	. ,	,, .	`) = (23a)			0	(23
If balanced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23
a) If balance	1					ery (MVI	HR) (24a	<u> </u>	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	1					- 	- ^ `	<u> </u>	 		1	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	nouse ex n < 0.5 ×			•	•				5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilatio	n or wh	ole hous	e positiv	/e input	L ventilatio	n from l	oft					
,	n = 1, the			•	•				0.5]				
24d)m= 0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25
3. Heat losse	es and he	eat loss r	paramete	er:									
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	re	AXU		k-value) A	λΧk
	area	(m ²)	· m		A ,r	m²	W/m2	K	(W/I	<)	kJ/m²-l	< k	J/K
Vindows					8.97	х1,	/[1/(1.4)+	0.04] =	11.89				(27
Valls Type1	31.4	4	8.97		22.43	3 X	0.18	=	4.04				(29
Valls Type2	22.9	92	0		22.92	<u>x</u>	0.18	= [4.13				(29
otal area of e	elements	, m²			54.32	2							(3
Party wall					30.08	3 x	0	=	0				(32
Party floor					50.62	2							(32
arty ceiling					50.62	2				Ī			(3:
nternal wall **	ŧ				83.2					Ī			(3:
for windows and	l roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the are				s and part	titions								
	ss, W/K :	•	U)				(26)(30)	,				20.06	(3:
		'Ayk)							$(30) \pm (33)$	2) + (32a).	(32e) =	8366.8	(3
leat capacity		,			,			***	, , ,	, , ,			
leat capacity hermal mass	parame	ter (TMF		,				Indica	tive Value:	Medium		250	(3:
Heat capacity Thermal mass For design asses	s parame	ter (TMF	tails of the	,			ecisely the	Indica	tive Value:	Medium	able 1f	250	(3:
Fabric heat lost lost leat capacity hermal mass for design assest and be used instead for the lost lost lost lost lost lost lost lost	s parame sments wh	eter (TMF ere the de tailed calci	tails of the ulation.	constructi	ion are not	t known pr	ecisely the	Indica	tive Value:	Medium	able 1f	250 5.76	
Heat capacity Thermal mass For design asses an be used inste Thermal bridg	s parame sments wh ead of a de es: S (L	eter (TMF ere the de tailed calcu x Y) cal	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	Indica	tive Value:	Medium	able 1f		
leat capacity hermal mass or design asses an be used inste hermal bridg details of therma	s parame sments wh ead of a de es:S(L al bridging	eter (TMF ere the de tailed calcu x Y) cal	tails of the ulation. culated u	constructius	ion are not pendix l	t known pr	ecisely the	Indica indicative	tive Value:	Medium	able 1f		(3)
Heat capacity Thermal mass For design asses an be used inste	s parame sments wh ead of a de es : S (L al bridging eat loss	ter (TMF ere the de tailed calco x Y) calco are not kn	tails of the ulation. culated (own (36) =	constructions constructions constructions constructions constructed as the construction construc	ion are not pendix l	t known pr	ecisely the	Indicative	tive Value:	Medium TMP in Ta		5.76	(3:
Thermal mass For design assessan be used inste Thermal bridg f details of therma Total fabric he Ventilation hea	s parame sments wh ead of a de es : S (L al bridging eat loss	ter (TMF ere the de tailed calco x Y) calco are not kn	tails of the ulation. culated (own (36) =	constructions constructions constructions constructions constructed as the construction construc	ion are not pendix l	t known pr	ecisely the	Indicative	tive Values of values of (36) =	Medium TMP in Ta		5.76	(3)
Heat capacity Thermal mass For design assess an be used inste Thermal bridg Total fabric he Tentilation hea	s parame sments wh had of a dec es: S (L al bridging eat loss at loss ca	ere the de tailed calco x Y) cal- are not kn	tails of the ulation. culated u own (36) =	constructions and constructions are constructed as the construction of the constructio	ppendix h	t known pr		Indicative (33) + (38)m	(36) = = 0.33 × (Medium TMP in Ta		5.76	(3)
Thermal mass For design assessan be used inste Thermal bridg Tetalis of thermal Total fabric her Ventilation her	s parame sments wh had of a deces: S (L had bridging eat loss at loss ca Feb 27.64	ere the de tailed calculare not kn	tails of the ulation. culated u own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix ł 1) Jun	t known pr	Aug	Indicative (33) + (38)m Sep 25.66	(36) = = 0.33 × (Medium TMP in Ta 25)m x (5) Nov 26.6	Dec	5.76	(3)

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.06	1.05	1.03	1.03	1.01	1.01	1.01	1.02	1.03	1.04	1.04		
()				<u> </u>		<u> </u>	<u> </u>			Sum(40) ₁ .		1.03	(40)
Number of day	s in mo	nth (Tab	le 1a)							(),			``
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
LI				Į.		!	Į.		ļ	•			
1 Motor boot	ina ono	ravi koani	romonti								Is\A/b/ye	NOT!	
4. Water heat	ing ene	rgy requi	rement.								kWh/ye	ar.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		71		(42)
Annual average Reduce the annual									se target o		.77		(43)
not more that 125									•				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres pe					Table 1c x			<u> </u>				
(44)m= 82.25	79.26	76.27	73.28	70.29	67.3	67.3	70.29	73.28	76.27	79.26	82.25		
, ,				<u> </u>		<u> </u>	<u> </u>	<u> </u>		lm(44) ₁₁₂ =	l	897.28	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 121.98	106.68	110.09	95.97	92.09	79.47	73.64	84.5	85.51	99.65	108.78	118.13		
				1	l	ı	ı	-	rotal = Su	ım(45) ₁₁₂ =	=	1176.48	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46	to (61)			'		_
(46)m= 18.3	16	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72		(46)
Water storage	loss:			!		!	!						
Storage volume	e (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	rcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage				:	(1-) (1/1	. /-							(45)
a) If manufacti				or is kno	wn (kvvr	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufacteHot water stora			-										(51)
If community h	•			IC 2 (KVV)	11/11110/00	' y)					0		(31)
Volume factor	•										0		(52)
Temperature fa	actor fro	m Table	2b							_	0		(53)
Energy lost fro	m watei	r storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (_	,					, , , ,	•	-	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains												ix H	(00)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Duine am a sina sit	l /		T-1-1-			ļ	ļ	!	!				(58)
Primary circuit	•	•			50\m - 4	(EQ) + 26	SE v (44)	ım			0		(30)
Primary circuit (modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
(00)111- 20.20	۱.0۱	20.20	١٤.٦١	20.20	١٤.٠٦	20.20	20.20		20.20	22.01	20.20		(00)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	01)111 =	00) + 0	0 7 (41) 0		0	0	0	0	1	(61)
	<u> </u>												J · (59)m + (61)m	(-)
(62)m= 168.5	-i	156.68	141.07	138.69	124.56		131	_	130.6	146.25	153.87	164.72]	(62)
Solar DHW inpo			<u> </u>	<u> </u>		1	<u> </u>						<u></u>	` '
(add addition												-: ····································		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	7	(63)
Output from	water hea	ter	ı				•						_	
(64)m= 168.5	7 148.77	156.68	141.07	138.69	124.56	120.23	131	.1	130.6	146.25	153.87	164.72	1	
	Į.		ı	ı				Outp	ut from wa	ater heate	er (annual)	112	1725.1	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	1] + 0.8 >	([(46)m	+ (57)m	+ (59)m	 n]	
(65)m= 77.83	3 69.14	73.88	67.99	67.9	62.5	61.76	65.3	37	64.51	70.41	72.24	76.55]	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar	r Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 85.42	2 85.42	85.42	85.42	85.42	85.42	85.42	85.4	42	85.42	85.42	85.42	85.42]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso s	ee 7	Table 5				_	
(67)m= 13.59	12.07	9.81	7.43	5.55	4.69	5.07	6.5	9	8.84	11.22	13.1	13.97]	(67)
Appliances (gains (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	also	see Ta	ble 5			_	
(68)m= 148.8	4 150.39	146.5	138.21	127.75	117.92	111.35	109.	.81	113.7	121.99	132.45	142.28]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5	-	-	_	
(69)m= 31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.	54	31.54	31.54	31.54	31.54]	(69)
Pumps and	fans gains	(Table 5	5a)										_	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.3	3 -68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.	33	-68.33	-68.33	-68.33	-68.33]	(71)
Water heatir	ng gains (T	able 5)											_	
(72)m= 104.6	1 102.89	99.3	94.42	91.26	86.8	83.01	87.8	37	89.59	94.64	100.34	102.89]	(72)
Total intern	al gains =				(66	6)m + (67)m	า + (68)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 318.6	7 316.97	307.24	291.69	276.19	261.04	251.06	255.	.89	263.76	279.47	297.51	310.76		(73)
6. Solar ga														
Solar gains ar		Ü					ations 1	:0 CO		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		Т	g_ able 6b	т	FF able 6c		Gains (W)	
Northoast a a							1 1					_	. ,	1,75
Northeast 0.9		X			—	11.28	X		0.63	X	0.7	=	30.93	(75)
Northeast 0.9	<u> </u>	X			—	22.97] X]		0.63		0.7	_ =	62.96	(75)
Northeast 0.9	<u> </u>	X	8.9			41.38	X 1		0.63		0.7	=	113.43	[(75)
Northeast 0.9		X	8.9		-	67.96	X		0.63	_	0.7	=	186.29](75)] ₍₇₅₎
Northeast 0.9	× 0.77	X	8.9	97	X	91.35	X		0.63	X	0.7	=	250.41	(75)

Northeast 0.9x	0.77	×	8.9)7	X	97.38] x [(0.63	x	0.7	=	266.96	(75)
Northeast 0.9x	0.77	x	8.9)7	x	91.1] x [(0.63	x	0.7	=	249.74	(75)
Northeast 0.9x	0.77	x	8.9)7	x	72.63] x [(0.63	x	0.7	=	199.1	(75)
Northeast 0.9x	0.77	x	8.9)7	X .	50.42] x [0.63	x	0.7	=	138.22	(75)
Northeast 0.9x	0.77	X	8.9)7	x	28.07	x		0.63	x	0.7	=	76.94	(75)
Northeast 0.9x	0.77	×	8.9)7	x	14.2	x	-	0.63	_ x _	0.7		38.92	(75)
Northeast 0.9x	0.77	х	8.9)7	х	9.21	וֹ × וֹ	(0.63	_ x [0.7	=	25.26	(75)
							_							
Solar gains in	n watts, c	alculated	I for eacl	h month			(83)m	= Sun	m(74)m .	(82)m				
(83)m= 30.93	62.96	113.43	186.29	250.41	266.96	249.74	199.	.1	138.22	76.94	38.92	25.26		(83)
Total gains -	internal a	and solar	(84)m =	= (73)m	+ (83)m	, watts							•	
(84)m= 349.6	379.93	420.67	477.98	526.6	528	500.8	454.9	98	401.98	356.42	336.43	336.02		(84)
7. Mean inte	ernal temp	perature	(heating	season)									
Temperatur	e during h	neating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1	(°C)				21	(85)
Utilisation fa	actor for g	ains for l	living are	ea, h1,m	(see Ta	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.94	0.81	0.6	0.45	0.51	1	0.79	0.96	0.99	1		(86)
Mean intern	al temper	ature in	living ar	22 T1 (fo	ollow ste	ns 3 to -	7 in Ta	ahle	9c)					
(87)m= 19.97		20.32	20.65	20.89	20.98	21	20.9	-	20.93	20.62	20.25	19.95		(87)
					-l Ilia .		-1-1-0		. (00)			<u> </u>		
Temperatur (88)m= 20.03		20.04	20.06	20.06	20.07	20.07	20.0		2 (°C) 20.07	20.06	20.05	20.05		(88)
` ′					<u> </u>	ļ	<u> </u>	,6	20.07	20.06	20.05	20.05		(00)
Utilisation fa		1				1	T -				1		1	
(89)m= 0.99	0.99	0.98	0.92	0.76	0.52	0.35	0.41	1	0.72	0.95	0.99	1		(89)
Mean intern	al temper	ature in	the rest	of dwell	ng T2 (1	follow ste	eps 3	to 7	in Tabl	e 9c)	_			
(90)m= 18.66	18.84	19.18	19.66	19.96	20.06	20.07	20.0)8	20.01	19.63	19.09	18.66		(90)
									f	LA = Livir	ng area ÷ (4	4) =	0.49	(91)
Mean intern	al temper	ature (fo	r the wh	ole dwe	lling) = f	fLA × T1	+ (1 -	- fLA	() × T2					
(92)m= 19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.5	53	20.46	20.12	19.66	19.29		(92)
Apply adjus	tment to t	he mean	internal	temper	ature fro	om Table	e 4e, v	where	e appro	priate	•			
(93)m= 19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.5	53	20.46	20.12	19.66	19.29		(93)
8. Space he	ating req	uirement												
Set Ti to the					ed at st	tep 11 of	Table	e 9b,	so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisatio	1				l .		Ι.			0 1		_	1	
Jan		Mar	Apr	May	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Utilisation fa	0.99	0.97	0.92	0.78	0.56	0.4	0.46	e T	0.75	0.95	0.99	0.99		(94)
Useful gains					0.50	0.4	0.40	<u> </u>	0.75	0.93	0.99	0.99		(0.1)
(95)m= 347.34		409.84	438.96	408.92	296.5	200.02	208.7	76	301.18	337.88	332.19	334.24		(95)
Monthly ave						1 =00.02				007.100	1 0020	00		, ,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Heat loss ra						1]	I	I	1	
(97)m= 805.22	1	704.94	587.07	453.33	302.4	200.76	210.2	 -	327.5	495.13	658.33	797.1		(97)
Space heati	ng requir	ement fo	r each n	nonth, k	Wh/mon	$\frac{1}{1}$ th = 0.02	24 x [((97)n	n – (95)m] x (4	1)m		1	
(98)m= 340.66	3 270.21	219.55	106.64	33.04	0	0	0		0	116.99	234.82	344.37		
													-	

			Tota	ıl per year	(kWh/yea	r) = Sum(9	98) _{15,912} =	1666.28	(98)
Space heating requirement in kWh/m²/y	/ear							32.92	(99)
9a. Energy requirements – Individual hea	ating syste	ms includin	g micro-C	CHP)					
Space heating:	·						ı		7,000
Fraction of space heat from secondary/s		itary systen		(004)				0	(201)
Fraction of space heat from main syster	` ,		(202) = 1	,	(000)1			1	(202)
Fraction of total heating from main syste			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system								93.5	(206)
Efficiency of secondary/supplementary	heating sy	stem, %	_					0	(208)
Jan Feb Mar Apr		un Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated a 340.66 270.21 219.55 106.64	´ i	<u> </u>		0	116.00	1 224 02	344.37		
	l l	0	0		116.99	234.82	344.37		(0.1.1)
$(211) m = \{ [(98) m \times (204)] \} \times 100 \div (206) $ $364.34 $) 0	0	0	125.13	251.14	368.31		(211)
304.54 209 254.02 114.03	33.33	<u>, </u>		l (kWh/yea				1782.12	(211)
Space heating fuel (secondary), kWh/m	onth				,	7 15, 10 1.		1702.12	(,
$= \{[(98) \text{m x } (201)] \} \times 100 \div (208)$									
(215)m= 0 0 0 0	0 (0	0	0	0	0	0		
	-	-	Tota	l (kWh/yea	ar) =Sum(2	215) _{15,101}	2=	0	(215)
Water heating									
Output from water heater (calculated about 168.57 148.77 156.68 141.07		1.56 120.23	131.1	130.6	146.25	153.87	164.72		
Efficiency of water heater	136.09	120.23	131.1	130.0	140.23	133.67	104.72	79.8	(216)
·	81.66 79	0.8 79.8	79.8	79.8	84.23	85.94	86.74	79.0	(217)
Fuel for water heating, kWh/month	01.00 70	70.0	7 0.0	7 0.0	04.20	00.04	00.74		(= : :)
(219) m = (64) m x $100 \div (217)$ m									
(219)m= 194.53 172.21 182.79 167.78 1	169.84 156	5.09 150.67		163.66	173.64	179.05	189.91		_
			Tota	ıl = Sum(2				2064.45	(219)
Annual totals Space heating fuel used, main system 1					k'	Wh/yea	r I	kWh/yea 1782.12	r ¬
							[╡
Water heating fuel used								2064.45	
Electricity for pumps, fans and electric ke	eep-hot								
central heating pump:							30		(2300
boiler with a fan-assisted flue							45		(230
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =	:		75	(231)
Electricity for lighting								239.96	(232)
Total delivered energy for all uses (211).	(221) + (2	231) + (232)(237b)	=			ļ	4161.53	(338)
12a. CO2 emissions – Individual heating	g systems	includina m	icro-CHF)			l		
	_								
		Energy kWh/yea	-		Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	

Space heating (main system 1)	(211) x	0.216	384.94 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	445.92 (264)
Space and water heating	(261) + (262) + (263) + (264) =		830.86 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	124.54 (268)
Total CO2, kg/year	sum	of (265)(271) =	994.32 (272)

 $TER = 19.64 \tag{273}$

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:43*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 63.92m²Site Reference:Highgate Road - GREENPlot Reference: 03 - H

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 17.67 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

15.46 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)
45.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 38.8 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	ОК
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	9.56m²	
Windows facing: South East	8.76m²	
Ventilation rate:	6.00	
10 Key features		
	2.0 m ³ /m ² h	
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				0010943 on: 1.0.5.50	
Address :	F	Property	Address	03 - H					
1. Overall dwelling dime	ensions:								
3		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor		(63.92	(1a) x	2	2.65	(2a) =	169.39	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (63.92	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	169.39	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hoι	ır
Number of chimneys	0 + 0	+ [0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī - Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ns				2	x '	10 =	20	(7a)
Number of passive vents	;			Ē	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			F	0	x	40 =	0	(7c)
				L					
							Air ch	nanges per he	our
	ys, flues and fans = (6a)+(6b)+(ontinus fr	20		÷ (5) =	0.12	(8)
Number of storeys in the	neen carried out or is intended, procee he dwelling (ns)	ea 10 (17),	otrierwise	onunue ir	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (45)		0	(15)
Infiltration rate	q50, expressed in cubic metro	oc por b	(8) + (10)				oroo	0	(16)
•	lity value, then $(18) = [(17) \div 20] + (18)$	•		•	elle ol e	rivelope	alea	0.37	(17)
•	es if a pressurisation test has been do				is being u	sed		0.01	()
Number of sides sheltered	ed		(00) 4	10.07E (4	10)1			0	(19)
Shelter factor	ling abolton footon		(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (18) X (20) =				0.37	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp	1 ' 1 ' 1	1 00.	1 7.09	Сор	1 000	1 1101		J	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
W. J. F. (22.)	0)	•			•	•			
Wind Factor (22a)m = (2.32)m $= 1.37$		0.05	1 0.00	4	1.00	4 40	1.18	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	J	

Adjusted infilt	ration rate	e (allowi	na for sh	nelter an	d wind s	need) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43]	
Calculate effe		change i	rate for t	he appli	l]	
If mechanic												0	(23a)
If exhaust air h) = (23a)			0	(23b)
If balanced wit	h heat reco	very: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(23c)
a) If balance	ed mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mecha	anical ve	ntilation	without	heat rec	overy (N	/IV) (24b	m = (22)	2b)m + (23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)ı	nouse ext $m < 0.5 \times$			•					5 × (23b	o)		_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)ı	ventilation m = 1, the								0.5]	-			
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59]	(24d)
Effective air	r change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•	-	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losse	es and he	at loss r	naramete	ōt.									
ELEMENT	Gros area	ss	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		X k I/K
Windows Typ		` ,			8.34	_	/[1/(1.4)+	0.04] =	11.06	$\stackrel{\prime}{\Box}$			(27)
Windows Typ	e 2				7.64	x1,	/[1/(1.4)+	0.04] =	10.13	Ħ			(27)
Walls Type1	61.0	9	15.98	3	45.11	x	0.18	[8.12	Ħ r		–	(29)
Walls Type2	3.86	=	0		3.86	=	0.18	<u> </u>	0.69	=		╡ ├─	(29)
Total area of	L				64.95	=	00		0.00				(31)
Party wall	,	,			37.5	×	0		0				(32)
Party floor					63.92	=	0			L		-	(32a)
Party ceiling						=				L T		╡	= '
Internal wall *	*				63.92	=				Ĺ		┥	(32b)
			ffootivo wi	ndow II ve	113.4		i formula 1	/[/1/ L vol	(0) (0 041 (l So givon in	norogrank		(32c)
* for windows and ** include the are						ateu usirig	TOTTIUIA I	/[((C)+ 0.04] a	is giveri iri	parayrapi	1 3.2	
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				30	(33)
Heat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	10121.33	(34)
Thermal mass	s paramet	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design asses				constructi	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
Thermal bridg	jes : S (L	x Y) cal	culated i	using Ap	pendix ł	<						7.91	(36)
if details of therm		are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric he									(36) =			37.91	(37)
Ventilation he	1									[25)m x (5]	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 34.1	33.87	33.63	32.53	32.32	31.37	31.37	31.19	31.74	32.32	32.74	33.18	J	(38)
Heat transfer	т т								= (37) + (1	
(39)m= 72.01	71.77	71.54	70.44	70.23	69.28	69.28	69.1	69.65	70.23	70.65	71.09		7,5=1
Stroma FSAP 20	12 Version:	1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com		,	Average =	Sum(39) ₁	12 /12=	70.4 ∌ age	2 of (3 7 9)

Heat loss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.13	1.12	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11		
	!	!	<u> </u>	<u> </u>		<u> </u>	<u> </u>		L Average =	Sum(40) ₁	12 /12=	1.1	(40)
Number of day	ys in mo	nth (Tab	le 1a)	•									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		09		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		3.84		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								·'	!				
(44)m= 92.22	88.87	85.51	82.16	78.81	75.45	75.45	78.81	82.16	85.51	88.87	92.22		
									Total = Su	m(44) ₁₁₂ =	=	1006.06	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 136.76	119.61	123.43	107.61	103.25	89.1	82.56	94.74	95.88	111.73	121.97	132.45		
If in atomton acus	vator booti	'na at naint	of upo (no	bot water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	= [1319.1	(45)
If instantaneous v			·	1			· · ·	, , , -	1	ı			(40)
(46)m= 20.51 Water storage	17.94	18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87		(46)
Storage volum) includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	,					_							()
Otherwise if n	•			-			, ,	ers) ente	er '0' in ((47)			
Water storage													
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		•	•				(48) x (49)) =		0.	75		(50)
b) If manufactHot water stor			-								0		(51)
If community h	-			G Z (KVV	ii/iiti G/GC	, y)					0		(31)
Volume factor	•										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)								0.	75		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5		7)m = (56)	m where (m Appendi	x H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	· · loss (ar	nual) fro	m Table	. 3		•	•	•	•		0		(58)
Primary circuit	,	•			59)m = ((58) ÷ 36	65 × (41)	ım					` '
(modified by				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss	ooloulotod	for oach	month ((61)m –	(60) · 2(SE (41)	١m						
(61)m= 0	0	0	0	0	00) + 30	0 7 (41)	0	0	0	0	0	1	(61)
				<u> </u>			<u> </u>	<u> </u>	<u> </u>	ļ	<u> </u>	J · (59)m + (61)m	, ,
(62)m= 183.3	<u> </u>	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	(39)111 + (01)1111	(62)
Solar DHW inp]	, ,
(add addition										o to mate	o:ag/		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ıter				ļ.	Į.	·		•		1	
(64)m= 183.3		170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04]	
	'						Out	put from w	ater heate	r (annual)₁	l12	1867.72	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	ı]	
(65)m= 82.7	5 73.44	78.32	71.85	71.61	65.7	64.73	68.78	67.95	74.43	76.63	81.31]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):													
Metabolic ga	ains (Table	e 5), Wat	ts									_	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 104.	5 104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 16.2	9 14.47	11.77	8.91	6.66	5.62	6.07	7.9	10.6	13.46	15.7	16.74]	(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5	_	-	•	
(68)m= 182.7	71 184.61	179.83	169.66	156.82	144.75	136.69	134.8	139.57	149.75	162.58	174.65		(68)
Cooking gai	ns (calcula	ated in Ap	opendix	L, equat	ion L15	or L15a), also s	ee Table	5	-		•	
(69)m= 33.4	5 33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45		(69)
Pumps and	fans gains	(Table 5	āa)							-		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)			-	-	-	-	•	
(71)m= -83.6	6 -83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6		(71)
Water heating	ng gains (1	Table 5)								•		•	
(72)m= 111.2	22 109.29	105.26	99.8	96.25	91.25	87	92.44	94.38	100.04	106.43	109.29		(72)
Total intern	al gains =	:			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 367.5	365.71	354.21	335.72	317.08	298.97	287.12	292.49	301.9	320.59	342.07	358.04		(73)
6. Solar ga	ins:					•			•				
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ Fabla Ch	_	FF		Gains	
	Table 6d		m²		Tai	ble 6a	. —	Table 6b	_ '	able 6c		(W)	,
Northeast 0.9		Х	8.3	34	x 1	1.28	x	0.63	x	0.7	=	28.76	(75)
Northeast 0.9		X	8.3	34	x 2	22.97	х	0.63	x	0.7	=	58.54	(75)
Northeast 0.9	<u> </u>	х	8.3	34	X 4	11.38	х	0.63	x	0.7	=	105.47	(75)
Northeast 0.9		X	8.3	34	x 6	67.96	х	0.63	x	0.7	=	173.21	(75)
Northeast 0.9	× 0.77	X	8.3	34	x 9	91.35	x	0.63	x	0.7	=	232.82	(75)

							, ,		_				_
Northeast _{0.9x}	0.77	X	8.3	34	X	97.38	X	0.63	X	0.7	=	248.21	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	91.1	x	0.63	X	0.7	=	232.2	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	72.63	x[0.63	x	0.7	=	185.11	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	50.42	x	0.63	X	0.7	=	128.51	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	28.07	x[0.63	x	0.7	=	71.54	(75)
Northeast _{0.9x}	0.77	x	8.3	34	х	14.2	x[0.63	х	0.7	=	36.19	(75)
Northeast _{0.9x}	0.77	x	8.3	34	x	9.21	x[0.63	x	0.7		23.49	(75)
Southeast _{0.9x}	0.77	x	7.6	64	х :	36.79	x	0.63	X	0.7	=	85.91	(77)
Southeast _{0.9x}	0.77	x	7.6	64	X	62.67	x	0.63	x	0.7	=	146.34	(77)
Southeast 0.9x	0.77	x	7.6	64	X	85.75	x	0.63	x	0.7	=	200.22	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	06.25	x	0.63	X	0.7	=	248.09	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	19.01	x	0.63	x	0.7	=	277.88	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	18.15	x	0.63	x	0.7	=	275.87	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	13.91	x	0.63	x	0.7		265.96	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x 1	04.39	x	0.63	x	0.7	-	243.74	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	92.85	x	0.63	x	0.7	-	216.8	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	69.27	x	0.63	x	0.7		161.73	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	44.07	x	0.63	x	0.7	-	102.9	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	31.49	x	0.63	x	0.7	-	73.52	(77)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m= 114.67	204.87 3	05.69	421.29	510.7	524.08	498.16	428.	85 345.31	233.27	7 139.08	97.01		(83)
Total gains – i	nternal and	d solar	(84)m =	= (73)m	+ (83)m	, watts							
(84)m= 482.24	570.59	659.9	757.01	827.78	823.06	785.28	721.	34 647.21	553.86	481.15	455.04		(84)
7. Mean inter	nal temper	ature	(heating	season)								
Temperature	during hea	ating p	eriods ir	n the livi	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gain	ns for I	iving are	ea, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
(86)m= 0.99	0.99	0.96	0.88	0.73	0.53	0.39	0.4	4 0.7	0.93	0.99	1		(86)
Mean interna	l temperatu	ure in I	iving are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)					
(87)m= 19.93	20.12 2	20.41	20.73	20.92	20.99	21	21	20.95	20.68	20.25	19.9		(87)
Temperature	during hea	ating p	eriods ir	n rest of	dwelling	from Ta	able 9	, Th2 (°C)		-	-		
(88)m= 19.98		19.99	20	20	20.01	20.01	20.0	<u> </u>	20	20	19.99		(88)
Utilisation fac	tor for gain	ns for r	est of d	welling	h2 m (s	ee Table	(9a)	I					
(89)m= 0.99		0.95	0.85	0.67	0.45	0.3	0.3	5 0.61	0.9	0.98	0.99		(89)
` ′				!		!	L	!	<u> </u>				
Mean interna		19.25	19.7	19.93	20.01	20.01	20.0	i	19.65	19.05	18.54		(90)
(00)m- 19.57	1 1885 1 1	コン・ムン し	13.1	19.93	20.01	20.01	20.0	19.90	<u> </u>				_ ` ′
(90)m= 18.57	18.85							1	LA = Iiv	⁄ing area ∸ (₄	4) =	U 36	(Q1)
	<u> </u>								fLA = Liv	ring area ÷ (4	4) =	0.38	(91)
Mean interna	l temperatu	ure (fo		·		1	- ` 	– fLA) × T2	.		i	0.38	
	ıl temperatu	ure (fo	20.09	20.31	20.38	20.39	20.3	- fLA) × T2	20.04	19.5	19.06	0.38	(91) (92)

			-				•				1			
` ′		19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06		(93)
8. Space														
Set Ti to the utilisa				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio					iviay	Juli	Jui	L	Зер	Oct	INOV	Dec		
	.99	0.98	0.95	0.86	0.69	0.48	0.33	0.38	0.64	0.9	0.98	0.99		(94)
Useful ga		mGm .	W = (94	I)m x (84	4)m		<u> </u>	l	l		<u> </u>			
	1	558.2	624.35	647.45	567.74	395.74	261.85	274.51	415.81	500.89	471.24	451.67		(95)
Monthly :	averag	e exte	rnal tem	perature	from Ta	able 8	ļ	!	!		<u> </u>			
(96)m= 4	1.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss	s rate f	or mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 106	65.09 1	036.14	943.75	788.38	604.7	400.4	262.39	275.56	435.18	663.3	876.26	1056.17		(97)
Space he	eating	require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 43	7.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
	-						-	Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1987.06	(98)
Space he	eating	require	ement in	kWh/m²	/year								31.09	(99)
9a. Energ		•			•	veteme i	ncluding	micro-C	'HDI					
Space h			its — Iriui	viduai Ti	calling s	yatema n	ricidaling	i illicio-c) II <i>)</i>					
Fraction	_		t from se	econdar	//supple	mentarv	svstem						0	(201)
Fraction				-		,	-	(202) = 1	- (201) =				1	(202)
Fraction				•	. ,				02) × [1 –	(203)] =				(204)
				•				(201) – (2	02) X [1	(200)] -			1	╡゛゛
Efficienc		•											93.5	(206)
Efficienc	y of se	conda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
J	lan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space he	Ť		<u> </u>		d above)								
43	7.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
(211)m =	{[(98)n	n x (20	4)] } x 1	00 ÷ (20	6)			_						(211)
46	7.48	343.5	254.15	108.52	29.41	0	0	0	0	129.24	311.89	481.01		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u></u>	2125.2	(211)
Space he	eating	fuel (se	econdary	y), kWh/	month									
= {[(98 <u>)</u> m	x (201))] } x 1	00 ÷ (20	8)			•							
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water hea	_													
Output fro							·	l	l		·	T 1		
		161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04		7,
Efficiency													79.8	(216)
· · ·		86.61	85.71	83.75	81.29	79.8	79.8	79.8	79.8	84.1	86.29	87.17		(217)
Fuel for w		•												
(219)m = 21		186.7	198.38	182.32	184.34	168.16	161.85	177.12	176.65	188.25	193.61	205.39		
(= 12/				. 52.52		1 . 30.10	L		I = Sum(2		L	L	2233.4	(219)
Annual to	ntale								\-		Wh/year	, ,	kWh/year	
Space hea		ıel use	d, main	system	1					ĸ	y cai		2125.2	1
-	-			-									<u> </u>	_

					_						
Water heating fuel used				2233.4							
Electricity for pumps, fans and electric keep-hot											
central heating pump:			30]	(230c)						
boiler with a fan-assisted flue			45]	(230e)						
Total electricity for the above, kWh/year		75	(231)								
Electricity for lighting	287.67	(232)									
Total delivered energy for all uses $(211)(221) + (231) + (232)(237b) =$ $4721.27 (338)$											
12a. CO2 emissions – Individual heating systems including micro-CHP											
	_										
	Energy kWh/year	Emission factoring the kg CO2/kWh		Emissions kg CO2/yea							
Space heating (main system 1)	3 7										
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar ¬						
	kWh/year	kg CO2/kWh	=	kg CO2/yea	ar](261)						
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)						
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 459.04 0 482.41	(261) (263) (264)						
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= =	kg CO2/yea 459.04 0 482.41 941.46	(261) (263) (264) (265)						
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.519	= = =	kg CO2/yea 459.04 0 482.41 941.46 38.93	(261) (263) (264) (265) (267)						

TER =

(273)

17.67

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:39*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 60.34m²Site Reference:Highgate Road - GREENPlot Reference: 03 - I

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 18.05 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.55 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.8 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	ок
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				0010943 on: 1.0.5.50	
Address :	F	Property	Address	: 03 - I					
1. Overall dwelling dime	ensions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor			60.34	(1a) x	2	.65	(2a) =	159.9	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	60.34	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	159.9	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				2	x ′	10 =	20	(7a)
Number of passive vents					0	x ′	10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per he	our
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.13	(8)
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	ea to (17),	otnerwise	continue tr	om (9) to ((16)		0	(9)
Additional infiltration	3 (=)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry constr	uction			0	(11)
if both types of wall are po deducting areas of openir	resent, use the value corresponding t	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or (.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	50		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$		•	•	etre of e	envelope	area	5	(17)
•	es if a pressurisation test has been do				is being u	sed		0.38	(18)
Number of sides sheltere				·	-			0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.38	(21)
Infiltration rate modified for	- 1 							1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	4.3 3.8	3.6	3.1	<u> </u>	4.3	<u> </u>	4.1	J	
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4		,					,	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rate (allow	ina for el	nelter an	d wind s	need) –	(21a) v	(22a)m					
0.48	0.47 0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44]	
	ctive air change	rate for t	he appli	cable ca	se		<u> </u>					
	al ventilation:					.=					0	(23a)
	eat pump using App) = (23a)			0	(23b)
	heat recovery: effi	-	_								0	(23c)
	d mechanical v	1		i	<u> </u>	- ^ ` ` - 	ŕ	<u> </u>	- 	- ` 	÷ 100] I	(245)
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24a)
· -	d mechanical v	1				- ^ ` 	ŕ	r `		Ι ο	l	(24h)
(24b)m= 0	0 0	0	0		0	0	0	0	0	0		(24b)
,	ouse extract ve $1 < 0.5 \times (23b)$,		•	•				5 v (23h	,)			
(24c)m = 0	0 0.5 x (2.55),	0	0	0	0	0	0	0	0	0		(24c)
(1)	ventilation or w	nole hous	e nositiv	/e input	ventilatio	n from l	oft.					, ,
,	n = 1, then (24d							0.5]				
(24d)m= 0.61	0.61 0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air	change rate - e	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)	-	-			
(25)m= 0.61	0.61 0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. Heat losse	s and heat loss	paramet	er:									
ELEMENT	Gross	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	9 ,	AXk
	area (m²)	· m		A ,r	n²	W/m2	!Κ	(W/I	<u>()</u>	kJ/m²-l	K	kJ/K
Windows Type	: 1			4.7	x1,	/[1/(1.4)+	0.04] =	6.23				(27)
Windows Type	2			6.09	x1,	/[1/(1.4)+	0.04] =	8.07				(27)
Windows Type	: 3			2.92	x1,	/[1/(1.4)+	0.04] =	3.87				(27)
Walls Type1	52.8	13.7	1	39.09	X	0.18	=	7.04				(29)
Walls Type2	27.31	0		27.31	X	0.18	=	4.92				(29)
Total area of e	lements, m ²			80.11								(31)
Party wall				16.88	3 X	0	=	0				(32)
Party floor				60.34								(32a)
Party ceiling				60.34					Ī		\neg	(32b)
Internal wall **				107.9	1				Ī		7 —	(32c)
	roof windows, use as on both sides of				ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	3.2	
Fabric heat los	ss, W/K = S (A >	(U)				(26)(30)) + (32) =				30.13	(33)
Heat capacity	$Cm = S(A \times k)$						((28).	(30) + (32	2) + (32a).	(32e) =	9938.59	(34)
Thermal mass	parameter (TM	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
ŭ	sments where the d ad of a detailed cal		construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L x Y) ca	lculated	using Ap	pendix l	<						7.3	(36)
	al bridging are not k	nown (36) =	= 0.05 x (3	11)								
Total fabric he							(33) +	(36) =			37.43	(37)
Ventilation hea	nt loss calculate	1		1		1		= 0.33 × (1	1	
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

20)	32.18	31.95	30.87	30.67	29.73	29.73	29.56	20.4	30.67	31.08	24.54		(38)
38)m= 32.42	<u> </u>		30.67	30.67	29.73	29.73	29.56	30.1			31.51		(30)
Heat transfer	69.61	69.38	68.31	68.1	67.16	67.16	66.99	67.53	= (37) + (3 68.1	68.51	68.94		
00.00	05.01	05.50	00.01	00.1	07.10	07.10	00.55		Average =			68.3	(39)
leat loss para	ameter (H	HLP), W	m²K						= (39)m ÷				_ `
40)m= 1.16	1.15	1.15	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.14	1.14		_
Number of da	ve in mo	oth (Tob	lo 1a)					,	Average =	Sum(40) ₁	12 /12=	1.13	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
,													
4. Water hea	ting ene	av regui	rement:								kWh/ye	ear:	
+. Water fied	ung cho	gy roqui	rement.								KVVII/ y		
Assumed occ if TFA > 13.			[1 - ovn	(<u>-</u> 0 0003	2/0 v /TE	-Λ ₋ 13 Ω)2)1 ± 0 ()012 v /	Γ Ε Λ -13		.99		(42)
if TFA £ 13.		+ 1.70 X	[i - exp	(-0.0003	949 X (17	- H - 13.9)2)] + 0.() X C 1 U.	IFA - 13.	9)			
Annual averaç											.49		(43
Reduce the annu not more that 125	_				_	_	to achieve	a water us	se target o	f			
	· · ·	·				<u> </u>	Λ	Con	0-4	Nav	Daa		
Jan lot water usage	Feb in litres per	Mar dav for ea	Apr ach month	May <i>Vd.m = fa</i>	Jun ctor from 7	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
14)m= 89.64	86.38	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64		
H4)III= 03.04	00.30	03.12	79.00	70.0	73.34	73.54	70.0		Total = Su		<u> </u>	977.9	(44
nergy content o	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			· /		011.0	
45)m= 132.93	116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74		
									Γotal = Su	m(45) ₁₁₂ =	=	1282.18	(45
instantaneous v	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)				1	_
19.94	17.44	18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31		(46
Vater storage Storage volun		includin	na anv eo	olar or M	/\//HRS	storana	within sa	ma vas	امء		450		(47
community I	` ,		•			Ū		iiiie ves	361		150		(47
Otherwise if n	_			-			. ,	ers) ente	er '0' in (47)			
Vater storage			`					,	`	,			
a) If manufac	turer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(48
emperature	actor fro	m Table	2b							0.	.54		(49
inergy lost fro		_	-				(48) x (49)	=		0.	.75		(50
o) If manufac lot water stor			-								0		(51
community I	•			C Z (KVV	11/11116/06	iy <i>)</i>					0		(3)
olume factor	•										0		(52
emperature	actor fro	m Table	2b								0		(53
nergy lost fro	om water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54
Enter (50) or	(54) in (5	55)								0.	.75		(55
Vater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
	1	00.00		00.00	22.50	23.33	23.33	22.58	23.33	22.58	23.33		(56
56)m= 23.33	21.07	23.33	22.58	23.33	22.58								•
cylinder contain												ix H	•

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder	er thermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51	23.26 22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0	0 0 0 (61)
Total heat required for water heating calculated for each month (62)m = 0.85 x	(45)m + (46)m + (57)m + (59)m + (61)m
(62)m= 179.53 158.35 166.57 149.69 146.96 131.7 126.85 138.69 138.28	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar	ar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	3,
(63)m= 0 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
(64)m= 179.53 158.35 166.57 149.69 146.96 131.7 126.85 138.69 138.28	155.2 163.64 175.34
	vater heater (annual) ₁₁₂ 1830.8 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8	
(65)m= 81.48 72.33 77.17 70.85 70.65 64.87 63.96 67.9 67.06	73.39 75.49 80.08 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot v	water is from community neating
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= 99.56 99.56 99.56 99.56 99.56 99.56 99.56 99.56	99.56 99.56 99.56 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 15.49 13.76 11.19 8.47 6.33 5.35 5.78 7.51 10.08	12.8 14.94 15.93 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Ta	able 5
(68)m= 173.8 175.61 171.06 161.39 149.17 137.69 130.03 128.22 132.77	142.44 154.66 166.13 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table	e 5
(69)m= 32.96 32.96 32.96 32.96 32.96 32.96 32.96 32.96 32.96	32.96 32.96 (69)
Pumps and fans gains (Table 5a)	· · · · · · · · · · · · · · · · · · ·
(70)m= 3 3 3 3 3 3 3 3 3 3	3 3 3 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -79.65 -79.65 -79.65 -79.65 -79.65 -79.65 -79.65 -79.65	-79.65 -79.65 -79.65 (71)
Water heating gains (Table 5)	
(72)m= 109.51 107.63 103.72 98.41 94.96 90.1 85.97 91.26 93.14	98.64 104.85 107.64 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m +$	
(73)m= 354.68 352.87 341.84 324.13 306.33 289.01 277.64 282.86 291.85	
6. Solar gains:	000.70 000.01 040.01
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to t	the applicable orientation.
Orientation: Access Factor Area Flux g_	FF Gains
Table 6d m ² Table 6a Table 6b	
Southeast 0.9x 0.77 x 6.09 x 36.79 x 0.63	× 0.7 = 68.48 (77)
Southeast 0.9x 0.77 x 6.09 x 62.67 x 0.63	× 0.7 = 116.65 (77)
0.05	. 0.7 - 110.00 (11)

CHINSAIION PACTA	പാവ വഷി	ns ior II	iving area, h	1,111 (\$	see ra	NIE 281							
Temperature d	•	•		_			ole 9,	Th1 (°C)				21	(85)
7. Mean interna	al tempe	rature ((heating sea	son)									
(84)m= 486.08	580.03	661.54	735.15 780	.29	765.52	734.56	691.	91 643.03	563.21	488.31	457.62]	(84)
Total gains – int	ernal an	d solar	(84)m = (73))m + ((83)m	, watts	· · · · ·	ı		1	I	1	
T		319.7	411.01 473		476.51	456.92	409.		253.46	157.99	112.06]	(83)
Solar gains in w	atte colo	aulatad	for each ma	nth			(83)m	= Sum(74)m .	(82)m				
Northwest _{0.9x}	0.77	X	2.92	X	(9.21	x	0.63	x [0.7	=	8.22	(81)
Northwest 0.9x	0.77	X	2.92	X		14.2	x	0.63	x [0.7	=	12.67	(81)
Northwest _{0.9x}	0.77	X	2.92	×	2	8.07	x	0.63	x [0.7	=	25.05	(81)
Northwest 0.9x	0.77	X	2.92	X	5	0.42	x	0.63	x [0.7	=	44.99	(81)
Northwest 0.9x	0.77	X	2.92	X	7	2.63	x	0.63	x [0.7	=	64.81	(81)
Northwest 0.9x	0.77	x	2.92	X	(91.1	x	0.63	x [0.7	=	81.3	(81)
Northwest _{0.9x}	0.77	x	2.92	X	9	7.38	x	0.63	× [0.7		86.9	(81)
Northwest _{0.9x}	0.77	x	2.92	x	9	1.35	х	0.63	x [0.7		81.52	(81)
Northwest _{0.9x}	0.77	x	2.92	×	6	7.96	x	0.63	x [0.7	=	60.64	(81)
Northwest _{0.9x}	0.77	x	2.92	×	4	1.38	x	0.63	 	0.7		36.93	(81)
Northwest _{0.9x}	0.77	x	2.92	×	2	2.97	x	0.63	x [0.7	=	20.5	(81)
Northwest _{0.9x}	0.77	x	2.92	×	1	1.28	х	0.63	x [0.7	=	10.07	(81)
Southwest _{0.9x}	0.77	x	4.7	T x	3	1.49		0.63	x	0.7		45.23	(79)
Southwest _{0.9x}	0.77	x	4.7	i x		4.07		0.63	_ x [0.7		63.3	(79)
Southwest _{0.9x}	0.77	x	4.7	X		9.27		0.63	x [0.7	=	99.49	(79)
Southwest _{0.9x}	0.77	x	4.7	x		2.85		0.63	x [0.7		133.37	(79)
Southwest _{0.9x}	0.77	x	4.7	×		04.39	,	0.63	x [0.7	= =	149.94	(79)
Southwest _{0.9x}	0.77	×	4.7	^ x		13.91	ı l [0.63	^ L	0.7	= =	163.62	(79)
Southwest _{0.9x}	0.77	= x	4.7	^ x		18.15	ı l [0.63	^ L x [0.7	= =	169.71	(79)
Southwest _{0.9x}	0.77	×	4.7	^ x		19.01	ı l [0.63	^ L x [0.7	=	170.94	(79)
Southwest _{0.9x}	0.77	$=$ $\frac{1}{x}$	4.7	$\frac{1}{x}$		06.25	ı l [0.63	^ L x [0.7	= -	152.62	(79)
Southwest _{0.9x}	0.77	→ x	4.7	┤ ^ ╴		5.75	, l [0.63	_ ^ L 	0.7	╡ -	123.17	(79)
Southwest _{0.9x}	0.77	×	4.7	→ × → ×		6.79 2.67	ı l [0.63		0.7		52.85 90.02	(79)
Southwest _{0.9x}	0.77	×	6.09	╣		1.49	×	0.63		0.7	=	58.6	(77) (79)
Southeast 0.9x	0.77	×	6.09	→ ↓		4.07	X	0.63	_	0.7	╡ -	82.02	$\frac{1}{1}$
Southeast 0.9x	0.77	×	6.09	→ ↓		9.27	X _V	0.63	_	0.7	_ = _	128.92	$=$ $\frac{(77)}{(77)}$
Southeast 0.9x	0.77	= ×	6.09	→ ↓		2.85		0.63	_	0.7	╡ :	172.81	$=$ $\frac{(77)}{(77)}$
Southeast 0.9x	0.77	×	6.09	→ ↓		04.39	x	0.63	_	0.7	╡ -	194.29	$\frac{1}{1}$
Southeast 0.9x	0.77	×	6.09	→ ↓		13.91	X	0.63	_	0.7	_ = -	212.01	$\frac{1}{1}$
Southeast 0.9x	0.77	x	6.09	X		18.15	X	0.63		0.7	=	219.9	$= \begin{pmatrix} (77) \\ (77) \end{pmatrix}$
Southeast 0.9x	0.77	X	6.09	X		19.01	X	0.63	X	0.7	_ =	221.5	(77)
Southeast 0.9x	0.77	X	6.09	→ ×		06.25	X	0.63	×	0.7	_ =	197.75	(77)
Southeast 0.9x	0.77	X	6.09	X		5.75	X	0.63		0.7	=	159.6	(77)

(86)m=	0.99	0.98	0.95	0.88	0.74	0.55	0.4	0.44	0.68	0.92	0.98	0.99		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				ı	
(87)m=	19.94	20.14	20.42	20.72	20.91	20.98	21	21	20.96	20.7	20.26	19.9		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)			•	I	
(88)m=	19.95	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.99	19.98	19.97	19.97		(88)
	tion for	tor for a	oine for	root of d	u allin a	h2 m /oc	L Toblo	00)						
(89)m=	0.99	0.98	0.94	0.85	0.68	0.47	0.31	0.35	0.6	0.88	0.98	0.99		(89)
						<u> </u>	l			<u> </u>	0.00	0.00		()
			r	r		- ` `	r	eps 3 to			40.05	40.50		(00)
(90)m=	18.56	18.86	19.25	19.67	19.9	19.98	19.99	19.99	19.95	19.66	19.05 g area ÷ (4	18.52	0.44	(90)
									!	LA = LIVII	g area - (4	4) =	0.44	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2				-	
(92)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate			1	
(93)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut		l	r –	using Ta				 			·		I	
1.14.11	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.7			T	T				I	(04)
(94)m=	0.99	0.97	0.94	0.85	0.7	0.5	0.35	0.39	0.63	0.89	0.97	0.99		(94)
				4)m x (84		005.40	050.00	000.44	100.50	500.0	475.70	450.00	I	(OE)
(95)m=	480.21	564.23	620.58	627.23	547	385.18	256.89	269.11	406.58	500.6	475.73	453.36		(95)
			i	perature		i	16.6	16.4	144	10.6	7.1	4.2	Ī	(96)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(90)
		1011.35	920.55	767.42	588.89	· ·	=[(39)fff . 257.65	x [(93)m	- (96)m 425.27	648.19	855.43	1029.57	l	(97)
(97)m=		ļ	ļ	<u> </u>		391.27		270.39		<u> </u>		1029.57	l	(31)
-	415.5	300.46	223.18	100.94	31.17	0	$\ln = 0.02$	24 x [(97])m – (95 0	109.81	273.39	428.7	1	
(98)m=	415.5	300.46	223.10	100.94	31.17	0							1000 11	7(00)
								rota	ıl per year	(kwn/yeai	r) = Sum(9	8)15,912 =	1883.14	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								31.21	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												_
Fracti	on of sp	ace hea	nt from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	t from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	∟ .ar
Snace				alculate			Jui	<u> </u> Aug	Гоер	001	1100	Dec	, KWII/ye	aı
Орас	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7		
(211)		<u> </u>	<u> </u>				<u> </u>			L	I		l	(244)
(211)	1 = {[(98 444.39)m x (20 321.35	238.69	00 ÷ (20	33.33	0	0	0	0	117.44	292.39	458.5		(211)
	777.08	021.00	230.08	107.80	00.00	L "	<u> </u>		l (kWh/yea				2014.05	(211)
								1010	(,(1	- 15,1012	2	2014.05	(211)

Space heating fuel (secondary), kWh/mon	th								
= {[(98)m x (201)]} x 100 \div (208)					_	_			
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_
			Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating									
Output from water heater (calculated above 179.53 158.35 166.57 149.69 146		126.85	138.69	138.28	155.2	163.64	175.34		
Efficiency of water heater		0.00	.00.00	.00.20				79.8	(216)
(217)m= 86.98 86.5 85.59 83.79 81.4	49 79.8	79.8	79.8	79.8	83.91	86.17	87.11		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								l.	
(219)m= 206.4 183.07 194.6 178.65 180.	35 165.04	158.96	173.79	173.29	184.96	189.9	201.28		
	•	•	Tota	I = Sum(2	19a) ₁₁₂ =			2190.29	(219)
Annual totals					k\	Wh/year	•	kWh/year	- -
Space heating fuel used, main system 1								2014.05	
Water heating fuel used								2190.29	
Electricity for pumps, fans and electric keep	-hot								
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								273.64	(232)
Total delivered energy for all uses (211)(2	21) + (231)	+ (232).	(237b)	=				4552.98	(338)
12a. CO2 emissions – Individual heating s	ystems incl	uding mi	cro-CHP)					
		ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(21	1) x			0.2	16	=	435.03	(261)
Space heating (secondary)	(21	5) x			0.5	19	=	0	(263)
Water heating	(21	9) x			0.2	16	=	473.1	(264)
Space and water heating	(26	1) + (262)	+ (263) + (264) =				908.14	(265)
Electricity for pumps, fans and electric keep	-hot (23	1) x			0.5	19	=	38.93	(267)
Electricity for lighting	(23	2) x			0.5	19	=	142.02	(268)
Total CO2, kg/year				sum o	f (265)(2	271) =		1089.08	(272)
							·		_

TER =

(273)

18.05

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:03:34

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 103.81m²

Site Reference: Highgate Road - GREEN

Plot Reference: 04 - A

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 15.34 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.08 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.3 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ok
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	13.21m²	
Windows facing: South East	5.5m²	
Windows facing: North West	4.61m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		Hear	Details:						
Access on Names	Noil lo alo an	Usei		- M	L		CTDO	010010	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa	-				010943 on: 1.0.5.50	
Contware reame.	01101110111	Property	Address:		31011.		7 01010	7.0.0.00	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			ea(m²)	(10) v		ight(m)	(2a) =	Volume(m ³	(3a)
	-\ . (4 l-\ . (4 -\ . (4 -\ .)			(1a) x	2	65	(2a) =	275.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(1n)	103.81	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	275.1	(5)
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	ır
Number of allipsychia	heating hea	ating		1			40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				L	4		10 =	40	(7a)
Number of passive vents	;				0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	vs. flues and fans = $(6a)$ -	+(6b)+(7a)+(7b)-	+(7c) =	Г	40		÷ (5) =	0.15	(8)
'	peen carried out or is intended,			ontinue fr			. (0) –	0.13	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)
deducting areas of openii		riding to the gre	ater wan area	a (aner					
If suspended wooden t	floor, enter 0.2 (unsealed	d) or 0.1 (sea	led), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
ŭ	s and doors draught strip	oped						0	(14)
Window infiltration			0.25 - [0.2		_			0	(15)
Infiltration rate			(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	inty value, then $(10) = 1(17)$ as if a pressurisation test has b				is heina u	sad		0.4	(18)
Number of sides sheltere		con done or a a	ogree an per	modelinty	io boilig a	00 u		0	(19)
Shelter factor			(20) = 1 - [0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.4	(21)
Infiltration rate modified f	or monthly wind speed						'		
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		
, ,,		3.30		-		L <u>-</u>		J	

Adjusted infiltration rate (allowing for shelter a	nd wind sn	need) =	(21a) x	(22a)m					
0.5 0.49 0.48 0.43 0.43	0.38	0.38	0.37	0.4	0.43	0.44	0.46		
Calculate effective air change rate for the app	licable cas	e					l		
If mechanical ventilation:		(1)	15// (1	. (20)	\ (00.)			0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23b)) = (23a)			0	(23b)
If balanced with heat recovery: efficiency in % allowing								0	(23c)
a) If balanced mechanical ventilation with he	1		, ,	í `		, -	``	÷ 100] I	(04-)
(24a)m= 0 0 0 0 0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation withou			, ,	``				İ	(0.41-)
(24b)m= 0 0 0 0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or position if (22b) = 0.5 × (22b), then (24c) = (22b)	•				E v (22h	١			
if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$		0	$\frac{(22L)}{0}$	0	0 1	0	0		(24c)
d) If natural ventilation or whole house position	ــــــــــــــــــــــــــــــــــــــ								(= .0)
if $(22b)m = 1$, then $(24d)m = (22b)m$ other					0.5]				
(24d)m= 0.63 0.62 0.62 0.59 0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24d)
Effective air change rate - enter (24a) or (24	lb) or (24c)	or (24)	d) in box	(25)					
(25)m= 0.63 0.62 0.62 0.59 0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25)
3. Heat losses and heat loss parameter:									
ELEMENT Gross Openings	Net Are	а	U-valı	re	AXU		k-value	e <i>F</i>	λΧk
area (m²) m²	A ,m ²		W/m2		(W/k	()	kJ/m²-l		J/K
Windows Type 1	13.21	_X 1/	[1/(1.4)+	0.04] =	17.51				(27)
Windows Type 2	5.5	x1/	[1/(1.4)+	0.04] =	7.29				(27)
Windows Type 3	4.61	_x 1/	[1/(1.4)+	0.04] =	6.11				(27)
Walls Type1 76.16 23.32	52.84	x	0.18	= [9.51				(29)
Walls Type2 49.77 0	49.77	х	0.18	_ = [8.96				(29)
Total area of elements, m ²	125.93								(31)
Party wall	12.14	x [0		0				(32)
Party floor	103.81	╡ '							(32a)
Party ceiling	103.81					Ī			(32b)
Internal wall **	193.17	=				Ĺ			(32c)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and pa	value calculat	ted using	formula 1	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	3.2	`` ′
Fabric heat loss, W/K = S (A x U)		((26)(30)	+ (32) =				49.39	(33)
Heat capacity Cm = S(A x k)				((28)	.(30) + (32) + (32a).	(32e) =	15708.13	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K			Indica	tive Value:	Medium	, ,	250	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.		known pre	ecisely the	indicative	values of	TMP in Ta	able 1f	200	(==/
Thermal bridges : S (L x Y) calculated using A	ppendix K							9.77	(36)
if details of thermal bridging are not known (36) = 0.05×10^{-3}								J. 7.11	(55)
Total fabric heat loss				(33) +	(36) =			59.16	(37)
Ventilation heat loss calculated monthly				(38)m	= 0.33 × (2	25)m x (5)			
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

_											,		ı	
(38)m= 5	56.93	56.48	56.04	53.98	53.59	51.8	51.8	51.46	52.49	53.59	54.37	55.19		(38)
Heat tran	nsfer c	oefficier	nt, W/K				•		(39)m	= (37) + (37)	38)m		ı	
(39)m= 1	16.08	115.63	115.2	113.13	112.75	110.95	110.95	110.62	111.64	112.75	113.53	114.34		¬
Heat loss	s parar	meter (H	ILP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ . (4)	12 /12=	113.13	(39)
(40)m=	1.12	1.11	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.09	1.1		_
Number	of day	s in moi	oth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.09	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wate	r heati	na ener	av reaui	rement:								kWh/ye	ear:	
Assumed if TFA if TFA	> 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.77		(42)
Annual a		,	ater usag	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		100	0.04		(43)
Reduce the		-		• .		-	-	to achieve	a water us	se target o	f			
						_	<u> </u>				·	_		
Hot water υ	Jan J	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
							1		00.04	102.04	100.04	140.04		
(44)m= 1	10.04	106.04	102.04	98.04	94.04	90.03	90.03	94.04	98.04	102.04	106.04 m(44) ₁₁₂ =	110.04	1200.45	(44)
Energy con	ntent of I	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600			· /		1200.43	(-1-1)
(45)m= 1	63.19	142.73	147.28	128.4	123.2	106.32	98.52	113.05	114.4	133.32	145.53	158.04		
If instantan	neous wa	ator hoatii	na at noint	of use (no	hot water	· storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =	=	1573.98	(45)
_	24.48	21.41	22.09	19.26						20	24.02	22.74		(46)
(46)m= 2 Water sto			22.09	19.26	18.48	15.95	14.78	16.96	17.16	20	21.83	23.71		(40)
Storage	volume	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If commu	unity he	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwis			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water sto	-		oclared l	occ foct	or ic kno	wo (k\//k	2/d2x/):					22		(40)
Tempera					טווא פו וכ	wii (Kvvi	i/uay).					.39		(48) (49)
Energy lo					aar			(48) x (49)	١ –			.54		, ,
b) If mar			_	-		or is not		(40) X (40)	, –		0.	.75		(50)
Hot wate				-								0		(51)
If commu	-	•		on 4.3									I	
Volume f Tempera				2h								0		(52)
•								(47) (54)) (FO) (50)		0		(53)
Energy lo Enter (50			_	, KVVII/ye	ear			(47) x (51)) X (52) X (53) =	-	0 .75		(54) (55)
Water sto	, ,	, ,	•	or each	month			((56)m = (55) × (41)ı	m	0.	.73		(00)
_	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder of													ix H	(50)
_	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
· ′							<u> </u>	<u> </u>	l	<u> </u>	<u> </u>	<u> </u>		•

Primary circuit loss (annual) fro	om Table 3				(0		(58)
Primary circuit loss calculated		59)m = (58) ÷ 3	65 × (41)m	า				
(modified by factor from Tab	le H5 if there is s	solar water heat	ing and a c	cylinder th	hermostat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23.26	23.26	22.51 2	23.26 22.51	23.26		(59)
Combi loss calculated for each	month (61)m = ((60) ÷ 365 × (4°	I)m					
(61)m= 0 0 0	0 0	0 0	0	0	0 0	0		(61)
Total heat required for water h	eating calculated	for each montl	1 (62) m = 0).85 × (45	5)m + (46)m +	 (57)m +	(59)m + (61)m	
(62)m= 209.78 184.81 193.87	173.49 169.8	151.41 145.11	``		79.92 190.62	204.63		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative quanti	ty) (enter '0' if	f no solar co	ontribution to wate	r heating)		
(add additional lines if FGHRS						3,		
(63)m= 0 0 0	0 0	0 0	0	0	0 0	0		(63)
Output from water heater				I	<u> </u>			
(64)m= 209.78 184.81 193.87	173.49 169.8	151.41 145.11	159.65	159.49 1	79.92 190.62	204.63		
	<u> </u>	<u> </u>	Outpu	t from water	r heater (annual) _{1.}	12	2122.6	(64)
Heat gains from water heating	. kWh/month 0.25	5 ´ [0.85 × (45)r	n + (61)ml	+ 0.8 x [((46)m + (57)m	+ (59)m	1	1
(65)m= 91.54 81.12 86.25	78.77 78.24	71.42 70.03	1 1		81.61 84.46	89.82	•	(65)
include (57)m in calculation		Vlinder is in the	dwelling o	r hot wate	er is from com	munity h	eating	
5. Internal gains (see Table 5		yiii aa ii a ii a ii	awoning o	THO Wate		inanity in	outing	
	,							
Metabolic gains (Table 5), Wat	tts Apr May	Jun Jul	Aug	Sep	Oct Nov	Dec		
(66)m= 138.61 138.61 138.61	138.61 138.61	138.61 138.61	 		38.61 138.61	138.61		(66)
` '					100.01	100.01		()
Lighting gains (calculated in Ap (67)m= 23.39 20.77 16.89	12.79 9.56	8.07 8.72			19.32 22.55	24.04		(67)
						24.04		(07)
Appliances gains (calculated in (68)m= 262.34 265.07 258.21	243.6 225.17	207.84 196.26	1 1		215.01 233.44	250.77		(68)
	<u> </u>	<u> </u>			215.01 233.44	250.77		(00)
Cooking gains (calculated in A	1 1	I I						(00)
(69)m= 36.86 36.86 36.86	36.86 36.86	36.86 36.86	36.86	36.86	36.86 36.86	36.86		(69)
Pumps and fans gains (Table !	, , , , , , , , , , , , , , , , , , , 							(70)
(70)m= 3 3 3	3 3	3 3	3	3	3 3	3		(70)
Losses e.g. evaporation (nega	, , , , , , , , , , , , , , , , , , , 	'						
(71)m= -110.88 -110.88 -110.88	-110.88 -110.88	-110.88 -110.88	-110.88 -	-110.88 -1	110.88 -110.88	-110.88		(71)
Water heating gains (Table 5)								
(72)m= 123.03 120.72 115.92	109.4 105.16	99.2 94.13	100.63	102.93 1	09.69 117.31	120.73		(72)
Total internal gains =		(66)m + (67)	m + (68)m + ((69)m + (70))m + (71)m + (72)	m		
(73)m= 476.34 474.14 458.6	433.37 407.47	382.69 366.7	373.08	386.13 4	111.59 440.88	463.12		(73)
6. Solar gains:								
Solar gains are calculated using sola		·	ations to conv	vert to the a	• •	ion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table 6a		g_ ble 6b	FF Table 6c		Gains (W)	
		l abie 0d	1 a	<u> </u>	i abie 00		. ,	1
Southeast 0.9x 0.77 x		x 36.79	x	0.63	× 0.7	_ =	61.85	(77)
Southeast 0.9x 0.77 x	5.5	x 62.67	X	0.63	x 0.7	= [105.35	(77)

(83)m= 226.28 Total gains – ir		548.63 nd sola	703.29 r (84)m =	809.2 (73)m		2.79 779.69 3)m , watts	699	.23 601.97	435.62	2 272	193.03		(83)
Solar gains in	watts, cal	lculated	for each	n month			(83)m	n = Sum(74)m	(82)m				
Northwest _{0.9x}	0.77	х	4.6	1	x [9.21	x	0.63	X	0.7	=	12.98	(81)
Northwest 0.9x	0.77	×	4.6	1	x [14.2	x	0.63	x	0.7	=	20	(81)
Northwest _{0.9x}	0.77	×	4.6	1	x [28.07	x	0.63	x	0.7	=	39.54	(81)
Northwest _{0.9x}	0.77	x		==	x [50.42	x	0.63	×	0.7		71.04	(81)
Northwest 0.9x	0.77	×			x [72.63	x	0.63	×	0.7	= =	102.32	(81)
Northwest 0.9x	0.77	$=$ \hat{x}	4.6		^ L х Г	91.1	_ ^ x	0.63	$=$ $\begin{bmatrix} \cdot \\ \times \end{bmatrix}$	0.7	-	128.35	(81)
Northwest 0.9x	0.77	x x			x L	91.35 97.38	x	0.63	X x	0.7	=	128.7 137.2	(81)
Northwest 0.9x	0.77	×			× L	67.96	X	0.63	_	0.7	╡ -	95.74	(81)
Northwest 0.9x	0.77	×	4.6		х <u>Г</u>	41.38	X	0.63	×	0.7	=	58.3	(81)
Northwest 0.9x	0.77	×			X	22.97	X	0.63	×	0.7	=	32.36	(81)
Northwest 0.9x	0.77	×	4.6		X	11.28	X	0.63	×	0.7	=	15.9	(81)
Southwest _{0.9x}	0.77	×	13.2		X	31.49		0.63	×	0.7	=	127.12	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	44.07		0.63	x	0.7	=	177.92	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	69.27		0.63	x	0.7	=	279.64	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x [92.85		0.63	×	0.7	=	374.86	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	104.39		0.63	×	0.7	=	421.44	(79)
Southwest _{0.9x}	0.77	x	13.2	21	x	113.91		0.63	x	0.7	=	459.87	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	118.15		0.63	x	0.7	=	476.99	(79)
Southwest _{0.9x}	0.77	×	13.2	21	х	119.01		0.63	x	0.7		480.46	(79)
Southwest _{0.9x}	0.77	x	13.2	21	х	106.25		0.63	x	0.7	-	428.95	(79)
Southwest _{0.9x}	0.77	×			x [85.75		0.63	×	0.7	-	346.2	(79)
Southwest _{0.9x}	0.77	$=$ \hat{x}	13.2		^ L x Г	62.67	 	0.63	$=$ $\frac{1}{x}$	0.7	- -	253.02	(79)
Southwest _{0.9x}	0.77	x x	5.5		x L	31.49	X	0.63	X	0.7	=	52.93 148.54	(77)
Southeast 0.9x	0.77	X			X L	44.07	X	0.63	× ر	0.7	┥ -	74.08	(77)
Southeast 0.9x	0.77	x			X Г	69.27	X	0.63	X	0.7	=	116.43	(77)
Southeast 0.9x	0.77	×	5.5		X	92.85	X	0.63	×	0.7	=	156.07	(77)
Southeast 0.9x	0.77	×			X	104.39	X	0.63	×	0.7	_ =	175.47	(77)
Southeast 0.9x	0.77	×	5.5		X	113.91	X	0.63	×	0.7	=	191.47	(77)
Southeast 0.9x	0.77	×	5.5		X	118.15	X	0.63	×	0.7	_ =	198.6	(77)
Southeast 0.9x	0.77	×	5.5	5	X	119.01	X	0.63	X	0.7	=	200.04	(77)
Southeast 0.9x	0.77	х	5.5	5	x	106.25	X	0.63	X	0.7	=	178.6	(77)
Southeast 0.9x	0.77	X	5.5	5	x	85.75	X	0.63	X	0.7	=	144.14	(77)

(86)m=	1	0.99	0.97	0.91	0.77	0.58	0.42	0.47	0.72	0.94	0.99	1		(86)
Mean in	nternal t	empera	ature in	living are	ea T1 (fc	ollow ste	ps 3 to 7	in Table	e 9c)					
	19.87	20.08	20.37	20.69	20.9	20.98	21	21	20.95	20.66	20.2	19.84		(87)
Temper	ature d	uring h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)					
· · ·	19.99	19.99	19.99	20.01	20.01	20.03	20.03	20.03	20.02	20.01	20.01	20		(88)
Utilisatio	on facto	or for ga	ains for i	rest of d	wellina. I	h2.m (se	e Table	9a)						
(89)m=	1	0.99	0.96	0.88	0.71	0.5	0.33	0.37	0.64	0.92	0.99	1		(89)
Mean in	nternal t	empera	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
	18.49	18.8	19.21	19.66	19.92	20.02	20.03	20.03	19.98	19.63	18.99	18.46		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.38	(91)
Mean in	nternal t	empera	ature (fo	r the wh	ole dwel	llina) = fl	A × T1	+ (1 – fL	A) x T2			!		_
	19.02	19.29	19.65	20.06	20.3	20.39	20.4	20.4	20.35	20.03	19.45	18.99		(92)
Apply a	djustme	ent to th	ne mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
(93)m= 1	19.02	19.29	19.65	20.06	20.3	20.39	20.4	20.4	20.35	20.03	19.45	18.99		(93)
8. Spac	e heati	ng requ	iirement											
				•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
		Feb	Mar	using Ta		Jun	Jul	Λιια	Son	Oct	Nov	Doo		
L_ Utilisatio	Jan on facto			Apr	May	Jun	Jui	Aug	Sep	Oct	INOV	Dec		
	0.99	0.98	0.96	0.88	0.73	0.53	0.37	0.41	0.67	0.92	0.99	1		(94)
Useful c	gains, h	mGm,	W = (94	1)m x (84	 1)m								I	
	98.32	850.4	962.81	1000.89	890.81	631.06	420.16	440.06	661.6	778.46	702.57	653.23		(95)
Monthly	/ avera	ge exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]			•	
(97)m= 17			1515.25		969.29	642.09	421.45	442.35	698.14	1062.76	1402.55	1691.21		(97)
· —	Ť	_)m – (95	í - `	<u> </u>		l	
(98)m= 7	751.9	546.95	411.02	188.25	58.4	0	0	0	0	211.52	503.99	772.26	0.444.00	7(00)
								Tota	l per year	(kwh/yeai	r) = Sum(9	8)15,912 =	3444.29	(98)
Space h	neating	require	ement in	kWh/m²	/year								33.18	(99)
9a. Energ	gy requ	iremen	ts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space I	-		4 fuana a		ما مساما،									7(004)
				econdary		mentary	-	(000) 4	(004)				0	(201)
				ain syst	, ,			(202) = 1 -		,			1	(202)
			_	main sys				(204) = (204)	02) x [1 –	(203)] =			1	(204)
Efficiend	cy of m	ain spa	ce heat	ing syste	em 1								93.5	(206)
Efficiend	cy of se	condar	ry/supple	ementar	y heating	g system	າ, %			_		_	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
· —	Ť			alculated									l	
_ 7	751.9	546.95	411.02	188.25	58.4	0	0	0	0	211.52	503.99	772.26		
(211)m =	í	<u> </u>				1		1	1	i	1	i	ı	(211)
8	304.18	584.98	439.59	201.34	62.45	0	0	0	0	226.23	539.02	825.95		٦.
								rota	l (kWh/yea	ar) =5um(2	(11) _{15,1012}	F	3683.73	(211)

= {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0 0	1 o 1	0	0	0	0		
				ar) =Sum(2			0	(215
Water heating								J
Output from water heater (calculated above)						ı	I	
	51.41 145.11	159.65	159.49	179.92	190.62	204.63	70.0	(216
Efficiency of water heater (217)m= 87.93 87.54 86.77 85.03 82.29	79.8 79.8	79.8	79.8	85.25	87.29	88.03	79.8	ار 217)
Fuel for water heating, kWh/month	70.0	1 70.0	70.0	00.20	07.20	00.00		(= ,
(219)m = (64)m x 100 ÷ (217)m							I	
(219)m= 238.58 211.13 223.43 204.03 206.34 18	89.73 181.85	200.06	199.87	211.06	218.39	232.47		٦
Annual totals		rotal	= Sum(Z	19a) ₁₁₂ =	Wh/year		2516.93 kWh/year	(219)
Space heating fuel used, main system 1				N.	rvii/yeai		3683.73	7
Water heating fuel used							2516.93	ī
Electricity for pumps, fans and electric keep-hot								_
central heating pump:						30		(230
boiler with a fan-assisted flue						45		(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							412.99	」` <mark>](232</mark>
Total delivered energy for all uses (211)(221) +	(231) ± (232)	(237h) -	_				6688.66	\` ☐(338)
12a. CO2 emissions – Individual heating systems	` ' ` '						0000.00	
12a. 002 emissions – muividual neating system.	s including m	ICIO-CI II						
	Energy kWh/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	795.69	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	543.66	(264
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1339.34	_ (265
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267
Liectricity for pumps, fans and electric keep-not								_
Electricity for lighting	(232) x			0.5	19	=	214.34	(268)

TER =

(273)

15.34

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:30*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 62.56m²Site Reference:Highgate Road - GREENPlot Reference: 04 - B

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

18.61 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.22 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

49.8 kWh/m²

44.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 41.0 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.71m²	
Windows facing: North West	3.46m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

Sasessor Name: Neil Ingham Stroma Number: STRO010943 Software Version: Version: 1.0.5.50			l lser I	Details: _						
### Coveral works Substitution S		Stroma FSAP 2012		Strom Softwa	are Ve					
Area(m²)	Address :	F	Property	Address	: 04 - B					
Ground floor G.2.56 (1a) x 2.55 (2a) = 165.78 (3a)		ensions:								
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)			Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Dwelling volume	Ground floor			62.56	(1a) x	2	2.65	(2a) =	165.78	(3a)
2. Ventilation rate: main heating heati	Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	62.56	(4)					
Number of chimneys	Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	165.78	(5)
Number of chimneys Number of open flues 0	2. Ventilation rate:									
Number of chimneys			ry	other		total			m³ per hou	ır
Number of intermittent fans 2	Number of chimneys] + [0	= [0	X 4	40 =	0	(6a)
Number of passive vents	Number of open flues	0 + 0	+ [0	_ = [0	x 2	20 =	0	(6b)
Number of flueless gas fires	Number of intermittent fa	ns				2	x ′	10 =	20	(7a)
Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20	Number of passive vents				Ē	0	x ′	10 =	0	(7b)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20	Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20					L					
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)								Air ch	nanges per ho	our
Number of storeys in the dwelling (ns) Additional infiltration (19)-1)x0.1 = 0 (10) (10)	'	•						÷ (5) =	0.12	(8)
Additional infiltration			ed to (17),	otherwise (continue ti	rom (9) to	(16)		0	(9)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	•	no awaming (no)					[(9)-	-1]x0.1 =		_
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction				=
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = 0 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 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	• • • • • • • • • • • • • • • • • • • •		o the grea	ter wall are	ea (after					
If no draught lobby, enter 0.05, else enter 0	,	• /-).1 (seal	ed), else	enter 0				0	(12)
Window infiltration $0.25 - [0.2 \times (14) + 100] = 0.015$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0.016$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.37 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered $(20) = 1 - [0.075 \times (19)] = 0.37$ (21) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.37$ (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 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$	•	,	`	,,						=
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.37 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 1$ (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 1$ $(21) = (18) \times (20) = 1$ $(21) = $	Percentage of windows	s and doors draught stripped							0	(14)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = $ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = $ Infiltration rate modified for monthly wind speed Many Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$ Wind Factor $(22a)m = (22)m \div 4$	Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $(21) = (18) \times (20) =$ Monthly average wind speed from Table 7 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$ Wind Factor $(22a)m = (22)m \div 4$									0	(16)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 1 (20)$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 1 \cdot (20) = 1 \cdot (20)$ 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 7 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$ Wind Factor $(22a)m = (22)m \div 4$	•			•	•	etre of e	envelope	area	5	= ' '
Number of sides sheltered $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	•					is hoina u	read		0.37	(18)
Shelter factor $ (20) = 1 - [0.075 \times (19)] = 1 $			ne or a de	gree an pe	тпеаышу	is being u	Seu		0	(19)
Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Shelter factor			(20) = 1 -	[0.075 x (19)] =				─
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	Infiltration rate incorporat	ting shelter factor		(21) = (18	s) x (20) =				0.37	(21)
Monthly average wind speed from Table 7 (22)m= $\begin{bmatrix} 5.1 & 5 & 4.9 & 4.4 & 4.3 & 3.8 & 3.8 & 3.7 & 4 & 4.3 & 4.5 & 4.7 \end{bmatrix}$ Wind Factor (22a)m = (22)m \div 4	Infiltration rate modified f	or monthly wind speed								
(22)m =	Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind Factor (22a)m = (22)m ÷ 4	Monthly average wind sp	eed from Table 7			•			•	,	
	(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
	Wind Factor (22a)m = (2	2)m ÷ 4								
			0.95	0.92	1	1.08	1.12	1.18]	

Adjusted infiltr	ation rat	e (allowi	ing for st	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44		
Calculate effe		_	rate for t	he appli	cable ca	se	-		-	-	-		(22
If exhaust air h			endix N (2	3h) = (23a	a) × Fmv (e	equation (N	N5)) other	wise (23h) = (23a)			0	(238
If balanced with) = (20a)			0	(23k
a) If balance		•	•	J		`			Oh)m ı (22h) v [1 (22a)	. 1001	(230
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	+ 100j	(24a
b) If balance													
(24b)m= 0		0	0	0	0	0	0	0	0	0	0		(24k
c) If whole h							n from c	utsida					`
,	n < 0.5 ×				•				5 × (23b)		•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)r	ventilation $n = 1$, the			•					0.5]				
24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				•	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losse	s and he	at loss r	naramet	≏r·									
ELEMENT	Gros area	SS	Openin	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
Vindows Type		` /			12.29		/[1/(1.4)+		16.29	$\stackrel{\prime}{\lnot}$			(27)
Vindows Type					3.35	_	/[1/(1.4)+	0.04] =	4.44	=			(27)
Nalls Type1	46.7	′2	15.6	4	31.08	=	0.18		5.59	╡ ┌		$\neg \vdash$	(29)
Valls Type2	13.7	_	0		13.75	=	0.18	-	2.48	룩 ;		╡	(29)
otal area of e					60.47	=	0.10		2.10				(31)
Party wall		,			30.32	=	0		0	– 1			(32)
Party floor					62.56	=	<u> </u>		0			╡	(32)
Party ceiling						_				L		╡	
nternal wall **	k				62.56	_				L		╡	(32)
for windows and		owe uso e	affactive w	ndow I I-vs	100.8		ı formula 1	/[/1/ L-val	ارور مراجر	e aiven in	naragrank		(320
* include the area						atou using	TOTTIGIA 1	I (170 Valo	10)+0.0 1] 6	is giveri iii	paragrapi	. J. Z	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				28.8	(33)
Heat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	9340.6	(34)
Thermal mass	parame	ter (TMF	P = Cm -	-TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
or design asses an be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						6.92	(36
f details of therma Fotal fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			35.73	(37)
entilation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))	-	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 33.46	33.23	32.99	31.9	31.7	30.75	30.75	30.57	31.11	31.7	32.11	32.54		(38)
Heat transfer	coefficier	nt, W/K	-				-	(39)m	= (37) + (38)m	-	•	
39)m= 69.19	68.95	68.72	67.63	67.42	66.47	66.47	66.29	66.84	67.42	67.84	68.27		
,													

Heat loss para	meter (l	-II P) \///	m²K					(40)m	= (39)m ÷	. (4)			
(40)m= 1.11	1.1	1.1	1.08	1.08	1.06	1.06	1.06	1.07	1.08	1.08	1.09		
(10)=			1.00	1.00	1.00	1.00	1.00	<u> </u>		Sum(40) ₁ .		1.08	(40)
Number of day	s in mo	nth (Tabl	le 1a)							Sum (10)1			(\ -/
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing one	rav regui	rement:								kWh/ye	ar:	
4. Water neat	ing ene	igy requi	rement.								KVVII/ye	tai.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		05		(42)
Annual average	l average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.96		(43)
not more that 125	litres per	person per	day (all w	ater use, l	not and co	ld) 	_						
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 91.25	87.94	84.62	81.3	77.98	74.66	74.66	77.98	81.3	84.62	87.94	91.25		
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		995.51	(44)
(45)m= 135.33	118.36	122.14	106.48	102.17	88.17	81.7	93.75	94.87	110.56	120.69	131.06		
L1									Total = Su	m(45) ₁₁₂ =	=	1305.27	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)			•		
(46)m= 20.3	17.75	18.32	15.97	15.33	13.22	12.25	14.06	14.23	16.58	18.1	19.66		(46)
Water storage									•				
Storage volume	` ′		•			Ū		ame ves	sel		150		(47)
If community h	•			•			` '		(01.1)				
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
Water storage a) If manufactor		eclared l	nss facto	nr is kna	wn (k\//ł	n/day).					39		(48)
Temperature fa				JI 13 KI10	WII (ICVVI	ı, day j.							
·				oor			(48) x (49)	\ _			54		(49)
Energy lost from b) If manufaction		_	-		or is not		(46) X (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	eating s	ee sectio	on 4.3										
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,		41	-4-1\			
(modified by					ı —	ı —		<u> </u>		<u> </u>	00.00		(50)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0 0	or each		(61)m =	(60) ÷ 30	05 × (41))m 0	0	0	Ιο	0	1	(61)
	!						ļ			ļ		(50)== : (61)==	(01)
(62)m= 181.9		168.73	151.57	148.77	133.26	128.29	140.3		(45)III + 157.16	165.78	(57)III +	(59)m + (61)m 1	(62)
` /			<u> </u>	<u> </u>		l						J	(02)
Solar DHW inp									r contribut	ion to wate	er neaung)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	1	(63)
Output from	<u> </u>											J	()
(64)m= 181.9		168.73	151.57	148.77	133.26	128.29	140.3	5 139.96	157.16	165.78	177.65]	
. ,		<u> </u>	<u> </u>	<u> </u>		<u> </u>	ļ	 utput from w		<u> </u>	12	1853.89	(64)
Heat gains	from water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m) + (61)	ml + 0.8	k [(46)m	+ (57)m	+ (59)m	1	_
(65)m= 82.2	1	77.89	71.48	71.25	65.39	64.44	68.45	1	74.04	76.2	80.85]	(65)
	7)m in cal	culation o	of (65)m	only if c	vlinder i	s in the ${\mathfrak a}$	dwellin	a or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	·				,			9 01 1101 11				.cag	
Metabolic g				,									
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 102.0	65 102.65	102.65	102.65	102.65	102.65	102.65	102.6	5 102.65	102.65	102.65	102.65	1	(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				•	
(67)m= 15.9	9 14.2	11.55	8.74	6.54	5.52	5.96	7.75	10.4	13.21	15.42	16.43		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5		•	•	
(68)m= 179.3	35 181.22	176.53	166.54	153.94	142.09	134.18	132.32	2 137.01	146.99	159.59	171.44]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	•	•	•	
(69)m= 33.2	7 33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27]	(69)
Pumps and	fans gains	(Table 5	. Ба)					•				•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (nega	tive valu	es) (Tab	le 5)				•	•	•	•	
(71)m= -82.	12 -82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12]	(71)
Water heati	ng gains (T	able 5)				•	•		•		•	•	
(72)m= 110.5	58 108.67	104.69	99.28	95.76	90.82	86.61	92	93.91	99.51	105.84	108.67]	(72)
Total intern	nal gains =	•			(66))m + (67)m	n + (68)n	n + (69)m +	(70)m + (7	'1)m + (72))m	•	
(73)m= 362.	72 360.88	349.56	331.36	313.03	295.22	283.55	288.86	6 298.12	316.51	337.64	353.34]	(73)
6. Solar ga	ins:					•	•	•	•	•	•		
Solar gains a	re calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to	convert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu			g_ Table Ch	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_	able 6c		(W)	_
Northeast 0.9		X	12.	29	X 1	1.28	x	0.63	x	0.7	=	42.38	(75)
Northeast 0.9	0.77	X	12.	29	X 2	22.97	X	0.63	x	0.7	=	86.26	(75)
Northeast 0.9	<u> </u>	X	12.	29	X	11.38	X	0.63	x	0.7	=	155.42	(75)
Northeast 0.9		X	12.	29	x 6	67.96	X	0.63	x	0.7	=	255.24	(75)
Northeast 0.9	0.77	X	12.	29	x 9	91.35	x	0.63	х	0.7	=	343.09	(75)

		_			_		_		_				_
Northeast _{0.9x}	0.77	X	12.	29	X	97.38	X	0.63	X	0.7	=	365.77	(75)
Northeast _{0.9x}	0.77	X	12.	29	X	91.1	X	0.63	X	0.7	=	342.17	(75)
Northeast _{0.9x}	0.77	X	12.	29	x	72.63	X	0.63	X	0.7	=	272.79	(75)
Northeast _{0.9x}	0.77	X	12.	29	X	50.42	X	0.63	X	0.7	=	189.38	(75)
Northeast _{0.9x}	0.77	X	12.	29	x	28.07	X	0.63	X	0.7	=	105.42	(75)
Northeast _{0.9x}	0.77	X	12.	29	x	14.2	X	0.63	X	0.7	=	53.32	(75)
Northeast 0.9x	0.77	х	12.	29	x	9.21	X	0.63	X	0.7	=	34.61	(75)
Northwest _{0.9x}	0.77	х	3.3	35	x	11.28	X	0.63	X	0.7	=	11.55	(81)
Northwest _{0.9x}	0.77	х	3.3	35	x	22.97	X	0.63	X	0.7	=	23.51	(81)
Northwest 0.9x	0.77	x	3.3	35	x	41.38	X	0.63	X	0.7	=	42.36	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	67.96	x	0.63	X	0.7	=	69.57	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	91.35	x	0.63	X	0.7	=	93.52	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	97.38	×	0.63	x	0.7	=	99.7	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	91.1	X	0.63	x	0.7		93.27	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	72.63	X	0.63	x	0.7		74.36	(81)
Northwest 0.9x	0.77	x	3.3	35	x	50.42	X	0.63	x	0.7	=	51.62	(81)
Northwest 0.9x	0.77	x	3.3	35	x	28.07	X	0.63	x	0.7	=	28.74	(81)
Northwest _{0.9x}	0.77	х	3.3	35	x	14.2	X	0.63	х	0.7	=	14.53	(81)
Northwest 0.9x	0.77	x	3.3	35	x	9.21	X	0.63	x	0.7	=	9.43	(81)
Solar gains in (83)m= 53.93 Total gains – i (84)m= 416.65	109.78 1	97.78	324.81	436.61	465.4	n , watts	(83)m 347	 	134.10 450.60		44.04 397.38]]	(83) (84)
7. Mean inter	nal temper	rature	(heating	season)								
Temperature	during hea	ating p	eriods ir	n the livi	ng are	a from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation fac	tor for gair	ns for I	iving are	ea, h1,m	(see	Table 9a)						1	
Jan	Feb	Mar	Apr	May	Jur	Jul	А	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.92	0.76	0.55	0.4	0.4	0.77	0.96	0.99	1		(86)
Mean interna	l temperati	ure in I	iving are	ea T1 (fo	ollow s	teps 3 to	7 in T	able 9c)		_	_	<u>.</u>	
(87)m= 19.88	20.03	20.3	20.67	20.91	20.99	21	2	1 20.93	20.59	20.18	19.86		(87)
Temperature	during hea	ating p	eriods ir	n rest of	dwelli	ng from Ta	able 9	9, Th2 (°C)					
(88)m= 20	20	20	20.02	20.02	20.03	20.03	20.	03 20.03	20.02	20.01	20.01		(88)
Utilisation fac	tor for gair	ns for r	est of d	welling,	h2,m (see Table	9a)	-	-	-	-		
(89)m= 1	_ <u> </u>	0.97	0.89	0.7	0.47	1	0.3	0.69	0.95	0.99	1		(89)
Mean interna	l temnerati	ure in 1	the rest	of dwell	ina T2	(follow st	ens 3	to 7 in Tah	le 9c)			l	
(90)m= 18.51		19.12	19.65	19.94	20.02	<u> </u>	20.		19.55	18.96	18.49		(90)
, , ,				L		1	1		<u> </u>	ving area ÷ (ļ	0.43	(91)
Many later	l damen and	/5	n Alexa . !	الماما	III: N	11 A T 1	. /4			`		L	` ′
Mean interna (92)m= 19.1	 	ure (fo _{19.63}	r the wh	ole dwe 20.36	lling) =		+ (1		20	19.48	19.08]	(92)
Apply adjustr				l	<u> </u>		1				19.06		(32)
Apply aujusti	HELIT TO THE	mean	micilia	remper	atul C I	וטווו ומטונ	J +C ,	where appl	opriate				

(02)	40.4	40.00	40.00	20.00	20.20	20.44	20.45	00.45	20.20	-00	40.40	40.00		(93)
(93)m=	19.1	19.28	19.63	20.09	20.36	20.44	20.45	20.45	20.38	20	19.48	19.08		(93)
			uirement				44 -4	Table O	41	4 T: /	70)	-11-	late	
			ernai ter or gains			ed at ste	ер ттог	rable 9i	o, so tha	t 11,m=(rojin an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	1:			,	,					•	
(94)m=	0.99	0.99	0.97	0.89	0.72	0.5	0.35	0.42	0.72	0.95	0.99	1		(94)
Usefu			W = (94)				ı	,			1	,	ı	
(95)m=		465.48	530.71	586.73	540.34	382.81	255.04	266.73	389.19	426.44	400.93	395.61		(95)
	nly avera	age exte	rnal tem	perature			•	,				,		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			i				-``	- ` 	– (96)m					
	1023.86		902.35	756.53	583.62	388.05	255.69	268.24	420.06	633.87	840.02	1015.78		(97)
Space		· · ·	ı	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		ı	
(98)m=	453.5	353.71	276.5	122.25	32.2	0	0	0	0	154.32	316.14	461.4		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2170.03	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								34.69	(99)
9a En	erav rec	wiremer	nts – Indi	ividual h	eating sy	vstems i	ncluding	micro-C	:HP)					
	e heatir		no ma	Madain	oainig oʻ	y otorno r	rioraanig	, moro c)					
•		•	at from s	econdar	v/supple	mentary	system						0	(201)
	•		at from m			,	•	(202) = 1	- (201) =				1] (202)
	•		ng from	-	. ,			(204) = (2	02) × [1 –	(203)] =			1] (204)
			ace heat	-									93.5	(206)
	•	-	ry/suppl			a svstem	າ. %						0] (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ´ ar
Space			ement (c	<u> </u>			<u> </u>	/tug	СОР	000	1101	200	KVVIII y Oc	A1
	453.5	353.71	276.5	122.25	32.2	0	0	0	0	154.32	316.14	461.4		
(211)m) – \[(08	\m v (20	 (4)] } x 1	00 ÷ (20	16)			<u> </u>	<u> </u>			<u> </u>		(211)
(211)11	485.03	378.29	295.72	130.75	34.44	0	0	0	0	165.05	338.12	493.48		(211)
	.00.00	0.0.20			0				l (kWh/yea				2320.89	(211)
Casa	- h1:	a fuel (e		//- /					(************		715,1012	2	2320.09	_(=11)
•		•	econdar 00 ÷ (20	• , .	month									
(215)m=		0	00 : (20	0	0	0	0	0	0	0	0	0		
(=:-)									l (kWh/yea		_		0	(215)
Motor	haatina									(- /15,1012	2	0	_(=.0)
	heating		ter (calc	ulated al	hove)									
Output	181.92	160.44	168.73	151.57	148.77	133.26	128.29	140.35	139.96	157.16	165.78	177.65		
Efficier		ater hea							l		ļ		79.8	(216)
(217)m=		86.87	86.12	84.25	81.51	79.8	79.8	79.8	79.8	84.77	86.51	87.25		」` ´ ´ (217)
. ,			kWh/mo								L			•
		•) ÷ (217)											
. ,	208.74	184.71	195.92	179.91	182.5	166.99	160.77	175.87	175.39	185.4	191.63	203.62		
			•					Tota	I = Sum(2	19a) ₁₁₂ =	-		2211.45	(219)
Annua	al totals									k'	Wh/year	,	kWh/year	_
Space	heating	fuel use	ed, main	system	1						=		2320.89	
												!		_

			,		_
Water heating fuel used				2211.45	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting				282.38	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4889.72	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	F.,		_		
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	-		tor =		
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar -
	kWh/year	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 501.31 0 477.67	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= = =	kg CO2/yea 501.31 0 477.67 978.98	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.216	= = = =	kg CO2/yea 501.31 0 477.67 978.98 38.93	(261) (263) (264) (265) (267)

TER =

(273)

18.61

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:03:27

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 72.62m²Site Reference:Highgate Road - GREENPlot Reference:04 - C

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 18.46 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.74 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 42.5 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.71m²	
Windows facing: North West	3.46m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		Hear	Details:						
A a a a a a a a a a Maria a a	Nail le place	Osei		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Contware reame.	0.1011/d 1 0711 2012		y Address:		31011.		7 01010	7.0.0.00	
Address :		·							
1. Overall dwelling dime	ensions:								
Ground floor		Ar	ea(m²)	(10) ×		ight(m)	(2a) =	Volume(m ³	(3a)
	a) . (4 la) . (4 a) . (4 al) . (4 a) .	. (4.5)		(1a) x	2	65	(2a) =	192.44	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	F(1II)	72.62	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	192.44	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	ır
Number of allipsychia	heating he	ating		,			40 =		_
Number of chimneys		<u> </u>	0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				L	3		10 =	30	(7a)
Number of passive vents	;				0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	vs. flues and fans = $(6a)$	+(6b)+(7a)+(7b)	+(7c) =	Г	30		÷ (5) =	0.16	(8)
	peen carried out or is intended,			continue fr			. (0) –	0.10	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)
deducting areas of openii		oriaing to the gre	aler wall are	a (aner					
If suspended wooden t	floor, enter 0.2 (unsealed	d) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
ŭ	s and doors draught strip	pped						0	(14)
Window infiltration			0.25 - [0.2		_			0	(15)
Infiltration rate			(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	inty value, then $(10) = 1(17)$ as if a pressurisation test has b				is heina u	sad		0.41	(18)
Number of sides sheltere		occir done or a c	regree an per	meability	is being u	3CU		0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.41	(21)
Infiltration rate modified f	or monthly wind speed						!		
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		
` '			1 - 7-		L			J	

Adjusted infiltration	on rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m				_	
).51	0.5	0.45	0.44	0.39	0.39	0.38	0.41	0.44	0.46	0.48		
<i>Calcul<mark>ate effectiv</mark></i> If mechanical v		•	rate for t	he appli	cable ca	se	-		-	-	-	· 	
If exhaust air heat			ndix N (2	3h) <i>– (2</i> 3a	a) × Fmv (e	equation (N5)) othe	wise (23h) = (23a)			0	(23
If balanced with he) = (23a)			0	(2:
		•	-	_					2h\m . /	22h) v [1 (220)	0 . 1001	(2:
a) If balanced r	0	0	0	0	0	0	0	0	0	0	0	- 100]	(2
b) If balanced r													,_
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole hous			_		<u> </u>								•
if (22b)m <				•	•				.5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural ver if (22b)m =									0.51	-			
	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61		(2
Effective air ch	ange i	rate - en	ter (24a	or (24b	o) or (24	c) or (24	·d) in box	(25)				I	
	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61		(2
							l						
3. Heat losses a									A 37.11				
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		X k J/K
Vindows Type 1					12.71	_x 1	/[1/(1.4)+	0.04] =	16.85				(2
Vindows Type 2					3.46	x1	/[1/(1.4)+	0.04] =	4.59	\equiv			(2
Valls Type1	72.6	2	16.17	7	56.45	5 X	0.18	i	10.16				(2
Valls Type2 ☐	17.78	8	0		17.78	3 x	0.18	=	3.2	Ħ i			<u> </u>
ــ otal area of elen	nents,	m²			90.4								 (3
Party wall					30.32	<u> </u>	0		0				(3
Party floor					72.62	=							(3
Party ceiling					72.62	=						╡	(3
nternal wall **					146.1	_				[(3
for windows and roo	of winda	ws. use e	ffective wi	ndow U-va			a formula 1	/[(1/U-valu	ıe)+0.041 a] as aiven in	paragraph		(5
* include the areas o								2(, ,	J	7-1-5-17		
abric heat loss,	W/K =	= S (A x	U)				(26)(30)	+ (32) =				34.8	(3
Heat capacity Cm	n = S(a)	Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	12217.13	(3
hermal mass pa	ramet	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
For design assessme ean be used instead o				construct	ion are noi	t known pi	recisely the	indicative	values of	TMP in T	able 1f		
hermal bridges	S (L	x Y) cal	culated u	using Ap	pendix l	<						7.11	(3
details of thermal brotal fabric heat I		are not kn	own (36) =	: 0.05 x (3	1)			(33) +	(36) =			41.91	(3
entilation heat lo		lculated	monthly	/					$= 0.33 \times ($	25)m x (5)		
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	9.93	39.6	38.08	37.8	36.47	36.47	36.23	36.98	37.8	38.37	38.98		(3
Heat transfer coe						<u> </u>			= (37) + (37)	<u> </u>	1	ı	
TOUT HAIRSTEI COE	HOIGH	ı, vv/IX						(00)111	- (01) 1° (1	•		1	
39)m= 82.16 8	1.83	81.51	79.99	79.71	78.38	78.38	78.14	78.89	79.71	80.28	80.88		

eat loss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
0)m= 1.13	1.13	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11		
umber of day	re in mo	nth (Tab	lo 1a)						Average =	Sum(40) ₁ .	12 /12=	1.1	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
-1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•				•	•	•	•	•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		31		(42)
nnual averag educe the annua ot more that 125	e hot wa al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.02		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	•					
4)m= 97.92	94.36	90.8	87.24	83.67	80.11	80.11	83.67	87.24	90.8	94.36	97.92		_
nergy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1068.18	(44
.5)m= 145.21	127	131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63		
		ı			l	l	l		Total = Su	m(45) ₁₁₂ =	= [1400.56	(45
instantaneous w									1	1			
6)m= 21.78 /ater storage	19.05	19.66	17.14	16.44	14.19	13.15	15.09	15.27	17.8	19.42	21.09		(46
torage volum) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47
community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)				<u> </u>		
therwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
/ater storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48
, emperature fa					`	3,					54		(49
nergy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50
) If manufact			-										,_,
ot water stora community h	•			e z (KVV	n/iitre/ua	iy)					0		(51
olume factor	_										0		(52
emperature fa	actor fro	m Table	2b								0		(53
nergy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter (50) or (, ,	,								0.	75		(55
/ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m 				
cylinder contains	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)ı	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Appendix	кН	(56
7)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57
rimary circuit			m Table	<u> </u>			<u> </u>	I		<u> </u>	0		(58
rimary circuit	loss cal	culated f	for each	month (•	. ,	, ,				~		(30
(modified by					ı —	ı —		<u> </u>		stat)			
9)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59

Combi loss (a a la ulata d	for oach	month /	(64)m	(CO) + 2(SE (41)	\						
Combi loss of (61)m= 0	o localizated	o each	0	0	00) - 30	05 × (41)	0	0	0	0	0	1	(61)
	!						ļ	ļ		<u> </u>	<u> </u>	(50)== : (61)==	(01)
(62)m= 191.8	-i	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	· (59)m + (61)m]	(62)
Solar DHW inpu]	(02)
(add addition									i contribut	ion to wate	er neating)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	1	(63)
Output from	l		-									J	` ,
(64)m= 191.8		177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22]	
` '	_ l					l	<u> </u>	put from w		ļ	I12	1949.18	(64)
Heat gains f	rom water	heating.	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)r	nl + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	_
(65)m= 85.56	_	80.85	74.06	73.73	67.53	66.42	70.72	69.92	76.72	79.13	84.03]	(65)
include (5	L 7)m in cald	culation o	of (65)m	only if c	vlinder i	ເ s in the ເ	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal	<u> </u>			•	y		z c					9	
Metabolic ga				, •									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m= 115.4	1 115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 18.13	ì	13.09	9.91	7.41	6.26	6.76	8.79	11.79	14.97	17.48	18.63	1	(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			4	
(68)m= 203.3	<u> </u>	200.13	188.81	174.52	161.09	152.12	150.01	155.32	166.64	180.93	194.36	1	(68)
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a	, also s	ee Table	5			•	
(69)m= 34.54	<u> </u>	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	1	(69)
Pumps and	fans gains	(Table 5	ia)									1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)		Į.			!	!		
(71)m= -92.3	2 -92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32]	(71)
Water heating	ng gains (T	able 5)				!			!			•	
(72)m= 115	112.94	108.67	102.87	99.1	93.79	89.28	95.06	97.11	103.12	109.9	112.95]	(72)
Total intern	al gains =				(66))m + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 397.0	8 395.1	382.51	362.21	341.65	321.75	308.78	314.47	324.85	345.36	368.93	386.56]	(73)
6. Solar gai	ins:									•	•		
Solar gains ar	e calculated	using sola	flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ 	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast 0.9		Х	12.	71	x 1	1.28	x	0.63	x	0.7	=	43.83	(75)
Northeast 0.9	0	Х	12.	71	x 2	22.97	х	0.63	x	0.7	=	89.21	(75)
Northeast 0.9	0	х	12.	71	X 4	11.38	х	0.63	x	0.7	=	160.73	(75)
Northeast 0.9		X	12.	71	× 6	67.96	x	0.63	x	0.7	=	263.96	(75)
Northeast 0.9	× 0.77	X	12.	71	x g	91.35	Х	0.63	х	0.7	=	354.82	(75)

		_							_				_
Northeast _{0.9x}	0.77	X	12.	71	х !	97.38	X	0.63	X	0.7	=	378.27	(75)
Northeast _{0.9x}	0.77	X	12.	71	Х	91.1	X	0.63	X	0.7	=	353.87	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	72.63	X	0.63	X	0.7	=	282.11	(75)
Northeast _{0.9x}	0.77	X	12.	71	X .	50.42	X	0.63	X	0.7	=	195.85	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	28.07	X	0.63	X	0.7	=	109.02	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	14.2	X	0.63	X	0.7	=	55.15	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	9.21	X	0.63	X	0.7	=	35.79	(75)
Northwest 0.9x	0.77	X	3.4	16	X	11.28	X	0.63	X	0.7	=	11.93	(81)
Northwest _{0.9x}	0.77	X	3.4	16	x	22.97	X	0.63	X	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.4	16	X .	41.38	X	0.63	X	0.7	=	43.75	(81)
Northwest _{0.9x}	0.77	x	3.4	16	x	67.96	x	0.63	x	0.7		71.86	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x	91.35	x	0.63	x	0.7		96.59	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x .	97.38	X	0.63	x	0.7	_ =	102.98	(81)
Northwest _{0.9x}	0.77	×	3.4	16	х	91.1	x	0.63	x	0.7	_ =	96.33	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	×	3.4	16	x .	50.42	х	0.63	x	0.7	=	53.32	(81)
Northwest 0.9x	0.77	×	3.4	16	x	28.07	х	0.63	x	0.7	=	29.68	(81)
Northwest 0.9x	0.77	×	3.4	16	х	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest 0.9x	0.77	×	3.4	16	х	9.21	x	0.63	x	0.7	=	9.74	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m= 55.76	ļ)4.48	335.82	451.41	481.25	450.2	358	.9 249.17	138.7	70.16	45.53		(83)
Total gains – i		-		<u> </u>	`	, watts						1	
(84)m= 452.84	508.6 58	36.99	698.03	793.06	803.01	758.98	673.	38 574.02	484.0	439.09	432.1		(84)
7. Mean inter	nal tempera	ature	(heating	season)								
Temperature	during heat	ting p	eriods ir	n the livi	ng area	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for I	iving are	ea, h1,m	(see Ta	able 9a)				_		1	
Jan	Feb I	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 1	1 0).99	0.94	0.81	0.6	0.45	0.5	2 0.82	0.97	1	1		(86)
Mean_interna	l temperatu	re in I	iving are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)			-	_	
(87)m= 19.81	19.95 20	0.22	20.59	20.87	20.98	21	20.9	99 20.9	20.53	20.11	19.79		(87)
Temperature	during heat	ting p	eriods ir	n rest of	dwelling	g from Ta	able 9), Th2 (°C)					
(88)m= 19.98	19.98 1	9.98	20	20	20.02	20.02	20.0	02 20.01	20	20	19.99]	(88)
Utilisation fac	tor for gains	s for r	est of d	welling,	h2,m (s	ee Table	9a)	•		-		•	
(89)m= 1		0.98	0.92	0.75	0.52	0.35	0.4	2 0.74	0.96	0.99	1]	(89)
Mean interna	l temperatu	re in 1	the rest	of dwell	ina T2 (f	follow ste	ne 3	to 7 in Tabl	 _ ()c)		!	J	
(90)m= 18.39	 	8.99	19.53	19.88	20	20.02	20.0	1	19.46	18.85	18.38]	(90)
()	1									ving area ÷ (0.38	(91)
Many late	l tamen a sect	/*	n Alexa . !	الماما	III:a a V	: A . T4	. /4			•			 ` ′
Mean interna	ı temperatu	re (to	r tne wh	ioie awe	iiing) = 1	LA X I1	+ (1 ·	– TLA) × 12				1	
(02)m- 10 02	10 14 44	വംI	10.04	20.26	20.20	20.20	201	20 20 24	10 07	1004	10 00		(02)
(92)m= 18.93 Apply adjustr		9.46 mean	19.94	20.26	20.38	20.39	20.3		19.87		18.92		(92)

(93)m= 18.93 19.11 19.46 19.94 20.26 20.38 20.39 20.39 20.31 19.87 19.34 18.92 (93)m= 18.93 19.11 19.46 19.94 20.26 20.38 20.39 20.39 20.31 19.87 19.34 18.92 (93)m= 19.34 18.92 (93)m= 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 19.34 18.92 (93)m= 19.34 19	93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	
(94)m= 1 0.99 0.98 0.92 0.77 0.55 0.39 0.46 0.77 0.96 0.99 1	94)
Useful gains, hmGm , W = (94)m x (84)m	
	95)
Monthly average external temperature from Table 8	00)
	96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]	07)
	97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 558.99	
	00)
Total per year (kWh/year) = Sum(98) _{15,912} = 2751.48	98)
Space heating requirement in kWh/m²/year 37.89	99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary system 0	201)
Fraction of space heat from main system(s) $(202) = 1 - (201) = 1$	202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1	204)
Efficiency of main space heating system 1	206)
Efficiency of secondary/supplementary heating system, %	208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	
Space heating requirement (calculated above)	
558.99 442.69 359.01 173.64 53.28 0 0 0 0 204.44 393.93 565.49	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	211)
597.85 473.47 383.97 185.71 56.99 0 0 0 0 218.66 421.32 604.8	
Total (kWh/year) =Sum(211) _{15,1012} = 2942.76 (2	211)
Space heating fuel (secondary), kWh/month	
$= \{[(98)m \times (201)] \} \times 100 \div (208)$	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	
Total (kWh/year) = Sum(215) _{15,1012} = 0 (2	215)
Water heating	
Output from water heater (calculated above)	
191.8 169.09 177.65 159.35 156.22 139.69 134.26 147.19 146.89 165.23 174.59 187.22	
Efficiency of water heater 79.8	216)
(217)m= 87.5 87.27 86.65 85.04 82.27 79.8 79.8 79.8 79.8 85.38 86.92 87.58	217)
Fuel for water heating, kWh/month	
(219)m = (64)m x 100 ÷ (217)m	
(219)m= 219.2 193.76 205.01 187.37 189.88 175.06 168.24 184.45 184.07 193.51 200.86 213.77	
	219)
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 2942.76	
Space heating fuel used, main system 1 2942.76	

					_					
Water heating fuel used				2315.18						
Electricity for pumps, fans and electric keep-hot										
central heating pump:			30		(230c)					
boiler with a fan-assisted flue			45		(230e)					
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)					
Electricity for lighting	320.14	(232)								
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 5653.09 (338										
12a. CO2 emissions – Individual heating systems including micro-CHP										
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea						
Space heating (main system 1)	(211) x	0.216	=	635.64	(261)					
Space heating (secondary)	(215) x	0.519	=	0	(263)					
Water heating	(219) x	0.216	=	500.08	(264)					
Space and water heating	(261) + (262) + (263) + (264) =			1135.72	(265)					
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)					
Electricity for lighting	(232) x	0.519	=	166.15	(268)					
Total CO2, kg/year	sum	of (265)(271) =		1340.79	(272)					

TER =

(273)

18.46

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:03:21

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 53.96m²Site Reference:Highgate Road - GREENPlot Reference:04 - D

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.25 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.23 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 39.2 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.17 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor)
Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.07m ²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:										
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50					
Property Address: 04 - D Address:													
Overall dwelling dime	ensions:												
		Are	a(m²)		Av. He	ight(m)		Volume(m	³)				
Ground floor		:	53.96	(1a) x	2	.65	(2a) =	142.99	(3a)				
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	53.96	(4)									
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	142.99	(5)				
2. Ventilation rate:													
	main seconda heating heating	ry	other		total			m³ per hou	ır				
Number of chimneys	0 + 0] + [0	= [0	X 4	40 =	0	(6a)				
Number of open flues	0 + 0	+ [0	_ = [0	x 2	20 =	0	(6b)				
Number of intermittent fa	ns				2	x ′	10 =	20	(7a)				
Number of passive vents				Ē	0	x '	10 =	0	(7b)				
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)				
	(10)												
				_			Air ch	nanges per ho	our 				
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.14	(8)				
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	ea to (17),	otnerwise	continue ti	om (9) to	(16)		0	(9)				
Additional infiltration						[(9)	-1]x0.1 =	0	(10)				
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)				
if both types of wall are pa deducting areas of openia	resent, use the value corresponding t	o the grea	ter wall are	ea (after									
,	floor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)				
If no draught lobby, en	ter 0.05, else enter 0							0	(13)				
-	s and doors draught stripped							0	(14)				
Window infiltration			0.25 - [0.2	. ,	-			0	(15)				
Infiltration rate	50		(8) + (10)					0	(16)				
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$		•	•	etre of e	envelope	area	5	(17)				
· ·	es if a pressurisation test has been do				is being u	sed		0.39	(18)				
Number of sides sheltere				•				0	(19)				
Shelter factor			(20) = 1 -		19)] =			1	(20)				
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.39	(21)				
Infiltration rate modified f	- 1 		Τ.		T .	·		1					
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind sp	 	T 20	1 27	Ι 4	1 42	1.5	4.7	1					
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	l					
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4	_	_		_	_		,					
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18						

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.5 Calculate effe	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46		
If mechanica		_	ale ioi i	пе арри	саын са	SE						0	(23a)
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	n)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b)m = (22	2b)m + (23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole h if (22b)r		tract ven (23b), t		•	-				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)r		on or wh en (24d)							0.5]	•	•	-	
(24d)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6]	(24d)
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6		(25)
3. Heat losse	s and he	eat loss p	paramete	er:									
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-		A X k kJ/K
Windows					12.07	x1.	/[1/(1.4)+	0.04] =	16				(27)
Walls Type1	27.6	66	12.0	7	15.59) x	0.18	_ =	2.81	$\overline{}$ [(29)
Walls Type2	24.2	24	0		24.24	x x	0.18	_ = [4.36				(29)
Total area of e	elements	, m²			51.9								(31)
Party wall					31.67	, X	0	= [0				(32)
Party floor					53.96	5							(32a)
Party ceiling					53.96	5				Ī			(32b)
Internal wall **	•				95.03	<u></u>				Ī		7 F	(32c)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	h 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				23.17	(33)
Heat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	8447.4	2 (34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste	ad of a de	tailed calc	ulation.				ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge					-	<						6.04	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			29.21	(37)
Ventilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))	-	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 29.42	29.2	28.98	27.93	27.74	26.83	26.83	26.66	27.18	27.74	28.13	28.55]	(38)
Heat transfer	coefficie	nt, W/K			,	•	•	(39)m	= (37) + (38)m		7	
(39)m= 58.63	58.41	58.18	57.14	56.95	56.04	56.04	55.87	56.39	56.95	57.34	57.75		
								,	Average =	Sum(39) ₁	12 /12=	57.14	(39)

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.09	1.08	1.08	1.06	1.06	1.04	1.04	1.04	1.04	1.06	1.06	1.07		
` /				<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	L Average =	: Sum(40)₁.	12 /12=	1.06	(40)
Number of day	s in mo	nth (Tab	le 1a)							, ,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ina ene	rav reaui	rement								kWh/ye	ear	
4. Water fleat	ing cho	igy roqui	romont.								icvvii, y c	our.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		81		(42)
Annual average	ıl average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.11		(43)
not more that 125	litres per	person per	aay (all w	ater use, i	not and co	ia) •							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 84.82	81.74	78.65	75.57	72.49	69.4	69.4	72.49	75.57	78.65	81.74	84.82		
Energy content of	hot water	used - cali	culated m	onthly = 4	190 x Vd r	n x nm x F)Tm / 3600			ım(44) ₁₁₂ = ables 1b 1		925.35	(44)
(45)m= 125.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82		
(43)111= 123.79	110.02	113.55	90.90	34.91	01.95	75.94	07.14			Im(45) ₁₁₂ =		1213.27	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		rolar = Su	1111(43)112 =	l	1213.27	(40)
(46)m= 18.87	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27		(46)
Water storage	loss:			<u> </u>	<u> </u>	l	l		<u> </u>	<u> </u>			
Storage volume	e (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage				مسامات	/1.\^/L	- /-l : \ .							(40)
a) If manufact				or is kno	wn (kvvr	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost from b) If manufaction		_	-		or io not		(48) x (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	-			() ()		-57					<u> </u>		(0.1)
Volume factor	•										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in (55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by					ı —		<u> </u>	<u> </u>	ı —	- 			(50)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m$	
(62)m= 172.39 152.1 160.12 144.07 141.57 127.04 122.54 133.74 133.28 149.36 157.27 168.42	+ (01 <i>)</i> 111 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	(- /
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 172.39 152.1 160.12 144.07 141.57 127.04 122.54 133.74 133.28 149.36 157.27 168.42	
	61.89 (64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]	
(65)m= 79.1 70.25 75.02 68.98 68.85 63.32 62.53 66.25 65.39 71.45 73.37 77.78	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
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= 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 14.04 12.47 10.14 7.68 5.74 4.85 5.24 6.81 9.13 11.6 13.54 14.43	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 157.5 159.14 155.02 146.25 135.18 124.78 117.83 116.2 120.31 129.08 140.15 150.55	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03	(69)
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27	(71)
Water heating gains (Table 5)	
(72)m= 106.32 104.54 100.84 95.81 92.55 87.95 84.04 89.05 90.83 96.03 101.91 104.55	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 330.96 329.25 319.1 302.84 286.57 270.67 260.21 265.15 273.38 289.81 308.7 322.63	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gain	
Table 6d m² Table 6a Table 6b Table 6c (W	')
Northeast 0.9x 0.77 x 12.07 x 11.28 x 0.63 x 0.7 = 4	1.62 (75)
Northeast 0.9x 0.77 x 12.07 x 22.97 x 0.63 x 0.7 = 8.	4.72 (75)
Northeast 0.9x 0.77 x 12.07 x 41.38 x 0.63 x 0.7 = 15	(75)
Northeast 0.9x 0.77 x 12.07 x 67.96 x 0.63 x 0.7 = 25	(75)
Northeast 0.9x 0.77 x 12.07 x 91.35 x 0.63 x 0.7 = 33	(75)

Northeast _{0.9x}	0.77	Х	12.0	07	x	97.38	X		0.63	x	0.7	=	359.23	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	91.1	X		0.63	x	0.7	=	336.05	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	72.63	X		0.63	x	0.7	=	267.9	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	50.42	X		0.63	x	0.7	=	185.99	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	28.07	X		0.63	x	0.7	=	103.53	(75)
Northeast _{0.9x}	0.77	х	12.0	07	x	14.2	X		0.63	x	0.7	=	52.37	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	9.21	X		0.63	x [0.7	=	33.99	(75)
Solar gains in w	ī				1		(83)m	n = Si	um(74)m .	(82)m			l	
(83)m= 41.62	84.72	152.64	250.67	336.95		9.23 336.05	267	7.9	185.99	103.53	52.37	33.99		(83)
Total gains – in			` 		·			1			1			(0.4)
(84)m= 372.58	413.97	471.74	553.51	623.52	62	9.9 596.26	533	3.05	459.37	393.35	361.07	356.62		(84)
7. Mean intern	al tempo	erature ((heating	season)									
Temperature of	during he	eating p	eriods ir	the livi	ng a	rea from Tal	ble 9	, Th	1 (°C)				21	(85)
Utilisation factor	or for ga	ins for l	iving are	ea, h1,m	(se	e Table 9a)		-					l	
Jan	Feb	Mar	Apr	May	J	un Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.92	0.77	0.	56 0.41	0.4	48	0.77	0.96	0.99	1		(86)
Mean internal	tempera	ature in I	iving are	ea T1 (fo	ollow	steps 3 to	7 in T	Table	e 9c)					
(87)m= 19.93	20.07	20.33	20.68	20.91	20	.99 21	2	1	20.93	20.62	20.22	19.91		(87)
Temperature of	during he	eating p	eriods ir	rest of	dwe	lling from Ta	able 9	9, Tł	n2 (°C)					
(88)m= 20.01	20.02	20.02	20.03	20.04	20	.05 20.05	20.	.05	20.05	20.04	20.03	20.03		(88)
Utilisation factor	or for ga	ins for r	est of d	wellina	h2 m	n (see Table	9a)	•					l	
(89)m= 0.99	0.99	0.97	0.9	0.71	_	48 0.32	0.3	38	0.69	0.94	0.99	1		(89)
Mean internal	tompore	turo in t	ho roct	of dwalli	na T	72 (follow st	nc 2	2 to 7	7 in Tahl	0.00)				
(90)m= 18.59	18.79	19.17	19.67	19.96	Ť	.04 20.05	20.		20	19.6	19.04	18.58		(90)
(11)		!									ng area ÷ (4		0.47	(91)
Managara da Garagara I			. 11 1.	.1) (I A T4	. /4		۸\ <u>T</u> 0				••••	`
Mean internal (92)m= 19.22	19.4	19.72	20.15	20.41		$ \begin{array}{c c} 1 = 1 \text{LA} \times 11 \\ \hline .49 & 20.5 \end{array} $	+ (1		20.44	20.08	19.6	19.21		(92)
Apply adjustm											19.0	19.21		(02)
(93)m= 19.22	19.4	19.72	20.15	20.41	_	.49 20.5	20		20.44	20.08	19.6	19.21		(93)
8. Space heati														· ·
Set Ti to the m			nperatur	e obtair	ned a	at step 11 of	Tabl	le 9t	o, so tha	t Ti,m=((76)m an	d re-calc	ulate	
the utilisation f						<u>'</u>					,		ı	
Jan	Feb	Mar	Apr	May	J	un Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation factor	Ť	ī										i	1	4
(94)m= 0.99	0.99	0.97	0.9	0.73	0.	52 0.37	0.4	43	0.72	0.94	0.99	0.99		(94)
Useful gains, h		<u> </u>					1 007		000.4	074.00	050.45	054.70		(OE)
` '	409.06	457.35	497.41	457.34		5.31 217.85	227	.64	332.1	371.03	356.45	354.76		(95)
Monthly avera	ge exter	6.5	8.9	11.7		8 I.6 16.6	16	. 4	14.1	10.6	7.1	4.2		(96)
Heat loss rate											1 '.1	7.4		(00)
(97)m= 874.98	846.6	769	642.6	495.76	_	30 218.42	228	_	357.48	540.07	716.56	866.86		(97)
Space heating														• •
· -	294.03	231.87	104.53	28.59		0 0	- 1 / 0		0	125.77	259.28	381		
		!			Ь	<u> </u>					1	<u> </u>	l	

Total per year (kWh/y	ear) = Sum(9	98)15,912 =	1800.63	(98)
Space heating requirement in kWh/m²/year			33.37	(99)
9a. Energy requirements – Individual heating systems including micro-CHP)				
Space heating:		_		-
Fraction of space heat from secondary/supplementary system			0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$		Ĺ	1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$		Į	1	(204)
Efficiency of main space heating system 1		L	93.5	(206)
Efficiency of secondary/supplementary heating system, %			0	(208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oc	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)				
375.57 294.03 231.87 104.53 28.59 0 0 0 0 125.7	7 259.28	381		
211)m = {[(98)m x (204)] } x 100 ÷ (206)	•			(211)
401.68 314.47 247.99 111.8 30.57 0 0 0 0 134.5		407.49		_
Total (kWh/year) =Su	n(211) _{15,101}	2=	1925.81	(211)
Space heating fuel (secondary), kWh/month				
= {[(98)m x (201)] } x 100 ÷ (208)	1 -			
215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0		¬
Total (kWh/year) =Su	II(213) _{15,101}	2=	0	(215)
Water heating				
Output from water heater (calculated above) 172.39 152.1 160.12 144.07 141.57 127.04 122.54 133.74 133.28 149.3	6 157.27	168.42		
Efficiency of water heater			79.8	(216)
217)m= 86.84 86.54 85.8 83.97 81.42 79.8 79.8 79.8 79.8 84.30	86.14	86.93		(217)
Fuel for water heating, kWh/month				
219)m = (64)m x 100 ÷ (217)m		1		
219)m= 198.52 175.75 186.62 171.56 173.88 159.2 153.55 167.59 167.01 177.0		193.74		٦
Total = Sum(219a) ₁₁₂		L	2107.07	(219)
Annual totals Space heating fuel used, main system 1	kWh/yea	r 「	1925.81	r ¬
		L		╡
Nater heating fuel used		L	2107.07	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(2300
boiler with a fan-assisted flue		45		(230
) =		75	(231)
Fotal electricity for the above, kWh/year sum of (230a)(230g		F	0.47.00	(232)
, , , , , , , , , , , , , , , , , , , ,			247.96	(- /
Total electricity for the above, kWh/year sum of (230a)(230g) Electricity for lighting Total delivered energy for all uses (211)(221) + (231) + (232)(237b) =		L T	4355.84	(338)

Energy kWh/year **Emissions**

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	415.98	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	455.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =			871.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	128.69	(268)
Total CO2, kg/year	sum	of (265)(271) =		1038.72	(272)

TER =

(273)

19.25

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:03:18

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:**

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.61m² Site Reference : Highgate Road - GREEN

Plot Reference: 04 - E

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 18.52 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.10 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.9 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 41.2 kWh/m²

OK

2 Fabric U-values

Element Average Highest 0.18 (max. 0.70) External wall 0.18 (max. 0.30) OK Party wall 0.00 (max. 0.20) OK Floor (no floor) OK

Roof 0.13 (max. 0.20) 0.13 (max. 0.35)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Windows facing: South West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m ² K	
Community heating, heat from boilers – mains gas		

		l Iser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	04 - E					
1. Overall dwelling dimer	nsions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor		(69.61	(1a) x	2	2.65	(2a) =	184.47	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (69.61	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	184.47	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	Ī - Ē	0	x 2	20 =	0	(6b)
Number of intermittent far	ns			, <u> </u>	2	x '	10 =	20	(7a)
Number of passive vents				F	0	x -	10 =	0	(7b)
Number of flueless gas fir	res			_ [0	X	40 =	0	(7c)
•				L					`
							Air ch	anges per ho	our
•	vs, flues and fans = $(6a)+(6b)+(6b)$				20		÷ (5) =	0.11	(8)
If a pressurisation test has be Number of storeys in th	een carried out or is intended, procee e dwelling (ns)	ed to (17),	otherwise of	continue fr	om (9) to	(16)		0	(9)
Additional infiltration	o awoming (no)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction	- ,		0	(11)
if both types of wall are pro deducting areas of openin	esent, use the value corresponding t	o the grea	ter wall are	a (after					
•	oor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0	`	,.					0	(13)
Percentage of windows	and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic metro	-	•	•	etre of e	envelope	area	5	(17)
•	ty value, then $(18) = [(17) \div 20] + (18)$ is if a pressurisation test has been do				is beina u	sed		0.36	(18)
Number of sides sheltered			g. 00 a po					0	(19)
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			1	(20)
Infiltration rate incorporati	ng shelter factor		(21) = (18	x (20) =				0.36	(21)
Infiltration rate modified for	or monthly wind speed		1		1		1	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe			-					1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	?)m ÷ 4								
(22a)m= 1.27 1.25 1	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

	ation rat	<u> </u>					`	` 				ı	
0.46 Calculate effe	0.45	0.44 change	0.39	0.39 he appli	0.34 cable ca	0.34	0.33	0.36	0.39	0.4	0.42		
If mechanic		•	ale for t	пе арріі	cable ca	30						0	(2
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	n)m = (22)	2b)m + (23b) × [ا (23c) – 1	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)	•		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	ouse ex	tract ver	tilation o	or positiv	e input v	entilatio	n from o	outside			-		
if (22b)r	n < 0.5 ×	(23b), t	hen (24	c) = (23b); other	vise (24	c) = (22k	o) m + 0.	5 × (23b)		-	
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r	ventilation $= 1$, the			•	•				0.5]				
24d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
2	م ما امراد	at loss :		. w.									
3. Heat losse	s and ne	_			Net Ar	00	U-valı	10	AXU		k-value	· ^	λΧk
LEMENT	area	_	Openin m		A,r		W/m2		(W/I	<)	kJ/m²·ł		J/K
indows Type	e 1				8.97	x1	/[1/(1.4)+	0.04] =	11.89				(
/indows Type	e 2				2.92	x1	/[1/(1.4)+	0.04] =	3.87				(2
/alls Type1	41.5	59	11.89	9	29.7	x	0.18	i	5.35	=		ヿ 	(2
Valls Type2	18.4	<u></u>	0	=	18.41	x	0.18	╡┇	3.31	=		i	(2
loof	69.6	61	0	=	69.61	= x	0.13	╡┇	9.05	=		i	(3
otal area of e					129.6	=							` (;
arty wall		,			38.68	=	0		0	— [–) (;
arty floor						=			0			┥ ├─	(;
iternal wall **	•				69.61	=				L		$\exists \vdash \vdash$	_
for windows and		owe uso e	ffective wi	ndow H-vs	136.2		r formula 1	/[(1/ ₋ valı	(۱۸۵ مرامر	L s aiven in	naragranh		(;
include the area		-				ateu using	i ioiiniala i	/[(1/ O -vaic	1 0 /+0.04j a	s giveri iii	paragrapri	5.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				33.47	(
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	9263.98	(
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium	j	250	(
or design assess an be used inste				constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix l	<						7.21	(
details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he	at loss							(33) +	(36) =			40.68	(:
entilation hea	 		monthly				1	(38)m	= 0.33 × (25)m x (5))	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 36.79	36.55	36.3	35.17	34.96	33.97	33.97	33.78	34.35	34.96	35.39	35.84		(
00.70	-												
eat transfer of	coefficie	nt, W/K						(39)m	= (37) + (3	38)m		-	

Heat loss para	meter (l	-II D\ \\//	m²k′					(40)m	= (39)m ÷	. (4)			
(40)m= 1.11	1.11	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.09	1.1		
(10)=			1.00	1.00	1.07	1.07	1.01		<u> </u>	Sum(40) ₁ .		1.09	(40)
Number of day	s in mo	nth (Tab	le 1a)					•	wordgo –	Carri (10)	12 / 12-	1.00	(```
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		24		(42)
Annual average Reduce the annua not more that 125	e hot wa laverage	hot water	usage by	5% if the α	lwelling is	designed t			se target o		7.32		(43)
							Λιια	Con	Oct	Nov	Doo		
Jan Hot water usage in	Feb	Mar day for ea	Apr ach month	May $Vd.m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	92.56	89.07	85.57	82.08	78.59	78.59	82.08	85.57	89.07	92.56	96.05		
(44)m= 96.05	92.50	09.07	05.57	02.00	70.59	70.59	02.00			m(44) ₁₁₂ =	l	1047.84	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C)Tm / 3600			` '		1047.04	(\/
(45)m= 142.44	124.58	128.56	112.08	107.54	92.8	85.99	98.68	99.86	116.37	127.03	137.95		
` '		l						-	I Total = Su	m(45) ₁₁₂ =		1373.88	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)		, ,	'		
(46)m= 21.37	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69		(46)
Water storage		•								!			
Storage volume	` '		-			•		ame ves	sel		150		(47)
If community h	•			•			` '		(01 ! /	(47)			
Otherwise if no Water storage		not wate	er (tnis ir	iciuaes i	nstantar	eous co	ilod idmo	ers) ente	er o in (47)			
a) If manufacti		eclared l	oss facto	or is kno	wn (kWł	n/dav):				1	39		(48)
Temperature fa					(., u.u.y , .					54		(49)
Energy lost from				ear			(48) x (49)) =			75		(50)
b) If manufacti		_	-		or is not		(10) // (10)	,		0.	73		(30)
Hot water stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
If community h	_		on 4.3										
Volume factor			O.							—	0		(52)
Temperature fa											0		(53)
Energy lost from		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (, ,	,					((50)	==> (44)		0.	75		(55)
Water storage	loss cal	culated f	or each	month		г	((56)m = (55) × (41)ı	m ·				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•	. ,	, ,		v 4h = ==== -	otot)			
(modified by						ı —			ı —	<u> </u>	00.00		(EO)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss ca	lculated	for each	month ((61)m =	(60) ÷ :	365 × (41)m							
(61)m= 0	0	0	0	0	0	0) 0		0	0	0	0]	(61)
	uired for	water h	L eating ca	Lalculated	L I for ea	 ch month	(62)	— m =	0.85 × (′45)m +		(57)m +	ו · (59)m + (61)m	
(62)m= 189.04	166.67	175.15	157.17	154.14	137.89		145	_	144.95	162.97	172.12	184.54]	(62)
Solar DHW input	calculated	using App	endix G o	r Appendix	H (nega	tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	1	
(add additiona												0,		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0	1	(63)
Output from w	ater hea	ter				•					•	!	•	
(64)m= 189.04	166.67	175.15	157.17	154.14	137.89	132.59	145	.27	144.95	162.97	172.12	184.54]	
						•		Outp	out from wa	ater heate	er (annual)	112	1922.5	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	n]	
(65)m= 84.64	75.09	80.02	73.34	73.03	66.93	65.87	70.	09	69.28	75.97	78.31	83.14]	(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):										
Metabolic gair	ns (Table	5). Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.83	111.83	111.83	111.83	111.83	111.83	111.83	111	.83	111.83	111.83	111.83	111.83	1	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5		•		•	
(67)m= 18.04	16.02	13.03	9.87	7.37	6.23	6.73	8.7	'4	11.74	14.9	17.39	18.54]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 196.39	198.42	193.29	182.36	168.55	155.58	146.92	144	.88	150.02	160.95	174.75	187.72]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	or L15a), als	o se	e Table	5	•		•	
(69)m= 34.18	34.18	34.18	34.18	34.18	34.18	34.18	34.	18	34.18	34.18	34.18	34.18]	(69)
Pumps and fa	ns gains	(Table 5				•							•	
(70)m= 3	3	3	3	3	3	3	3	1	3	3	3	3]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)	•					•		•	
(71)m= -89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.	.46	-89.46	-89.46	-89.46	-89.46]	(71)
Water heating	gains (T	able 5)									•		•	
(72)m= 113.76	111.74	107.55	101.86	98.16	92.96	88.53	94.	.2	96.22	102.11	108.77	111.75]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m	•	
(73)m= 387.74	385.74	373.42	353.63	333.64	314.32	301.73	307	.38	317.52	337.51	360.46	377.56]	(73)
6. Solar gain	s:					•					•			
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica	ble orienta	tion.		
Orientation:			Area			ux		_	g_	-	FF		Gains	
_	Table 6d		m²			able 6a			able 6b	_ ' 	able 6c		(W)	_
Northeast _{0.9x}	0.77	Х	8.9	97	х	11.28	X		0.63	x	0.7	=	30.93	(75)
Northeast _{0.9x}	0.77	X	8.8	97	х	22.97	X		0.63	x	0.7	=	62.96	(75)
Northeast _{0.9x}	0.77	X	8.8	97	x	41.38	X		0.63	x	0.7	=	113.43	(75)
Northeast _{0.9x}	0.77	X	8.9	97	x	67.96	X		0.63	x	0.7	=	186.29	(75)
Northeast _{0.9x}	0.77	X	8.9	97	X	91.35	X		0.63	X	0.7	=	250.41	(75)

_								_						_
Northeast 0.9x	0.77	Х	8.9)7	X	9	7.38	X	0.63	X	0.7	=	266.96	(75)
Northeast 0.9x	0.77	X	8.9)7	X	9	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast 0.9x	0.77	X	8.9)7	x	7.	2.63	x	0.63	X	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	X	8.9)7	X	5	0.42	X	0.63	X	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	X	8.9)7	X	2	8.07	x	0.63	X	0.7	=	76.94	(75)
Northeast _{0.9x}	0.77	X	8.9)7	X	1	14.2	x	0.63	X	0.7	=	38.92	(75)
Northeast 0.9x	0.77	X	8.9)7	X	9	9.21	x	0.63	X	0.7	=	25.26	(75)
Southwest _{0.9x}	0.77	X	2.9)2	x	3	6.79		0.63	x	0.7	=	32.83	(79)
Southwest _{0.9x}	0.77	X	2.9)2	X	6	2.67		0.63	X	0.7	=	55.93	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	8	5.75		0.63	X	0.7	=	76.52	(79)
Southwest _{0.9x}	0.77	X	2.9)2	X	10	06.25		0.63	X	0.7	=	94.82	(79)
Southwest _{0.9x}	0.77	X	2.9)2	X	11	19.01		0.63	X	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	11	18.15		0.63	X	0.7	=	105.44	(79)
Southwest _{0.9x}	0.77	X	2.9)2	X	11	13.91		0.63	X	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	10	04.39		0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	X	2.9)2	X	9	2.85		0.63	X	0.7	=	82.86	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	6	9.27]	0.63	X	0.7	=	61.81	(79)
Southwest _{0.9x}	0.77	X	2.9)2	x	4	4.07		0.63	x	0.7	=	39.33	(79)
Southwest _{0.9x}	0.77	X	2.9)2	X	3	1.49		0.63	X	0.7	=	28.1	(79)
Solar gains in (83)m= 63.76 Total gains – in	118.89	189.96	281.11	356.62	3	372.4	351.39	(<mark>83</mark>)m 292	n = Sum(74)m . .25 221.08	(82)m 138.70	6 78.25	53.36]	(83)
(84)m= 451.5	504.63	563.38	634.74	690.26	Ť	86.72	653.12	599	.63 538.6	476.2	7 438.71	430.92]	(84)
` ′	504.63	563.38	634.74	690.26	68	<u> </u>		599	.63 538.6	476.2	7 438.71	430.92		(84)
(84)m= 451.5 7. Mean inter Temperature	504.63 nal tempo	563.38 erature	634.74 (heating	690.26 season	68	86.72	653.12			476.2	7 438.71	430.92	21	(84)
7. Mean inter	504.63 nal tempo during ho	563.38 erature (eating p	634.74 (heating	690.26 seasor	68 n)	86.72 area f	653.12 from Tab			476.2	7 438.71	430.92	21	
7. Mean inter	504.63 nal tempo during ho	563.38 erature (eating p	634.74 (heating	690.26 seasor	68 ing	86.72 area f	653.12 from Tab	ole 9		476.2°		430.92 Dec	21	
7. Mean inter Temperature Utilisation fac	504.63 nal tempe during he etor for ga	erature (eating pains for li	634.74 (heating eriods in	season the livi	68 ing n (se	area f	653.12 from Tab ble 9a)	ole 9	, Th1 (°C)				21	
7. Mean inter Temperature Utilisation fac Jan (86)m= 1	nal tempo during ho etor for ga Feb	erature (eating pains for limits of limits) Mar 0.99	634.74 (heating eriods in ving are Apr 0.95	season the livi ea, h1,m May	68 ing n (se	area f ee Ta Jun	653.12 from Tab ble 9a) Jul 0.5	ole 9 A	, Th1 (°C) ug Sep 66 0.82	Oct	Nov	Dec	21	(85)
7. Mean inter Temperature Utilisation fac	nal tempo during ho etor for ga Feb	erature (eating pains for limits of limits) Mar 0.99	634.74 (heating eriods in ving are Apr 0.95	season the livi ea, h1,m May	ing (so	area f ee Ta Jun	653.12 from Tab ble 9a) Jul 0.5	ole 9 A	Th1 (°C) Sep 6 0.82 Table 9c)	Oct	Nov 0.99	Dec	21	(85)
7. Mean inter Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 19.85	nal temperature of the state of	erature eating pains for limits for limits for limits and limits for limits f	634.74 (heating eriods in ving are 0.95 iving are 20.57	season the livies, h1,m May 0.85 ea T1 (for	68 (Second of the control of the con	area f ee Ta Jun 0.66 w ste	653.12 from Tak ble 9a) Jul 0.5 ps 3 to 7 20.99	ole 9 A 0.5 in T 20.	Sep 66 0.82 Table 9c) 99 20.9	Oct 0.97	Nov 0.99	Dec 1	21	(85)
7. Mean inter Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 19.85 Temperature	nal temperature of the state of	erature eating pains for limits for limits for limits and limits for limits f	634.74 (heating eriods in ving are 0.95 iving are 20.57	season the livies, h1,m May 0.85 ea T1 (for	68 (solution)	area f ee Ta Jun 0.66 w ste	653.12 from Tak ble 9a) Jul 0.5 ps 3 to 7 20.99	ole 9 A 0.5 in T 20.	Sep 66 0.82 Fable 9c) 99 20.9 9, Th2 (°C)	Oct 0.97	Nov 0.99 20.15	Dec 1	21	(85)
7. Mean internation factors and the second s	nal temporal during heater for garage Feb 0.99 I temperal 19.99 during heater 19.99	erature eating pains for limited Mar 0.99 ature in lace 20 20	634.74 (heating eriods in Apr 0.95 iving are 20.57 eriods in 20.01	seasor of the living t	66 (sollo ollo 2	area f ee Ta Jun 0.66 w ste 20.97 velling	653.12 from Tab ble 9a) Jul 0.5 ps 3 to 7 20.99 from Ta	ole 9 A 0.57 in T 20. able 9	Sep 66 0.82 Fable 9c) 99 20.9 9, Th2 (°C)	Oct 0.97 20.56	Nov 0.99 20.15	Dec 1	21	(85) (86) (87)
7. Mean inter Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 19.85 Temperature (88)m= 19.99 Utilisation fac	nal temperature of the second	erature eating pains for line ature in land 20.24 eating pains for real land ature in land 20.24 eating pains for real land ature in land 20.24 eating pains for real land ature in land 20.24 eating pains for real land ature in land 20.24 eating pains for real land	634.74 (heating eriods in ving are 0.95) iving are 20.57 eriods in 20.01	season the livies, h1,m May 0.85 ea T1 (for 20.84 or rest of 20.01 welling,	66 (solution) (solutio	area f ee Ta Jun 0.66 w stel 20.97 velling 20.02 m (se	from Table 9a) Jul 0.5 ps 3 to 7 20.99 from Ta 20.02	A 0.5.7 in T 20. bble 9 20. 9a)	Sep 66 0.82 Table 9c) 99 20.9 9, Th2 (°C) 03 20.02	Oct 0.97 20.56	Nov 0.99 20.15	Dec 1 19.84 20	21	(85) (86) (87) (88)
7. Mean inter Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 19.85 Temperature (88)m= 19.99 Utilisation fac (89)m= 1	nal temperature of the second	erature eating pains for line 20.24 eating pains for rough	634.74 (heating eriods ir ving are 0.95 iving are 20.57 eriods ir 20.01 est of do 0.93	season the livies, h1,m May 0.85 ea T1 (for 20.84 or rest of 20.01 welling, 0.8	66 (sing (sing collows)) (sing collows) (sing collo	area f ee Ta Jun 0.66 w ste 20.97 velling 20.02 m (se 0.57	653.12 From Take ble 9a) Jul 0.5 ps 3 to 7 20.99 from Take 20.02 re Table 0.39	A 0.5 of 1 of 1 of 1 of 1 of 1 of 1 of 1 of	Sep 66 0.82 Table 9c) 99 20.9 9, Th2 (°C) 03 20.02	Oct 0.97 20.56 20.01	Nov 0.99 20.15	Dec 1	21	(85) (86) (87)
7. Mean internation factors and the second s	nal temporal	erature (eating pains for line) ature in line) 20.24 eating pains for rine) 20.99 ature in time for rine)	634.74 (heating eriods in ving are Apr 0.95) iving are 20.57 eriods in 20.01 est of do 0.93 he rest	season the livi ea, h1,m May 0.85 ea T1 (for 20.84 n rest of 20.01 welling, 0.8	66 (sing (sing collows)) (sing collows) (sing collo	area f ee Ta Jun 0.66 w ste 20.97 velling 20.02 m (se 0.57	from Table 9a) Jul 0.5 ps 3 to 7 20.99 from Ta 20.02 pe Table 0.39 pllow ste	A 0.5 on T 20. on T 2	Sep 66 0.82 Table 9c) 99 20.9 9, Th2 (°C) 03 20.02 15 0.75 to 7 in Table	Oct 0.97 20.56 20.01 0.96 e 9c)	Nov 0.99 20.15 20.01	Dec 1 1 19.84 20 1	21	(85) (86) (87) (88) (89)
7. Mean inter Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 19.85 Temperature (88)m= 19.99 Utilisation fac (89)m= 1	nal temperature of the second	erature eating pains for line 20.24 eating pains for rough	634.74 (heating eriods ir ving are 0.95 iving are 20.57 eriods ir 20.01 est of do 0.93	season the livies, h1,m May 0.85 ea T1 (for 20.84 or rest of 20.01 welling, 0.8	66 (sing (sing collows)) (sing collows) (sing collo	area f ee Ta Jun 0.66 w ste 20.97 velling 20.02 m (se 0.57	653.12 From Take ble 9a) Jul 0.5 ps 3 to 7 20.99 from Take 20.02 re Table 0.39	A 0.5 of 1 of 1 of 1 of 1 of 1 of 1 of 1 of	Th1 (°C) ug Sep 66 0.82 Table 9c) 99 20.9 9, Th2 (°C) 03 20.02 to 7 in Tabl 02 19.94	Oct 0.97 20.56 20.01 0.96 e 9c) 19.5	Nov 0.99 20.15 20.01 0.99	Dec 1 19.84 20 1		(85) (86) (87) (88) (89)
7. Mean inter Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 19.85 Temperature (88)m= 19.99 Utilisation fac (89)m= 1 Mean interna (90)m= 18.47	source for garage for garage for g	erature eating pains for In 20.24 eating pains for In 0.98 eature in 1 19.03	634.74 (heating eriods in ving are 20.57 eriods in 20.01 est of do 0.93 he rest 19.51	seasor of the living t	66 (sing) (solution) (area f ee Ta Jun 0.66 ow stel 20.97 relling 20.02 m (se 0.57 T2 (fo	653.12 from Take ble 9a) Jul 0.5 ps 3 to 7 20.99 from Take 20.02 re Table 0.39 pollow steen 20.02	A 0.5 on 1 on 1 on 1 on 1 on 1 on 1 on 1 on	Th1 (°C) ug Sep 66 0.82 Table 9c) 99 20.9 9, Th2 (°C) 03 20.02 to 7 in Tabl 02 19.94	Oct 0.97 20.56 20.01 0.96 e 9c) 19.5	Nov 0.99 20.15 20.01	Dec 1 19.84 20 1	21	(85) (86) (87) (88) (89)
7. Mean inter Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 19.85 Temperature (88)m= 19.99 Utilisation fac (89)m= 1 Mean interna (90)m= 18.47	source of the second se	erature eating pains for line 20.24 eating pains for rough ature in the 19.03 eature (for	634.74 (heating eriods in ving are Apr 0.95) iving are 20.57 eriods in 20.01 est of do 0.93 he rest 19.51	season the livi ea, h1,m May 0.85 ea T1 (for 20.84 n rest of 20.01 welling, 0.8 of dwell 19.86	ollo 2 h2,	area f ee Ta Jun 0.66 w ste 20.97 velling 20.02 m (se 0.57 T2 (fc 20	653.12 from Table 9a) Jul 0.5 ps 3 to 7 20.99 from Ta 20.02 ee Table 0.39 bllow ste 20.02	A 0.6 9 A 0.6 9 O.6 9 O.6 9 O.6 9 O.6 9 O.7 in T 20 O.6 9 O.7 in T 20 O.7 in T 20 O.7 in T 20 O.8 1	Th1 (°C) ug Sep 66 0.82 Table 9c) 99 20.9 9, Th2 (°C) 03 20.02 15 0.75 to 7 in Tabl 02 19.94 ft.A) × T2	Oct 0.97 20.56 20.01 0.96 e 9c) 19.5	Nov 0.99 20.15 20.01 0.99 18.92 ring area ÷ (4	Dec 1 1 19.84 20 1 1 18.45 4) =		(85) (86) (87) (88) (89) (90) (91)
7. Mean inter Temperature Utilisation fac Jan (86)m= 1 Mean interna (87)m= 19.85 Temperature (88)m= 19.99 Utilisation fac (89)m= 1 Mean interna (90)m= 18.47	nal temporal during heter for garage during heter for	erature eating pains for line 20.24 eating pains for rough ature in the 19.03 eature (for 19.49)	634.74 (heating eriods in ving are 20.57 eriods in 20.01 est of do 0.93 he rest 19.51 r the wh	season the livies, h1,m May 0.85 ea T1 (for 20.84 en rest of 20.01 elling, 0.8 of dwell 19.86 ele dwell 20.23	66 ollo 2 h2, colling billing 2	area f ee Ta Jun 0.66 w ste 0.97 relling 0.02 m (se 0.57 T2 (fc 20 g) = fl	653.12 from Take ble 9a) Jul 0.5 ps 3 to 7 20.99 from Take ble 9a) 20.02 re Table 0.39 pollow stee 20.02 A × T1 20.39	A 0.5 on T 20. on T 2	Sep 66 0.82 Table 9c) 99 20.9 9, Th2 (°C) 03 20.02 15 0.75 to 7 in Tabl 02 19.94 f fLA) × T2 39 20.31	Oct 0.97 20.56 20.01 0.96 e 9c) 19.5 LA = Liv	Nov 0.99 20.15 20.01 0.99 18.92 ring area ÷ (4	Dec 1 19.84 20 1		(85) (86) (87) (88) (89)

												l	
(93)m= 1		19.49	19.91	20.23	20.37	20.39	20.39	20.31	19.9	19.39	18.98		(93)
	heating rec												
	he mean in tion factor f		•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	factor for g	<u> </u>		iviay	<u> </u>	<u> </u>	l mag	СОР	000	1101	200		
(94)m= 0.9		0.98	0.93	0.81	0.61	0.43	0.49	0.77	0.95	0.99	1		(94)
Useful ga	ins, hmGm	, W = (94	4)m x (84	4)m		<u>!</u>				!		l	
(95)m= 449	.19 499.78	550.46	590.78	559.57	416.56	281.18	293.54	416.95	454.64	434.23	429.17		(95)
Monthly a	verage ext	ernal tem	perature	from Ta	able 8		•						
(96)m= 4.	3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss	rate for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	-			
(97)m= 113	8.5 1102.3	999.86	835.35	645.26	430.75	283.07	297.14	465.54	703.6	934.61	1130.58		(97)
	ating requir	1			Wh/mon	th = 0.02	24 x [(97)m – (95	<u>`</u>	1)m	,	ı	
(98)m= 512	.85 404.89	334.35	176.09	63.76	0	0	0	0	185.23	360.27	521.85		_
							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2559.29	(98)
Space he	ating requir	ement in	kWh/m²	² /year								36.77	(99)
9a. Energy	requireme	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space he	·							,					
Fraction of	f space he	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction of	f space he	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of	f total heat	ing from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency	of main sp	ace heat	ing syste	em 1								93.5	(206)
•	of seconda		-		a system	ղ. %						0	(208)
	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ′
	ating requir	<u> </u>	•		l	<u> </u>	l mag	СОР	000	1 1101	200	KVVIII y OC	A 1
	.85 404.89	334.35	176.09	63.76	0	0	0	0	185.23	360.27	521.85		
(211)m = {	(98)m x (2)	04)1 } x 1	00 ÷ (20)6)	!	l							(211)
548	·	357.6	188.34	68.19	0	0	0	0	198.11	385.32	558.12		()
<u> </u>	!	!			ļ		Tota	l (kWh/yea	ar) =Sum(2	1 211) _{15,1012}	<u>. </u>	2737.2	(211)
Space he	ating fuel (s	secondar	v). kWh/	month									_
$= \{[(98)m x]\}$	•		• •										
(215)m=	0	0	0	0	0	0	0	0	0	0	0		
	•	•			!		Tota	I (kWh/yea	ar) =Sum(2	215) _{15,101}	<u></u>	0	(215)
Water hea	ting												_
Output from	n water hea		ulated a	bove)		•						ı	
189	.04 166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54		_
Efficiency	of water he	ater										79.8	(216)
(217)m= 87.	35 87.09	86.51	85.12	82.66	79.8	79.8	79.8	79.8	85.16	86.74	87.44		(217)
Fuel for wa	_												
(219)m = (219)m = 216		0 ÷ (217) 202.46	m 184.65	186.47	172.8	166.15	182.05	181.64	191.38	198.44	211.06		
(213)111= 210	.72 131.30	202.40	104.00	100.47	172.0	100.10		I = Sum(2		130.44	211.00	2284.87	(210)
Annual to	ale						1010	• • • • • • • • • • • • • • • • • •		Wh/yeaı		kWh/year	(219)
Space hea		ed, main	system	1					ĸ	•••#yedi		2737.2	1
	•	·	•										J

Water heating fuel used				2284.87	7
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)
Electricity for lighting				318.62	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			5415.69	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy	Emission fac	ctor	Emissions	
	kWh/year	kg CO2/kWh		kg CO2/yea	
Space heating (main system 1)	<u> </u>	kg CO2/kWh	=	kg CO2/yea	
Space heating (main system 1) Space heating (secondary)	kWh/year		=		ar ¬
	kWh/year	0.216		591.24	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	0.216	=	591.24	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	0.216	=	591.24 0 493.53	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 0.519 0.216	=	591.24 0 493.53 1084.77	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 0.519 0.216	= =	591.24 0 493.53 1084.77 38.93	(261) (263) (264) (265) (267)

TER =

(273)

18.52

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:15*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 50.62m²Site Reference:Highgate Road - GREENPlot Reference:04 - F

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 21.42 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.26 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 57.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 46.0 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.17 (max. 0.30) 0.18 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK

Floor (no floor)

Roof 0.13 (max. 0.20) 0.13 (max. 0.35) **OK**Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Iser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					0010943 on: 1.0.5.50	
Address :	F	Property	Address	04 - F					
1. Overall dwelling dime	ensions:								
3		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor		;	50.62	(1a) x	2	2.65	(2a) =	134.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) = = :	50.62	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	134.14	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hoι	ır
Number of chimneys	0 + 0	+ [0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī - Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ns				2	x ²	10 =	20	(7a)
Number of passive vents	;			Ē	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per he	our
	ys, flues and fans = (6a)+(6b)+(ontinus fr	20		÷ (5) =	0.15	(8)
Number of storeys in the	neen carried out or is intended, procee he dwelling (ns)	ea 10 (17),	otrierwise (onunue ir	om (9) to	(10)		0	(9)
Additional infiltration	3 ()					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (15) -		0	(15)
Infiltration rate	q50, expressed in cubic metro	se nar h	(8) + (10)				area	0	(16)
•	lity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	elle oi e	rivelope	aica	0.4	(17)
•	es if a pressurisation test has been do				is being u	sed		<u> </u>	(\ -/
Number of sides sheltere	ed		(20) 4	10 07F ·· //	10)1			0	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			1	(20)
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (10) X (20) =				0.4	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1	1	1 3		1	1 -		J	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Faster (00s) (0	2)	-	•		•	-	-	•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	1	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	1 0.33	1 0.32	'	1.00	1.12	1.10	J	

0.51	ation rate (a).49	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47]	
Calculate effe		•	te for t	he appli	cable ca	se	<u> </u>				!		
If mechanica												0	(2
If exhaust air h				, ,	,	. `	***	`) = (23a)			0	(2
If balanced with		•	•	•		,	·					0	(2
a) If balance		i	1			<u> </u>	HR) (24a	<u> </u>			1 – (23c)) ÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
b) If balance							r ´`	<u> </u>	r í à		ı	1	
(4b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h				•	•				F (22h	`			
4c)m= 0	n < 0.5 × (2	0 T	0	0	o), otherv	0	C) = (220)	0	5 × (230	0	0	1	(2
									0	0]	(2
d) If natural if (22b)r	n = 1, then			•					0.5]				
4d)m= 0.63		0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61]	(2
Effective air	change rat	e - ente	er (24a	or (24b	o) or (240	c) or (24	d) in box	(25)				_	
5)m= 0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	1	(2
) Haatlaasa												_	
B. Heat losse		•											
LEMENT	Gross area (m		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/ł	<)	k-valu kJ/m².		X k /K
indows	a. ca (,			8.97		<u>-</u> /[1/(1.4)+		11.89	,	,		(2
/alls Type1	31.4	п г	8.97	\neg	22.43	=	0.18		4.04	=) (2
/alls Type2	22.92	- - - -	0.57	=	22.92	=	0.18		4.13	ᆿ ¦		╡	—\`- (2
oof	50.62	╡ ┆	0	=	50.62	=	0.13		6.58	륵 ¦		╡	(3
otal area of e		_			104.9	=	0.13		0.30				۰) (3)
arty wall	nomonio, m					=		[—			(S
arty wan					30.08	=	0	= [0	<u> </u>			=
arty 11001 ternal wall **	•				50.62					Ĺ		\dashv \models	(3
		use off	antiva vii	ndow II ve	83.2		, formula 1	/F/1/II.vol	(0) (0 0 4 1 0		no roor ron		(3
for windows and						atea using	i tormula 1,	/[(1/ U- vaiu	ie)+0.04j a	s given in	paragrapi	n 3.2	
include the area				•			(26)(30)	+ (32) =				26.64	(3
include the area abric heat los	33, VV/IX — O											7303.78	<u> </u>
		(k)						((28)	.(30) + (32	2) + (32a).	(32e) =		
abric heat los eat capacity	Cm = S(A x)	,	= Cm ÷	· TFA) in	ı kJ/m²K				.(30) + (32 tive Value:	, , ,	(32e) =	250	
abric heat los	Cm = S(A x parameter	(TMP :		,			ecisely the	Indica	tive Value:	Medium			(3
abric heat lose eat capacity nermal mass or design assess on be used inste	Cm = S(A x parameter sments where ad of a detaile	(TMP :	ils of the ation.	constructi	ion are not	t known pr	ecisely the	Indica	tive Value:	Medium			
abric heat lose at capacity nermal mass or design assess on the used inste	Cm = S(A x parameter sments where ad of a detaile	(TMP :	ils of the ation.	constructi	ion are not	t known pr	ecisely the	Indica	tive Value:	Medium			
abric heat lost eat capacity nermal mass or design assess on be used inste nermal bridge details of therma	Cm = S(A x parameter sments where ad of a detaile es : S (L x) al bridging are	(TMP : the detail d calcula () calcu	ils of the ation. ulated ι	constructi	ion are not pendix k	t known pr	ecisely the	Indica indicative	tive Value:	Medium		6.08	
abric heat los eat capacity nermal mass or design assess n be used inste nermal bridge details of therman otal fabric he	Cm = S(A x parameter sments where ad of a detaile es: S(L x) al bridging are at loss	(TMP : the detail d calcula f) calcula not know	ils of the ation. ulated u wn (36) =	constructi	ion are not pendix k	t known pr	ecisely the	Indicative	tive Value: values of (36) =	Medium TMP in Ta	able 1f	250	
abric heat lose eat capacity nermal mass or design assess no be used instendental bridged etails of thermal brial fabric heat the contilation heat	Cm = S(A x) parameter sments where ad of a detaile es : S (L x) al bridging are at loss at loss calcu	(TMP: the detailed calculated (f) calculated related r	ils of the ation. ulated u wn (36) =	constructi	on are not pendix h	t known pr		Indicative (33) + (38)m	(36) = = 0.33 × (30)	Medium TMP in To	able 1f	6.08	
eat capacity nermal mass or design assess on be used inste nermal bridge details of therma otal fabric he entilation hea	Cm = S(A x) parameter sments where ad of a detaile es : S (L x) al bridging are at loss at loss calcu	(TMP: the detail d calcula f) calcul not know ulated r	ils of the ation. ulated u wn (36) = monthly	constructiusing Ap	pendix h	t known pr	Aug	Indicative (33) + (38)m Sep	tive Value: values of (36) = = 0.33 × (30)	Medium TMP in To	able 1f	6.08	
eat capacity nermal mass or design assess on be used inste nermal bridge details of therma otal fabric he entilation hea Jan B)m= 27.86	Cm = S(A x) parameter sments where ad of a detaile es : S (L x) al bridging are at loss at loss calcu Feb 27.64 2	(TMP: the detailed calculated f) calculated r Mar 7.42	ils of the ation. ulated u wn (36) =	constructi	on are not pendix h	t known pr		(33) + (38)m Sep 25.66	(36) = = 0.33 × (200 Ct	Medium TMP in To 25)m x (5) Nov 26.6	able 1f	6.08	
eat capacity nermal mass or design assess on be used inste nermal bridge details of therma otal fabric he entilation hea	Cm = S(A x) parameter sments where ad of a detaile es : S (L x) al bridging are at loss at loss calcu Feb 27.64 2	(TMP: the detailed calculated f) calculated r Mar 7.42	ils of the ation. ulated u wn (36) = monthly	constructiusing Ap	pendix h	t known pr	Aug	(33) + (38)m Sep 25.66	tive Value: values of (36) = = 0.33 × (30)	Medium TMP in To 25)m x (5) Nov 26.6	able 1f	6.08	

Heat loss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.2	1.19	1.19	1.17	1.16	1.15	1.15	1.14	1.15	1.16	1.17	1.18		
		!	<u>. </u>	<u>. </u>		!	!		Average =	Sum(40) ₁	12 /12=	1.17	(40)
Number of day	<u> </u>	1 `	· ·						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		71		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.77		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 82.25	79.26	76.27	73.28	70.29	67.3	67.3	70.29	73.28	76.27	79.26	82.25		
Francisco de la contracto de l				- mth	400 \/-/		T / 200			m(44) ₁₁₂ =	L	897.28	(44)
Energy content of													
(45)m= 121.98	106.68	110.09	95.97	92.09	79.47	73.64	84.5	85.51	99.65	108.78	118.13	1170 10	(45)
If instantaneous w	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46		10tal = Su	m(45) ₁₁₂ =	· [1176.48	(43)
(46)m= 18.3	16	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72		(46)
Water storage	loss:	<u>!</u>	Į	Į		Į	Į	<u>!</u>	<u>!</u>				
Storage volum	•					_		ame ves	sel		150		(47)
If community h Otherwise if no	_			-			, ,	ora) onto	or 'O' in /	′ 17 \			
Water storage		not wate	:i (tili5 ii	iciuues i	HStaritai	ieous co	ווטט וטוווו	ers) erite	ei O III ((47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		•					(48) x (49)) =		0.	75		(50)
b) If manufact			-										(54)
Hot water store If community h	-			e z (KVV	n/iiti e/ua	iy <i>)</i>					0		(51)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)								0.	75		(55)
Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Appendi	хН	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	` '	, ,						
(modified by		1	ı —	ı —				<u> </u>		'			· ·
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	01)111 =	00) + 0	0 7 (41) 0		0	0	0	0	1	(61)
	<u> </u>												J · (59)m + (61)m	(-)
(62)m= 168.5	-i	156.68	141.07	138.69	124.56		131	_	130.6	146.25	153.87	164.72]	(62)
Solar DHW inpo			<u> </u>	<u> </u>		1	<u> </u>						<u></u>	` '
(add addition												-: ····································		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	7	(63)
Output from	water hea	ter	ı				•						_	
(64)m= 168.5	7 148.77	156.68	141.07	138.69	124.56	120.23	131	.1	130.6	146.25	153.87	164.72	1	
	Į.		ı	ı				Outp	ut from wa	ater heate	er (annual)	112	1725.1	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	1] + 0.8 >	([(46)m	+ (57)m	+ (59)m	 n]	
(65)m= 77.83	3 69.14	73.88	67.99	67.9	62.5	61.76	65.3	37	64.51	70.41	72.24	76.55]	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar	r Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 85.42	2 85.42	85.42	85.42	85.42	85.42	85.42	85.4	42	85.42	85.42	85.42	85.42]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso s	ee 7	Table 5				_	
(67)m= 13.59	12.07	9.81	7.43	5.55	4.69	5.07	6.5	9	8.84	11.22	13.1	13.97]	(67)
Appliances (gains (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	also	see Ta	ble 5			_	
(68)m= 148.8	4 150.39	146.5	138.21	127.75	117.92	111.35	109.	.81	113.7	121.99	132.45	142.28]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5	-	-	_	
(69)m= 31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.	54	31.54	31.54	31.54	31.54]	(69)
Pumps and	fans gains	(Table 5	5a)										_	
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.3	3 -68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.	33	-68.33	-68.33	-68.33	-68.33]	(71)
Water heatir	ng gains (T	able 5)											_	
(72)m= 104.6	1 102.89	99.3	94.42	91.26	86.8	83.01	87.8	37	89.59	94.64	100.34	102.89]	(72)
Total intern	al gains =				(66	6)m + (67)m	า + (68)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 318.6	7 316.97	307.24	291.69	276.19	261.04	251.06	255.	.89	263.76	279.47	297.51	310.76		(73)
6. Solar ga														
Solar gains ar		Ü					ations 1	:0 CO		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		Т	g_ able 6b	т	FF able 6c		Gains (W)	
Northoast a a							1 1					_	. ,	1,75
Northeast 0.9		X			—	11.28	X		0.63	X	0.7	=	30.93	(75)
Northeast 0.9	<u> </u>	X			—	22.97] X]		0.63		0.7	=	62.96	(75)
Northeast 0.9	<u> </u>	X	8.9			41.38	X 1		0.63		0.7	=	113.43	[(75)
Northeast 0.9		X	8.9		-	67.96	X		0.63	_	0.7	=	186.29](75)] ₍₇₅₎
Northeast 0.9	× 0.77	X	8.9	97	X	91.35	X		0.63	X	0.7	=	250.41	(75)

Northeast _{0.9x}	0.77	X	8.9	7	X	97.38] x [0.63	×	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	X	8.9	7	x	91.1] x [0.63	х	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	X	8.9	7	x	72.63	x [0.63	х	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	Х	8.9	7	X .	50.42] x [0.63	х	0.7	=	138.22	(75)
Northeast 0.9x	0.77	х	8.9	7	x	28.07	×	0.63	×	0.7	=	76.94	(75)
Northeast 0.9x	0.77	x	8.9	7	x	14.2	×	0.63	×	0.7	=	38.92	(75)
Northeast 0.9x	0.77	х	8.9	7	х	9.21	i × i	0.63	x	0.7	=	25.26	(75)
,							_						
Solar gains in	watts, ca	alculated	for eacl	n month			(83)m	= Sum(74)n	n(82)m				
(83)m= 30.93	62.96	113.43	186.29	250.41	266.96	249.74	199.	1 138.22	76.94	38.92	25.26		(83)
Total gains –	internal a	nd solar	(84)m =	(73)m	+ (83)m	, watts						-	
(84)m= 349.6	379.93	420.67	477.98	526.6	528	500.8	454.9	98 401.98	356.42	336.43	336.02		(84)
7. Mean inte	rnal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	iving are	a, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.95	0.85	0.66	0.5	0.57	7 0.83	0.97	0.99	1		(86)
Mean interna	al temper	ature in	living are	a T1 (fo	ollow ste	ens 3 to 7	7 in Ta	able 9c)	!			1	
(87)m= 19.78	19.91	20.16	20.52	20.81	20.96	20.99	20.9		20.51	20.09	19.77		(87)
					-l Illia .		-1-1-0	Th 0 (00)	_ -!	_		l	
Temperature (88)m= 19.92	19.93	19.93	19.95	19.95	19.96	19.96	19.9		19.95	19.94	19.94]	(88)
` '	ļ				<u> </u>	<u> </u>		7 19.90	19.93	19.94	19.94		(00)
Utilisation fa	 	1				1	T				_	1	
(89)m= 1	0.99	0.98	0.93	0.8	0.57	0.39	0.45	0.76	0.96	0.99	1		(89)
Mean interna	al temper	ature in	the rest	of dwell	ng T2 (1	follow ste	eps 3	to 7 in Ta	ble 9c)	_	_	_	
(90)m= 18.31	18.5	18.86	19.38	19.77	19.94	19.96	19.9	6 19.86	19.38	18.78	18.3		(90)
									fLA = Livi	ng area ÷ (4) =	0.49	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 -	- fLA) × T	2				
(92)m= 19.03	19.19	19.5	19.94	20.28	20.44	20.47	20.4	6 20.36	19.93	19.43	19.02		(92)
Apply adjust	ment to t	he mean	internal	temper	ature fro	om Table	4e, v	vhere app	ropriate	•	•	•	
(93)m= 19.03	19.19	19.5	19.94	20.28	20.44	20.47	20.4	6 20.36	19.93	19.43	19.02		(93)
8. Space hea	ating requ	uirement											
Set Ti to the					ed at st	ep 11 of	Table	9b, so th	at Ti,m=	(76)m an	d re-cald	culate	
the utilisation	1				l .				1	1		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
Utilisation fa	0.99	0.98	0.93	0.82	0.62	0.44	0.51	0.79	0.96	0.99	0.99]	(94)
Useful gains					0.02	0.44	0.5	0.79	0.90	0.99	0.99		(01)
(95)m= 347.37		411.07	445.68	429.35	324.89	222.15	230.9	96 318.12	340.75	332.49	334.25		(95)
Monthly ave						1	1	1 0 10 112	1 2.5.70	1 -02.10	1 -520	I	V 17
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat							<u> </u>		 n]	1	1	I	
(97)m= 892.33	1	781.6	652.6	505.61	338.83	224.33	235.0		-i	731	884.93		(97)
Space heatir	ng require	ement fo	r each m	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (9	5)m] x (4	11)m	•	1	
(98)m= 405.45	326.8	275.67	148.98	56.74	0	0	0	0	155.56	286.92	409.71		
												-	

				Tota	ıl per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	2065.84	(98)
Space heating requirement in kWh/m	²/year								40.81	(99)
9a. Energy requirements – Individual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:	, ,							Г		¬
Fraction of space heat from secondar		mentary	-		(224)			ļ	0	(201)
Fraction of space heat from main sys	, ,			(202) = 1		,		ļ	1	(202)
Fraction of total heating from main sy				(204) = (2	02) x [1 –	(203)] =		ļ	1	(204)
Efficiency of main space heating syst								ļ	93.5	(206)
Efficiency of secondary/supplementa	ry heating	g system	า, %		,		,		0	(208)
Jan Feb Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculate	d above)	0	0	0	0	155.56	286.92	409.71		
	<u> </u>	U	0	U	0	155.56	200.92	409.71		(044)
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (204)$ $433.63 349.52 294.84 159.34$	60.69	0	0	0	0	166.38	306.87	438.2		(211)
			<u> </u>		l (kWh/yea				2209.45	(211)
Space heating fuel (secondary), kWh	/month							L		
$= \{[(98)m \times (201)]\} \times 100 \div (208)$										
(215)m= 0 0 0 0	0	0	0	0	0	0	0	0		_
				Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating	hava)									
Output from water heater (calculated a	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72		
Efficiency of water heater	!	ļ	<u> </u>	ļ	<u> </u>	<u> </u>	!		79.8	(216)
(217)m= 87.07 86.86 86.31 84.96	82.64	79.8	79.8	79.8	79.8	84.98	86.45	87.15		(217)
Fuel for water heating, kWh/month	•									
(219) m = (64) m x $100 \div (217)$ m (219)m = 193.6 171.28 181.54 166.04	167.82	156.09	150.67	164.28	163.66	172.1	177.98	189.01		
(210)	101.02	100.00	100.01		I = Sum(2		111.00	100.01	2054.07	(219)
Annual totals						k'	Wh/yeaı	r r	kWh/yea	
Space heating fuel used, main system	1								2209.45	
Water heating fuel used									2054.07	
Electricity for pumps, fans and electric	keep-ho	t						-		_
central heating pump:								30		(2300
boiler with a fan-assisted flue								45		(230€
Total electricity for the above, kWh/yea	ar			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								[239.96	(232)
Total delivered energy for all uses (21)	1)(221)	+ (231)	+ (232)	(237h)	=			ا آ	4578.48	` (338)
12a. CO2 emissions – Individual hea	<i>,</i> , ,	` ′	` ′	` ′					10. 0. 10	
12a. COZ emissions – muividual nea	ing syste		ading IIII	olo- OHF						
			ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	

Space heating (main system 1)	(211) x	0.216	=	477.24	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	443.68	(264)
Space and water heating	(261) + (262) + (263) + (264) =			920.92	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	124.54	(268)
Total CO2, kg/year	sum	of (265)(271) =		1084.39	(272)

TER = 21.42 (273)

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Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:**

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.92m²

Plot Reference: Site Reference : Highgate Road - GREEN 04 - G

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.33 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.12 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.1 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 45.7 kWh/m²

OK 2 Fabric U-values

Element Average Highest

0.18 (max. 0.70) External wall 0.18 (max. 0.30) OK Party wall 0.00 (max. 0.20) OK

Floor (no floor)

Roof 0.13 (max. 0.20) 0.13 (max. 0.35) OK Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	ОК
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	9.56m²	
Windows facing: South East	8.76m²	
Ventilation rate:	6.00	
10 Key features		
	2.0 m ³ /m ² h	
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Isar I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				0010943 on: 1.0.5.50	
Address :	F	Property	Address	04 - G					
1. Overall dwelling dime	ensions:								
3		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor		(63.92	(1a) x	2	2.65	(2a) =	169.39	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (63.92	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	169.39	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hoι	ır
Number of chimneys	0 + 0	+ [0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī - Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ns				2	x '	10 =	20	(7a)
Number of passive vents	;			Ē	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			F	0	x	40 =	0	(7c)
				L					
							Air ch	nanges per he	our
	ys, flues and fans = (6a)+(6b)+(ontinus fr	20		÷ (5) =	0.12	(8)
Number of storeys in the	neen carried out or is intended, procee he dwelling (ns)	ea 10 (17),	otrierwise	onunue ir	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t	o the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (15) -		0	(15)
Infiltration rate	q50, expressed in cubic metro	se nar h	(8) + (10)				area	0	(16)
•	lity value, then $(18) = [(17) \div 20] + (18)$	•		•	elle oi e	rivelope	aica	0.37	(17)
•	es if a pressurisation test has been do				is being u	sed		0.0.	(\ -/
Number of sides sheltered	ed		(00) 4	10 07F ·· //	10)1			0	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			1	(20)
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (10) X (20) =				0.37	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1	1	1 3		1	1 -		J	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Faster (00s) (0	2) 4	-	•		•	-	•	•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	1	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	1 0.95	0.32		1.00	1.12	1.10	J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43		
Calculate effect If mechanica		•	rate for t	he appli	cable ca	se	-	-	-	-	-		
If exhaust air h			endix N (2	3h) = (23a	a) × Fmv (e	equation (1	N5)) othe	rwise (23h) = (23a)			0	(23)
If balanced with		0 11		, ,	,	. ,	,, .	,) = (20a)			0	(23)
		•	•	ŭ		`		,	Oh)m ı (22h) v [-	1 (220)	0	(230
a) If balance (24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance												l	`
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole h	<u> </u>				e input v	<u> </u>	n from o	L - outside				J	•
if (22b)n				•	•				.5 × (23b	p)	_	,	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n									0.5]				
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(240
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)		•	•	•	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losse	s and he	eat loss r	paramet	ėr.									
ELEMENT	Gros area	SS	Openin	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value		A X k J/K
Nindows Type		(***)			8.34		/[1/(1.4)+		11.06				(27)
Vindows Type					7.64		/[1/(1.4)+		10.13	=			(27)
Walls Type1	61.0	19	15.9	<u>. </u>	45.11		0.18		8.12	╡┌			(29)
Nalls Type2	3.80		0		3.86	=	0.18		0.69	륵 ;		-	(29)
Roof	63.9		0	=	63.92	_	0.13		8.31	륵 ;		-	(30)
Γotal area of e					128.8	=	0.10		0.01				(31)
Party wall		,			37.5	<u>, </u>	0		0				(32)
Party floor					63.92	=			U	L		╡	(32)
nternal wall **						_				L T		╡ ├─	(32)
for windows and		ows, use e	effective wi	ndow U-va	113.4		ı formula 1	/[(1/U-valı	ue)+0.041 a	L as aiven in	paragraph		(32)
** include the area						a.co a a.og	, , , , , , , , , , , , , , , , , , , ,	, _{[(1} , 0	.0, .0.0 ., 0	.o g o	paragrap.	. 0.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				38.31	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	8779.01	(34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						8.3	(36)
f details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			46.61	(37)
entilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × ([25)m x (5])		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
38)m= 34.1	33.87	33.63	32.53	32.32	31.37	31.37	31.19	31.74	32.32	32.74	33.18	1	(38)
 eat transfer d	coefficier	nt, W/K			•	•	•	(39)m	= (37) + (37)	38)m	•	•	
39)m= 80.71	80.47	80.24	79.14	78.93	77.97	77.97	77.79	78.34	78.93	79.35	79.78]	

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.26	1.26	1.26	1.24	1.23	1.22	1.22	1.22	1.23	1.23	1.24	1.25		
	!		<u>. </u>	!		!	!		Average =	Sum(40) ₁	12 /12=	1.24	(40)
Number of day	1	<u> </u>	<u> </u>										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		09		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		3.84		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 - 3 5	I	1			
(44)m= 92.22	88.87	85.51	82.16	78.81	75.45	75.45	78.81	82.16	85.51	88.87	92.22		
_						· _				m(44) ₁₁₂ =	L	1006.06	(44)
Energy content of													
(45)m= 136.76	119.61	123.43	107.61	103.25	89.1	82.56	94.74	95.88	111.73	121.97	132.45		(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	= [1319.1	(45)
(46)m= 20.51	17.94	18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87		(46)
Water storage	loss:	<u>!</u>	ļ	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>!</u>			
Storage volum	ne (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '		(Ol ! - /	· 4 ¬ \			
Otherwise if no Water storage		not wate	er (tnis ir	iciuaes i	nstantar	ieous co	iiod idmo	ers) ente	er o in ((47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufact			-										(5 4)
Hot water stor	•			ie z (KVV	n/iitre/ua	iy)					0		(51)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,								0.	75		(55)
Water storage	loss cal	culated f	for each	month		_	((56)m = (55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m •	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56) •	m where ((H11) is fro	m Appendi	x H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	` '	, ,						
(modified by			ı —					<u> </u>		'	00.00		(EO)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss	ooloulotod	for oach	month ((61)m –	(60) · 2(SE (41)	١m						
(61)m= 0	0	0	0	0	00) + 30	0 7 (41)	0	0	0	0	0	1	(61)
				<u> </u>			<u> </u>	<u> </u>	<u> </u>	ļ	<u> </u>	J · (59)m + (61)m	, ,
(62)m= 183.3	<u> </u>	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	(39)111 + (01)1111	(62)
Solar DHW inp]	, ,
(add addition										o to mate	o:ag/		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ıter				ļ.	Į.	·!		•		1	
(64)m= 183.3		170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04]	
	'						Out	put from w	ater heate	r (annual)₁	l12	1867.72	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	ı]	
(65)m= 82.7	5 73.44	78.32	71.85	71.61	65.7	64.73	68.78	67.95	74.43	76.63	81.31]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):													
Metabolic ga	ains (Table	e 5), Wat	ts									_	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 104.	5 104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5	104.5		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 16.2	9 14.47	11.77	8.91	6.66	5.62	6.07	7.9	10.6	13.46	15.7	16.74]	(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5	_	-	•	
(68)m= 182.7	71 184.61	179.83	169.66	156.82	144.75	136.69	134.8	139.57	149.75	162.58	174.65		(68)
Cooking gai	ns (calcula	ated in Ap	opendix	L, equat	ion L15	or L15a), also s	ee Table	5	-		•	
(69)m= 33.4	5 33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45		(69)
Pumps and	fans gains	(Table 5	āa)							-		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)			-	-	-	-	•	
(71)m= -83.6	6 -83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6		(71)
Water heating	ng gains (1	Table 5)								•		•	
(72)m= 111.2	22 109.29	105.26	99.8	96.25	91.25	87	92.44	94.38	100.04	106.43	109.29		(72)
Total intern	al gains =	:			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 367.5	365.71	354.21	335.72	317.08	298.97	287.12	292.49	301.9	320.59	342.07	358.04		(73)
6. Solar ga	ins:					•			•				
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ Fabla Ch	_	FF		Gains	
	Table 6d		m²		Tai	ble 6a	. —	Table 6b	_ '	able 6c		(W)	,
Northeast 0.9		Х	8.3	34	x 1	1.28	x	0.63	x	0.7	=	28.76	(75)
Northeast 0.9		X	8.3	34	x 2	22.97	х	0.63	x	0.7	=	58.54	(75)
Northeast 0.9	<u> </u>	х	8.3	34	X 4	11.38	х	0.63	x	0.7	=	105.47	(75)
Northeast 0.9		X	8.3	34	x 6	67.96	х	0.63	x	0.7	=	173.21	(75)
Northeast 0.9	× 0.77	X	8.3	34	x 9	91.35	x	0.63	x	0.7	=	232.82	(75)

							_						_
Northeast _{0.9x}	0.77	X	8.3	34	X	97.38	×	0.63	X	0.7	=	248.21	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	91.1	X	0.63	X	0.7	=	232.2	(75)
Northeast _{0.9x}	0.77	X	8.3	34	x	72.63	X	0.63	X	0.7	=	185.11	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	50.42	X	0.63	X	0.7	=	128.51	(75)
Northeast _{0.9x}	0.77	X	8.3	34	X	28.07	X	0.63	X	0.7	=	71.54	(75)
Northeast _{0.9x}	0.77	X	8.3	34	x	14.2	X	0.63	X	0.7	=	36.19	(75)
Northeast _{0.9x}	0.77	x	8.3	34	x	9.21	X	0.63	х	0.7	=	23.49	(75)
Southeast _{0.9x}	0.77	x	7.6	64	x	36.79	X	0.63	X	0.7	=	85.91	(77)
Southeast _{0.9x}	0.77	X	7.6	64	x	62.67	x	0.63	X	0.7	=	146.34	(77)
Southeast 0.9x	0.77	x	7.6	64	x	85.75	x	0.63	x	0.7	=	200.22	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	106.25	X	0.63	X	0.7	_	248.09	(77)
Southeast _{0.9x}	0.77	x	7.6	64	x	119.01	X	0.63	X	0.7	=	277.88	(77)
Southeast _{0.9x}	0.77	×	7.6	64	x	118.15	X	0.63	x	0.7	=	275.87	(77)
Southeast _{0.9x}	0.77	×	7.6	64	x	113.91	X	0.63	x	0.7		265.96	(77)
Southeast _{0.9x}	0.77	×	7.6	64	x	104.39	X	0.63	X	0.7		243.74	(77)
Southeast _{0.9x}	0.77	×	7.6	64	x	92.85	X	0.63	x	0.7	<u> </u>	216.8	(77)
Southeast _{0.9x}	0.77	×	7.6	64	x	69.27	X	0.63	x	0.7		161.73	(77)
Southeast _{0.9x}	0.77	×	7.6	64	x	44.07	X	0.63	X	0.7	<u> </u>	102.9	(77)
Southeast _{0.9x}	0.77	×	7.6	64	x	31.49	X	0.63	x	0.7	<u> </u>	73.52	(77)
Solar gains in watts, calculated for each month $(83)m = Sum(74)m(82)m$													
Solar gains in (83)m= 114.67	· · ·	ulated _{05.69}	for eac 421.29	n month 510.7	524.0	8 498.16	(83)m 428	n = Sum(74)m 3.85 345.31	(82)m 233.2	1	97.01]	(83)
Total gains – i							420	.00 343.31	255.2	1 139.00	37.01		(00)
(84)m= 482.24		559.9	757.01	827.78	823.0		721	.34 647.21	553.8	6 481.15	455.04		(84)
		o 4:			\				L				<u> </u>
7. Mean inter			, ,		,	a from Ta	bla O	Th1 (°C)				04	(85)
•	ŭ	٠.			•		DIE 9	, IIII (C)				21	(65)
Utilisation fac		Mar	Apr	May	Jui		ΤΛ	ug Sep	Oct	Nov	Dec		
(86)m= 0.99		0.97	0.91	0.77	0.58	-	0.4		0.94	+	1		(86)
` /		!				!			0.04	0.00	<u> </u>		()
Mean interna					1	_i	т —		T 20 57	, , , , , , , , , , , , , , , , , , , ,	10.70		(87)
(87)m= 19.75	19.95 2	20.24	20.61	20.86	20.9	7 20.99	20.	99 20.92	20.57	20.09	19.72		(01)
Temperature					i	-	т —		1	-	Г	1	(0.0)
(88)m= 19.87	19.87 1	9.88	19.89	19.89	19.9	19.9	19.	91 19.9	19.89	19.89	19.88		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,m	(see Table	9a)					•	
(89)m= 0.99	0.98	0.96	0.88	0.71	0.49	0.33	0.3	0.66	0.92	0.98	0.99		(89)
Mean interna	l temperatu	ure in t	he rest	of dwelli	ing T2	(follow st	eps 3	to 7 in Tab	le 9c)				
(90)m= 18.23	18.52 1	8.94	19.46	19.77	19.8	9 19.9	19	.9 19.84	19.42	18.74	18.19		(90)
<u> </u>									fLA = Liv	ving area ÷ (4) =	0.38	(91)
Mean interna	l temperati	ıre (fo	r the wh	ole dwe	llina) =	= fLA × T1	+ (1	– fLA) × T2	<u>.</u>				
(92)m= 18.81	 	9.44	19.89	20.19	20.3	1	20.		19.85	5 19.26	18.77		(92)
Apply adjustr	nent to the	mean	interna	temper	ature	from Table	e 4e,	where appr	opriate	- 	I.	1	

(00) == 4	40.04	10.00	40.44	10.00	00.40	00.0	00.00	00.00	00.05	40.05	10.00	40.77	1	(93)
,	18.81	19.06	19.44	19.89	20.19	20.3	20.32	20.32	20.25	19.85	19.26	18.77		(93)
8. Space		·			o obtoin	ad at at	nn 11 of	Table 0	b oo tha	tTim (76\m an	d ro oolo	vuloto	
the utilis						eu ai sii	=p 1101	rable 9i	o, so ma	t 11,111=(rojili ali	d re-calc	ulate	
,	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	-										,		ı	
` '	0.99	0.98	0.95	0.88	0.73	0.53	0.37	0.42	0.69	0.92	0.98	0.99		(94)
Useful g			<u> </u>	<u> </u>				I	I		T	I I		(05)
` ′	477.7	559.15	628.8	664.54	603.37	433.48	288.32	301.85	444.95	508.69	471.99	451.69		(95)
Monthly (96)m=	avera	ge exte	rnal tem 6.5	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
											7.1	4.2		(90)
(97)m= 11			1038.14	869.97	669.77	444.44	289.86	304.67	- (96)m	730.48	964.51	1162.69		(97)
)m – (95			1102.03		(01)
· -	Ť	389.91	304.55	147.91	49.4	0	0.02	0	0	165.01	354.61	528.99		
(00)									l per year	(kWh/vear		8), 59 12 =	2456.13	(98)
0	4:			1-10/1-	16			1010	ii poi youi	(IKVVII) year	i) = Cum(o	O/15,912 —		╡``
Space h		•			•								38.43	(99)
9a. Enerç	gy requ	uiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space h		_			/I-							ı		٦,,,,,,
Fraction	•			-		mentary	-		(55.1)				0	(201)
Fraction	n of spa	ace hea	it from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction	of tota	al heatii	ng from i	main sys	stem 1			(204) = (2	02) x [1 – ((203)] =			1	(204)
Efficiency of main space heating system 1										93.5	(206)			
Efficiend	cy of s	econda	ry/supple	ementar	y heatin	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space h	 ř				d above)						,		ı	
5	15.75	389.91	304.55	147.91	49.4	0	0	0	0	165.01	354.61	528.99		
(211)m =	= {[(98)	m x (20	4)] } x 1	00 ÷ (20	(6)									(211)
5	51.61	417.01	325.72	158.19	52.84	0	0	0	0	176.48	379.27	565.76		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u>F</u>	2626.88	(211)
Space h	_	•			month									
= {[(98)m													1	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		7(045)
								Tota	ıl (kWh/yea	ar) =Sum(<i>i</i>	215) _{15,1012}	,=	0	(215)
Water he	_	4	t/l	اء اد ماداد	\									
Output fro	83.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04		
Efficiency				102.7	1 10.00	101.10	120.10	1 111.01	1 10.01	100.00	107.00	170.01	79.8	(216)
	87.43	87.08	86.35	84.73	82.21	79.8	79.8	79.8	79.8	84.92	86.77	87.53	75.0	(217)
Fuel for v					02.21	19.0	1 3.0	1 3.0	1 9.0	04.32	00.77	01.33		(,)
(219)m =		0.												
(219)m= 20		185.7	196.9	180.22	182.28	168.16	161.85	177.12	176.65	186.44	192.52	204.54		
	1							Tota	I = Sum(2	19a) ₁₁₂ =	•	•	2222.1	(219)
Annual t	totals									k'	Wh/year	•	kWh/year	<u>-</u>
Space he	eating t	uel use	ed, main	system	1								2626.88	╛
												•		

					_						
Water heating fuel used				2222.1							
Electricity for pumps, fans and electric keep-hot											
central heating pump:			30		(230c)						
boiler with a fan-assisted flue		(230e)									
Total electricity for the above, kWh/year		75	(231)								
Electricity for lighting	287.67	(232)									
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 5211.66 (338)											
12a. CO2 emissions – Individual heating systems including micro-CHP											
	_										
	Energy kWh/year	Emission factoring kg CO2/kWh	ctor	Emissions kg CO2/yea							
Space heating (main system 1)	-		etor =								
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar ¬						
	kWh/year	kg CO2/kWh	=	kg CO2/yea	ar](261)						
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)						
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 567.41 0 479.97	(261) (263) (264)						
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= = =	kg CO2/yea 567.41 0 479.97 1047.38	(261) (263) (264) (265)						
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.519	= = =	kg CO2/yea 567.41 0 479.97 1047.38 38.93	(261) (263) (264) (265) (267)						

TER =

(273)

19.33

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:03:10

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 60.34m² Site Reference :

Plot Reference: Highgate Road - GREEN 04 - H

Address:

Client Details:

Name: Address:

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 19.72 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.26 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 44.9 kWh/m²

OK 2 Fabric U-values

Element Average Highest

0.18 (max. 0.70) External wall 0.18 (max. 0.30) OK Party wall 0.00 (max. 0.20) OK

Floor (no floor)

Roof 0.13 (max. 0.20) 0.13 (max. 0.35) OK Openings 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	ок
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		Heart	Details:											
A No	Nail Inchase	Useri		- M	L		CTDO	040040						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa	-				010943 on: 1.0.5.50						
Contware Hame.	0.1011la 1 0/11 2012	Property	Address:		31011.		7 01010	7.0.0.00						
Address :														
1. Overall dwelling dime	ensions:													
Ground floor			ea(m²)	(10) v		ight(m)	(2a) =	Volume(m ³	(3a)					
	a) . (4 b) . (4 a) . (4 d) . (4 a) .			(1a) x	2	.65	(2a) =	159.9	(3a)					
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+.	(1n)	60.34	(4)	\	n (O)	(0.)		_					
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	159.9	(5)					
2. Ventilation rate:	main seco	ondary	other		total			m³ per hou	ır					
Number of altimospess	heating hea	ting		1 _ [40 =		_					
Number of chimneys		<u> </u>	0] = [0			0	(6a)					
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)					
Number of intermittent fa				Ĺ	2		10 =	20	(7a)					
Number of passive vents				L	0	X '	10 =	0	(7b)					
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)					
Air changes per hour														
Infiltration due to chimne	vs. flues and fans = $(6a)$ +	(6b)+(7a)+(7b)+	·(7c) =	Г	20		÷ (5) =	0.13	(8)					
•	een carried out or is intended,			ontinue fr			. (0) –	0.13	(0)					
Number of storeys in the	ne dwelling (ns)							0	(9)					
Additional infiltration						[(9)	-1]x0.1 =	0	(10)					
	.25 for steel or timber fra resent, use the value correspor			•	ruction			0	(11)					
deducting areas of openii		iding to the grea	ilei wali are	a (anter										
If suspended wooden f	floor, enter 0.2 (unsealed) or 0.1 (seal	ed), else	enter 0				0	(12)					
If no draught lobby, en								0	(13)					
ŭ	s and doors draught strip	ped						0	(14)					
Window infiltration			0.25 - [0.2			. (45)		0	(15)					
Infiltration rate	arron avanced in authic		(8) + (10) -					0	(16)					
If based on air permeabil	q50, expressed in cubic ity value, then $(18) = [(17)]$	•	•	•	etre or e	invelope	area	5	(17)					
•	es if a pressurisation test has be				is beina u	sed		0.38	(18)					
Number of sides sheltere			3	,	3			0	(19)					
Shelter factor			(20) = 1 - [0.075 x (1	19)] =			1	(20)					
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =				0.38	(21)					
Infiltration rate modified f	or monthly wind speed													
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec							
Monthly average wind sp	eed from Table 7							_						
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7							
Wind Factor (22a)m = (2	2)m ∸ 4													
		0.95 0.95	0.92	1	1.08	1.12	1.18							
<u> </u>		<u> </u>				-		ı						

Adjusted infiltration rate (allowir	na for shelter an	nd wind s	need) –	(21a) v	(22a)m					
0.48 0.47 0.46	0.41 0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44		
Calculate effective air change n	ate for the appli	cable cas	se							
If mechanical ventilation:									0	(23a)
If exhaust air heat pump using Appe) = (23a)			0	(23b)
If balanced with heat recovery: efficient	ency in % allowing f	for in-use fa	actor (from	Table 4h) =				0	(23c)
a) If balanced mechanical ve	ntilation with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [′	1 – (23c)	÷ 100]	
(24a)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ve	ntilation without	heat rec	overy (N	/IV) (24b	m = (22)	2b)m + (2	23b)		i	
(24b)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract vent	•	•				- (00)				
if $(22b)m < 0.5 \times (23b)$, the second secon	``''	i ı	`	``	ŕ	<u> </u>			Ī	(240)
(24c)m= 0 0 0	0 0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or who if (22b)m = 1, then (24d)r						0.5]				
(24d)m= 0.61 0.61 0.61	0.59 0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air change rate - en	ter (24a) or (24b	o) or (24c	c) or (24	d) in box	(25)	-		-		
(25)m= 0.61 0.61 0.61	0.59 0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. Heat losses and heat loss p	arameter:									
ELEMENT Gross	Openings	Net Are	ea	U-valı	ıe	AXU		k-value	9	ΑΧk
area (m²)	m ²	A ,m		W/m2		(W/k	<)	kJ/m²-l		kJ/K
Windows Type 1		4.7	x1/	/[1/(1.4)+	0.04] =	6.23				(27)
Windows Type 2		6.09	x1/	/[1/(1.4)+	0.04] =	8.07				(27)
Windows Type 3		2.92	x1/	/[1/(1.4)+	0.04] =	3.87				(27)
Walls Type1 52.8	13.71	39.09	x	0.18	=	7.04	<u> </u>			(29)
Walls Type2 27.31	0	27.31	x	0.18	= i	4.92			<u> </u>	(29)
Roof 60.34	0	60.34	x	0.13	= i	7.84	Ŧ i		7 —	(30)
Total area of elements, m ²		140.45	5							(31)
Party wall		16.88		0		0	– 1		–	(32)
Party floor		60.34	=			<u> </u>			i	(32a)
Internal wall **		107.91	=				L [-	(32c)
* for windows and roof windows, use et		alue calcula		formula 1	/[(1/U-valu	ie)+0.04] a	L s given in	paragraph	3.2	(020)
** include the areas on both sides of int Fabric heat loss, W/K = S (A x I	•	นแงกร		(26)(30)	+ (32) =				27.27	(22)
Heat capacity $Cm = S(A \times k)$	5)			(20)(00)		.(30) + (32)) ± (32a)	(326) -	37.97	(33)
Thermal mass parameter (TMP	- Cm · TΕΛ\ ir	n k I/m²k				tive Value:	, , ,	(326) =	8671.45	(34)
For design assessments where the det	•		known pr	ecisely the				ahle 1f	250	(35)
can be used instead of a detailed calcu		ion are not	KIIOWII PI	colscry the	maicative	values of	11011 111 16	abic 11		
Thermal bridges : S (L x Y) calc		•	(7.67	(36)
if details of thermal bridging are not kno Total fabric heat loss	own(36) = 0.05 x(3)	31)			(33) +	(36) =			45.64	(37)
Ventilation heat loss calculated	monthly					$= 0.33 \times (2$	25)m x (5)		45.04	(0.7
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Carr 1 OD IVIAI	, .p. Way	1 2011	5 41	, .ug	ı Cop	1 500	. 101		I	

(38)m= 32.42 32.18 31.95 30.87 30.67 29.73 29.73 29.56 30.1 30.67 31.08 31.51 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 78.06 77.82 77.59 76.52 76.31 75.37 75.37 75.2 75.74 76.31 76.72 77.15 Average = Sum(39),2 /12= 76.52 (39) Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4) (40)m= 1.29 1.29 1.29 1.27 1.26 1.25 1.25 1.25 1.26 1.26 1.27 1.28 Average = Sum(40),2 /12= 1.27 (40) Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41)m= 31 28 31 30 31 30 31 30 31 30 31 30 31 30 31 (41) 4. Water heating energy requirement: **Wh/year:** Assumed occupancy, N (1.99 if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 81.49 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(39)m=
Heat loss parameter (HLP), W/m²K
Heat loss parameter (HLP), W/m²K
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(41)m= 31 28 31 30 31
Assumed occupancy, N 1.99 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ 81.49 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)
Assumed occupancy, N 1.99 (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ 81.49 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)
if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \text{ x (TFA -}13.9)2)] + 0.0013 \text{ x (TFA -}13.9)$ if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) (43)
if TFA > 13.9, N = 1 + 1.76 x [1 - $\exp(-0.000349 \text{ x (TFA } - 13.9)2)] + 0.0013 \text{ x (TFA } - 13.9)$ if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) (43)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) (43)
not more that 125 litres per person per day (all water use, hot and cold)
I Jan i red i Mai i Adi i May i Jun i Jun i Add i Sed i Oci i Nov i Deci
Hot water usage in litres per day for each month Vd , m = factor from Table 1c x (43)
(44)m= 89.64 86.38 83.12 79.86 76.6 73.34 73.34 76.6 79.86 83.12 86.38 89.64
Total = $Sum(44)_{112}$ = 977.9 (44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)
(45)m= 132.93 116.27 119.98 104.6 100.36 86.61 80.25 92.09 93.19 108.61 118.55 128.74
Total = Sum(45) ₁₁₂ = 1282.18 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)
(46)m= 19.94 17.44 18 15.69 15.05 12.99 12.04 13.81 13.98 16.29 17.78 19.31 Water storage loss:
Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)
If community heating and no tank in dwelling, enter 110 litres in (47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)
a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48) Temperature factor from Table 2b (49)
Energy lost from water storage, kWh/year $(48) \times (49) = 0.75$ (50)
b) If manufacturer's declared cylinder loss factor is not known:
Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)
If community heating see section 4.3
Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)
If cylinder contains dedicated solar storage, (57) m = (56) m x $[(50) - (H11)] \div (50)$, else (57) m = (56) m where $(H11)$ is from Appendix H
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder	er thermostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51	23.26 22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0	0 0 0 (61)
Total heat required for water heating calculated for each month (62)m = 0.85 x	(45)m + (46)m + (57)m + (59)m + (61)m
(62)m= 179.53 158.35 166.57 149.69 146.96 131.7 126.85 138.69 138.28	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar	ar contribution to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	3,
(63)m= 0 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
(64)m= 179.53 158.35 166.57 149.69 146.96 131.7 126.85 138.69 138.28	155.2 163.64 175.34
	vater heater (annual) ₁₁₂ 1830.8 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 × (45)m + (61)m] + 0.8	
(65)m= 81.48 72.33 77.17 70.85 70.65 64.87 63.96 67.9 67.06	73.39 75.49 80.08 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot v	water is from community neating
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= 99.56 99.56 99.56 99.56 99.56 99.56 99.56 99.56	99.56 99.56 99.56 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 15.49 13.76 11.19 8.47 6.33 5.35 5.78 7.51 10.08	12.8 14.94 15.93 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Ta	able 5
(68)m= 173.8 175.61 171.06 161.39 149.17 137.69 130.03 128.22 132.77	142.44 154.66 166.13 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table	e 5
(69)m= 32.96 32.96 32.96 32.96 32.96 32.96 32.96 32.96 32.96	32.96 32.96 (69)
Pumps and fans gains (Table 5a)	· · · · · · · · · · · · · · · · · · ·
(70)m= 3 3 3 3 3 3 3 3 3 3	3 3 3 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -79.65 -79.65 -79.65 -79.65 -79.65 -79.65 -79.65 -79.65	-79.65 -79.65 -79.65 (71)
Water heating gains (Table 5)	
(72)m= 109.51 107.63 103.72 98.41 94.96 90.1 85.97 91.26 93.14	98.64 104.85 107.64 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m +$	
(73)m= 354.68 352.87 341.84 324.13 306.33 289.01 277.64 282.86 291.85	
6. Solar gains:	000.70 000.01 040.01
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to t	the applicable orientation.
Orientation: Access Factor Area Flux g_	FF Gains
Table 6d m ² Table 6a Table 6b	
Southeast 0.9x 0.77 x 6.09 x 36.79 x 0.63	× 0.7 = 68.48 (77)
Southeast 0.9x 0.77 x 6.09 x 62.67 x 0.63	× 0.7 = 116.65 (77)
0.05	. 0.7 - 110.00 (11)

CHINSAIION PACTA	പാവ വഷി	ns ior II	iving area, h	1,111 (8	see ra	NIE 281							
Temperature d	•	•		_			ole 9,	Th1 (°C)				21	(85)
7. Mean interna	al tempe	rature ((heating sea	son)									
(84)m= 486.08	580.03	661.54	735.15 780	.29	765.52	734.56	691.	91 643.03	563.21	488.31	457.62]	(84)
Total gains – int	ernal an	d solar	(84)m = (73))m + ((83)m	, watts	· · · · ·	ı		1	I	1	
T		319.7	411.01 473		476.51	456.92	409.		253.46	157.99	112.06]	(83)
Solar gains in w	atte colo	aulatad	for each ma	nth			(83)m	= Sum(74)m .	(82)m				
Northwest _{0.9x}	0.77	X	2.92	X	(9.21	x	0.63	x [0.7	=	8.22	(81)
Northwest 0.9x	0.77	X	2.92	X		14.2	x	0.63	x [0.7	=	12.67	(81)
Northwest 0.9x	0.77	x	2.92	×	2	8.07	x	0.63	x [0.7	=	25.05	(81)
Northwest 0.9x	0.77	X	2.92	X	5	0.42	x	0.63	x [0.7	=	44.99	(81)
Northwest 0.9x	0.77	X	2.92	X	7	2.63	x	0.63	x [0.7	=	64.81	(81)
Northwest 0.9x	0.77	x	2.92	X	(91.1	x	0.63	x [0.7	=	81.3	(81)
Northwest _{0.9x}	0.77	x	2.92	X	9	7.38	x	0.63	× [0.7		86.9	(81)
Northwest _{0.9x}	0.77	x	2.92	x	9	1.35	х	0.63	x [0.7		81.52	(81)
Northwest _{0.9x}	0.77	x	2.92	×	6	7.96	х	0.63	x [0.7	=	60.64	(81)
Northwest _{0.9x}	0.77	x	2.92	×	4	1.38	x	0.63	 	0.7		36.93	(81)
Northwest _{0.9x}	0.77	x	2.92	×	2	2.97	x	0.63	x [0.7	=	20.5	(81)
Northwest _{0.9x}	0.77	x	2.92	×	1	1.28	х	0.63	x [0.7	=	10.07	(81)
Southwest _{0.9x}	0.77	x	4.7	T x	3	1.49		0.63	x	0.7		45.23	(79)
Southwest _{0.9x}	0.77	x	4.7	i x		4.07		0.63	_ x [0.7		63.3	(79)
Southwest _{0.9x}	0.77	x	4.7	X		9.27		0.63	x [0.7	=	99.49	(79)
Southwest _{0.9x}	0.77	x	4.7	x		2.85		0.63	x [0.7		133.37	(79)
Southwest _{0.9x}	0.77	x	4.7	×		04.39	,	0.63	x [0.7	= =	149.94	(79)
Southwest _{0.9x}	0.77	×	4.7	^ x		13.91	, l [0.63	^ L	0.7	= =	163.62	(79)
Southwest _{0.9x}	0.77	= x	4.7	^ x		18.15	ı l [0.63	^ L x [0.7	= =	169.71	(79)
Southwest _{0.9x}	0.77	×	4.7	^ x		19.01	ı l [0.63	^ L x [0.7	=	170.94	(79)
Southwest _{0.9x}	0.77	$=$ $\frac{1}{x}$	4.7	$\frac{1}{x}$		06.25	ı l [0.63	^ L x [0.7	= -	152.62	(79)
Southwest _{0.9x}	0.77	→ x	4.7	┤ ^ ╴		5.75	, l [0.63	_ ^ L 	0.7	╡ -	123.17	(79)
Southwest _{0.9x}	0.77	X x	4.7	→ × → ×		6.79 2.67	ı l [0.63		0.7		52.85 90.02	(79)
Southwest _{0.9x}	0.77	×	6.09	→ ↓		1.49	×	0.63		0.7	=	58.6	(77) (79)
Southeast 0.9x	0.77	×	6.09	→ ↓		4.07	X	0.63	_	0.7	╡ -	82.02	$\frac{1}{1}$
Southeast 0.9x	0.77	×	6.09	→ ↓		9.27	X _V	0.63	_	0.7	_ = _	128.92	$=$ $\frac{(77)}{(77)}$
Southeast 0.9x	0.77	= ×	6.09	→ ↓		2.85		0.63	_	0.7	╡ :	172.81	$=$ $\frac{(77)}{(77)}$
Southeast 0.9x	0.77	×	6.09	→ ↓		04.39	x	0.63	_	0.7	╡ -	194.29	$\frac{1}{1}$
Southeast 0.9x	0.77	×	6.09	→ ↓		13.91	X	0.63	_	0.7	_ = -	212.01	$\frac{1}{1}$
Southeast 0.9x	0.77	x	6.09	X		18.15	X	0.63		0.7	=	219.9	$= \begin{pmatrix} (77) \\ (77) \end{pmatrix}$
Southeast 0.9x	0.77	X	6.09	X		19.01	X	0.63		0.7	_ =	221.5	(77)
Southeast 0.9x	0.77	X	6.09	→ ×		06.25	X	0.63	×	0.7	_ =	197.75	(77)
Southeast 0.9x	0.77	X	6.09	X		5.75	X	0.63		0.7	=	159.6	(77)

(86)m= 0.99 0.98 0.96	0.9 0.78	0.6	0.45	0.49	0.73	0.93	0.99	0.99		(86)
Mean internal temperature in	living area T1 (fo	ollow step	os 3 to 7	' in Table	e 9c)				•	
(87)m= 19.75 19.96 20.26	20.6 20.85	20.97	20.99	20.99	20.92	20.59	20.11	19.72		(87)
Temperature during heating p	periods in rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)				•	
(88)m= 19.85 19.85 19.85	19.87 19.87	19.88	19.88	19.88	19.88	19.87	19.86	19.86		(88)
Utilisation factor for gains for	rest of dwelling.	h2.m (se	e Table	9a)					•	
(89)m= 0.99 0.98 0.95	0.87 0.72	0.51	0.34	0.38	0.64	0.9	0.98	0.99		(89)
Mean internal temperature in	the rest of dwelli	na T2 (fc	ollow ste	os 3 to 7	7 in Tabl	e 9c)		•		
(90)m= 18.22 18.52 18.95	19.43 19.73	19.86	19.88	19.88	19.82	19.42	18.75	18.18		(90)
!					f	LA = Livin	g area ÷ (4	4) =	0.44	(91)
Mean internal temperature (fo	or the whole dwe	llina) = fl	A x T1	+ (1 – fl	A) x T2			· ·		
(92)m= 18.9 19.16 19.53	19.95 20.23	20.35	20.37	20.37	20.31	19.94	19.35	18.86		(92)
Apply adjustment to the mean	n internal temper	ature fror	m Table	4e, whe	ere appro	priate		!		
(93)m= 18.9 19.16 19.53	19.95 20.23	20.35	20.37	20.37	20.31	19.94	19.35	18.86		(93)
8. Space heating requiremen	t									
Set Ti to the mean internal te	•	ed at ste	p 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation factor for gains		ا میبا	led	۸۰۰۰	Con	Oot	Nov	Doo		
Jan Feb Mar Utilisation factor for gains, hn	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m= 0.99 0.98 0.95	0.88 0.74	0.55	0.38	0.43	0.68	0.9	0.98	0.99		(94)
Useful gains, hmGm , W = (9										• •
(95)m= 480.4 565.56 625.69	643.42 578.54	420	282.35	295.4	435.04	509.67	476.79	453.44		(95)
Monthly average external ten	nperature from Ta	able 8								
(96)m= 4.3 4.9 6.5	8.9 11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean interr	nal temperature,	Lm , W =	[(39)m :	x [(93)m	– (96)m]	ı	1	•	
(97)m= 1139.68 1110.01 1010.83		433.46	284.36	298.66	470.01	712.84	939.86	1131.2		(97)
Space heating requirement for	i i					<u> </u>	<u> </u>		1	
(98)m= 490.51 365.87 286.54	145.3 53.7	0	0	0	0	151.16	333.41	504.26		7(00)
				Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	2330.74	(98)
Space heating requirement in	n kWh/m²/year								38.63	(99)
9a. Energy requirements – Inc	ividual heating s	ystems ir	ncluding	micro-C	HP)					
Space heating:								ĺ		7,000
Fraction of space heat from s	,	mentary	•	(222)	(224)				0	(201)
Fraction of space heat from r	• , ,			(202) = 1 -					1	(202)
Fraction of total heating from	main system 1			(204) = (20	02) x [1 –	(203)] =			1	(204)
Efficiency of main space hear	ing system 1								93.5	(206)
Efficiency of secondary/supp	ementary heating	g system	, %						0	(208)
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above)							•	
490.51 365.87 286.54	145.3 53.7	0	0	0	0	151.16	333.41	504.26		
$(211)m = \{[(98)m \times (204)] \} \times (204)$	100 ÷ (206)						•		•	(211)
524.6 391.3 306.46	155.4 57.43	0	0	0	0	161.67	356.59	539.31		_
				Tota	I (kWh/yea	ar) =Sum(2	211),15,1012	=	2492.77	(211)

$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m = $	0 0	0	0	0	0	0	1	
(2.10)	<u> </u>		-	ar) =Sum(2			0	(215)
Water heating				,	7 10,1012	•		」` ′
Output from water heater (calculated above)							1	
	131.7 126.85	138.69	138.28	155.2	163.64	175.34		٦,,,,,
Efficiency of water heater (217)m= 87.36 86.98 86.25 84.73 82.41	79.8 79.8	70.0	70.9	84.74	96 67	87.47	79.8	(216)
(217)m= 87.36 86.98 86.25 84.73 82.41 7	79.8 79.8	79.8	79.8	64.74	86.67	67.47		(217)
(219) m = (64) m x $100 \div (217)$ m							,	
(219)m= 205.5 182.06 193.13 176.66 178.33 1	65.04 158.96	173.79	173.29	183.14	188.8	200.44		_
Assessed Assessed		Total	I = Sum(2		A/I. /		2179.15	(219)
Annual totals Space heating fuel used, main system 1				K	Wh/year		kWh/year 2492.77	٦
Water heating fuel used							2179.15	1
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30]	(230
boiler with a fan-assisted flue						45]]	(230
Total electricity for the above, kWh/year		sum	of (230a)	(230g) =		43	7,	(231)
		Jun	01 (2004).	(200g) –			75	_
Electricity for lighting	(004) (000)	(0071)					273.64	(232)
Total delivered energy for all uses (211)(221) +	. , , , ,	` ′					5020.56	(338)
12a. CO2 emissions – Individual heating system	s including m	icro-CHP	'					
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	538.44	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	470.7	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1009.13	(265)
	(231) x			0.5	19	=	38.93	
Electricity for pumps, fans and electric keep-hot							·	_
Electricity for pumps, fans and electric keep-hot Electricity for lighting	(232) x			0.5	19	=	142.02	(268)

TER =

(273)

19.72

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:03:08

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 103.81m²Site Reference:Highgate Road - GREENPlot Reference: 05 - A

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 15.34 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.08 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 37.3 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ok
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	13.21m²	
Windows facing: South East	5.5m ²	
Windows facing: North West	4.61m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Jser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					010943 on: 1.0.5.50	
A 11	F	Property	Address	05 - A					
Address: 1. Overall dwelling dime	ensions:								
1. Overall awailing all ne	niorio.	Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor				(1a) x		.65	(2a) =	275.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 1	03.81	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	275.1	(5)
2. Ventilation rate:									`
2. Ventuation rate.	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating bearing + 0	- + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	╡ + ト	0	i = F	0	x2	20 =	0	(6b)
Number of intermittent fa	ns			_ _ _	4	x ′	10 =	40	(7a)
Number of passive vents				F	0	x ^	10 =	0	(7b)
Number of flueless gas fi				F	0	x 4	10 =	0	(7c)
J				L				Ů	(, ,
							Air ch	nanges per h	our
•	ys, flues and fans = $(6a)+(6b)+(6b)$				40		÷ (5) =	0.15	(8)
If a pressurisation test has b Number of storeys in the	een carried out or is intended, procee	ed to (17),	otherwise (continue fr	rom (9) to	(16)			— (0)
Additional infiltration	ie dweiling (115)					[(9)-	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	uction		•	0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value corresponding t	o the grea	ter wall are	a (after			'		
,	iloor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$	•	•	•	etre of e	envelope	area	0.4	(17)
· ·	es if a pressurisation test has been do				is being u	sed		0.4	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.4	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		Jul	Aug	Зер	l Oct	INOV	Dec	l	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
, , -	1 1 3 1 3.0	1	1	<u> </u>	<u> </u>	<u> </u>	l	J	
Wind Factor (22a)m = (22	' 	1	T		l	T		1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltration rate (allowing for shelter a	nd wind sn	need) =	(21a) x	(22a)m					
0.5 0.49 0.48 0.43 0.43	0.38	0.38	0.37	0.4	0.43	0.44	0.46		
Calculate effective air change rate for the app	licable cas	e					l		
If mechanical ventilation:		(1)	15// (1	. (20)	\ (00.)			0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23b)) = (23a)			0	(23b)
If balanced with heat recovery: efficiency in % allowing								0	(23c)
a) If balanced mechanical ventilation with he	1		, ,	í `		, -	``	÷ 100] I	(04-)
(24a)m= 0 0 0 0 0	0	0	0	0	0	0	0		(24a)
b) If balanced mechanical ventilation withou			, ,	``				İ	(0.41-)
(24b)m= 0 0 0 0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or position if (22b) = 0.5 x (22b) then (24c) = (22b)	•				E v (22h	١			
if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$		0	$\frac{(22L)}{0}$	0	0 1	0	0		(24c)
d) If natural ventilation or whole house position	4								(= .0)
if $(22b)m = 1$, then $(24d)m = (22b)m$ other					0.5]				
(24d)m= 0.63 0.62 0.62 0.59 0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24d)
Effective air change rate - enter (24a) or (24	lb) or (24c)	or (24)	d) in box	(25)					
(25)m= 0.63 0.62 0.62 0.59 0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(25)
3. Heat losses and heat loss parameter:									
ELEMENT Gross Openings	Net Are	а	U-valı	re	AXU		k-value	e <i>F</i>	λΧk
area (m²) m²	A ,m ²		W/m2		(W/k	()	kJ/m²-l		J/K
Windows Type 1	13.21	_X 1/	[1/(1.4)+	0.04] =	17.51				(27)
Windows Type 2	5.5	x1/	[1/(1.4)+	0.04] =	7.29				(27)
Windows Type 3	4.61	_x 1/	[1/(1.4)+	0.04] =	6.11				(27)
Walls Type1 76.16 23.32	52.84	x	0.18	= [9.51				(29)
Walls Type2 49.77 0	49.77	х	0.18	_ = [8.96				(29)
Total area of elements, m ²	125.93								(31)
Party wall	12.14	x [0		0				(32)
Party floor	103.81	╡ '							(32a)
Party ceiling	103.81					Ī			(32b)
Internal wall **	193.17	=				Ĺ			(32c)
* for windows and roof windows, use effective window U- ** include the areas on both sides of internal walls and pa	value calculat	ted using	formula 1	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	3.2	`` ′
Fabric heat loss, W/K = S (A x U)			(26)(30)	+ (32) =				49.39	(33)
Heat capacity Cm = S(A x k)				((28)	.(30) + (32) + (32a).	(32e) =	15708.13	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)	in kJ/m²K			Indica	tive Value:	Medium	, ,	250	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.		known pre	ecisely the	indicative	values of	TMP in Ta	able 1f	200	(==/
Thermal bridges : S (L x Y) calculated using A	ppendix K							9.77	(36)
if details of thermal bridging are not known (36) = 0.05×10^{-3}								J. 7.11	(55)
Total fabric heat loss				(33) +	(36) =			59.16	(37)
Ventilation heat loss calculated monthly				(38)m	= 0.33 × (2	25)m x (5)			
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

_											,		ı	
(38)m= 5	56.93	56.48	56.04	53.98	53.59	51.8	51.8	51.46	52.49	53.59	54.37	55.19		(38)
Heat tran	nsfer c	oefficier	nt, W/K				•		(39)m	= (37) + (37)	38)m		ı	
(39)m= 1	16.08	115.63	115.2	113.13	112.75	110.95	110.95	110.62	111.64	112.75	113.53	114.34		¬
Heat loss	s parar	meter (H	ILP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ . (4)	12 /12=	113.13	(39)
(40)m=	1.12	1.11	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.09	1.1		_
Number	of day	s in moi	oth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.09	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wate	r heati	na ener	av reaui	rement:								kWh/ye	ear:	
Assumed if TFA if TFA	> 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.77		(42)
Annual a		,	ater usag	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		100	0.04		(43)
Reduce the		-		• .		-	-	to achieve	a water us	se target o	f			
						_	<u> </u>				·	_		
Hot water υ	Jan J	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
							1		00.04	102.04	100.04	140.04		
(44)m= 1	10.04	106.04	102.04	98.04	94.04	90.03	90.03	94.04	98.04	102.04	106.04 m(44) ₁₁₂ =	110.04	1200.45	(44)
Energy con	ntent of I	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600			· /		1200.43	(-1-1)
(45)m= 1	63.19	142.73	147.28	128.4	123.2	106.32	98.52	113.05	114.4	133.32	145.53	158.04		
If instantan	neous wa	ator hoatii	na at noint	of use (no	hot water	· storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =	=	1573.98	(45)
_	24.48	21.41	22.09	19.26						20	24.02	22.74		(46)
(46)m= 2 Water sto			22.09	19.26	18.48	15.95	14.78	16.96	17.16	20	21.83	23.71		(40)
Storage	volume	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If commu	unity he	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwis			hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water sto	-		oclared b	occ foct	or ic kno	wo (k\//k	2/d2x/):					22		(40)
Tempera					טווא פו וכ	wii (Kvvi	i/uay).					.39		(48) (49)
Energy lo					aar			(48) x (49)	١ –			.54		, ,
b) If mar			_	-		or is not		(40) X (43)	, –		0.	.75		(50)
Hot wate				-								0		(51)
If commu	-	•		on 4.3									I	
Volume f Tempera				2h								0		(52)
•								(47) (54)) (FO) (50)		0		(53)
Energy lo Enter (50			_	, KVVII/ye	ear			(47) x (51)) X (52) X (53) =	-	0 .75		(54) (55)
Water sto	, ,	, ,	•	or each	month			((56)m = (55) × (41)ı	m	0.	.73		(00)
_	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder of													ix H	(50)
_	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
· /							<u> </u>	<u> </u>	l	<u> </u>	<u> </u>	<u> </u>		•

Primary circuit loss (annual) fro	om Table 3				(0		(58)
Primary circuit loss calculated		59)m = (58) ÷ 3	65 × (41)m	า				
(modified by factor from Tab	le H5 if there is s	solar water heat	ing and a c	cylinder th	hermostat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23.26	23.26	22.51 2	23.26 22.51	23.26		(59)
Combi loss calculated for each	month (61)m = ((60) ÷ 365 × (4°	I)m					
(61)m= 0 0 0	0 0	0 0	0	0	0 0	0		(61)
Total heat required for water h	eating calculated	for each montl	1 (62) m = 0).85 × (45	5)m + (46)m +	 (57)m +	(59)m + (61)m	
(62)m= 209.78 184.81 193.87	173.49 169.8	151.41 145.11	``		79.92 190.62	204.63		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative quanti	ty) (enter '0' if	f no solar co	ontribution to wate	r heating)		
(add additional lines if FGHRS						3,		
(63)m= 0 0 0	0 0	0 0	0	0	0 0	0		(63)
Output from water heater				I	<u> </u>			
(64)m= 209.78 184.81 193.87	173.49 169.8	151.41 145.11	159.65	159.49 1	79.92 190.62	204.63		
	<u> </u>	<u> </u>	Outpu	t from water	r heater (annual) _{1.}	12	2122.6	(64)
Heat gains from water heating	. kWh/month 0.25	5 ´ [0.85 × (45)r	n + (61)ml	+ 0.8 x [((46)m + (57)m	+ (59)m	1	1
(65)m= 91.54 81.12 86.25	78.77 78.24	71.42 70.03	1 1		81.61 84.46	89.82	•	(65)
include (57)m in calculation		Vlinder is in the	dwelling o	r hot wate	er is from com	munity h	eating	
5. Internal gains (see Table 5		yiii aa ii a ii a ii	awoning o	THO Wate		inanity in	outing	
	,							
Metabolic gains (Table 5), Wat	tts Apr May	Jun Jul	Aug	Sep	Oct Nov	Dec		
(66)m= 138.61 138.61 138.61	138.61 138.61	138.61 138.61	 		38.61 138.61	138.61		(66)
` '					100.01	100.01		()
Lighting gains (calculated in Ap (67)m= 23.39 20.77 16.89	12.79 9.56	8.07 8.72			19.32 22.55	24.04		(67)
						24.04		(07)
Appliances gains (calculated in (68)m= 262.34 265.07 258.21	243.6 225.17	207.84 196.26	1 1		215.01 233.44	250.77		(68)
	<u> </u>	<u> </u>			215.01 233.44	250.77		(00)
Cooking gains (calculated in A	1 1	I I						(00)
(69)m= 36.86 36.86 36.86	36.86 36.86	36.86 36.86	36.86	36.86	36.86 36.86	36.86		(69)
Pumps and fans gains (Table !	, , , , , , , , , , , , , , , , , , , 							(70)
(70)m= 3 3 3	3 3	3 3	3	3	3 3	3		(70)
Losses e.g. evaporation (nega	, , , , , , , , , , , , , , , , , , , 	'						
(71)m= -110.88 -110.88 -110.88	-110.88 -110.88	-110.88 -110.88	-110.88 -	-110.88 -1	110.88 -110.88	-110.88		(71)
Water heating gains (Table 5)								
(72)m= 123.03 120.72 115.92	109.4 105.16	99.2 94.13	100.63	102.93 1	09.69 117.31	120.73		(72)
Total internal gains =		(66)m + (67)	m + (68)m + ((69)m + (70))m + (71)m + (72)	m		
(73)m= 476.34 474.14 458.6	433.37 407.47	382.69 366.7	373.08	386.13 4	111.59 440.88	463.12		(73)
6. Solar gains:								
Solar gains are calculated using sola		·	ations to conv	vert to the a	• •	ion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table 6a		g_ ble 6b	FF Table 6c		Gains (W)	
		l abie 0d	1 a	<u> </u>	i abie 00		. ,	1
Southeast 0.9x 0.77 x		x 36.79	x	0.63	× 0.7	_ =	61.85	(77)
Southeast 0.9x 0.77 x	5.5	x 62.67	X	0.63	x 0.7	= [105.35	(77)

(83)m= 226.28 Total gains – ir		548.63 nd sola	703.29 r (84)m =	809.2 (73)m		2.79 779.69 3)m , watts	699	.23 601.97	435.62	2 272	193.03		(83)
Solar gains in	watts, cal	lculated	for each	n month			(83)m	n = Sum(74)m	(82)m				
Northwest _{0.9x}	0.77	х	4.6	1	x [9.21	x	0.63	X	0.7	=	12.98	(81)
Northwest 0.9x	0.77	×	4.6	1	x [14.2	x	0.63	x	0.7	=	20	(81)
Northwest _{0.9x}	0.77	×	4.6	1	x [28.07	x	0.63	x	0.7	=	39.54	(81)
Northwest _{0.9x}	0.77	x		==	x [50.42	x	0.63	×	0.7		71.04	(81)
Northwest 0.9x	0.77	×			x [72.63	x	0.63	×	0.7	= =	102.32	(81)
Northwest 0.9x	0.77	$=$ \hat{x}	4.6		^ L х Г	91.1	_ ^ x	0.63	$=$ $\begin{bmatrix} \cdot \\ \times \end{bmatrix}$	0.7	-	128.35	(81)
Northwest 0.9x	0.77	x x			x L	91.35 97.38	x	0.63	X x	0.7	=	128.7 137.2	(81)
Northwest 0.9x	0.77	×			× L	67.96	X	0.63	_	0.7	╡ -	95.74	(81)
Northwest 0.9x	0.77	×	4.6		х <u>Г</u>	41.38	X	0.63	×	0.7	=	58.3	(81)
Northwest 0.9x	0.77	×			X	22.97	X	0.63	×	0.7	=	32.36	(81)
Northwest 0.9x	0.77	×	4.6		X	11.28	X	0.63	×	0.7	=	15.9	(81)
Southwest _{0.9x}	0.77	×	13.2		X	31.49		0.63	×	0.7	=	127.12	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	44.07		0.63	x	0.7	=	177.92	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	69.27		0.63	x	0.7	=	279.64	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x [92.85		0.63	×	0.7	=	374.86	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	104.39		0.63	×	0.7	=	421.44	(79)
Southwest _{0.9x}	0.77	x	13.2	21	x	113.91		0.63	x	0.7	=	459.87	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	118.15		0.63	x	0.7	=	476.99	(79)
Southwest _{0.9x}	0.77	×	13.2	21	х	119.01		0.63	x	0.7		480.46	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	106.25		0.63	x	0.7	-	428.95	(79)
Southwest _{0.9x}	0.77	×			x [85.75		0.63	×	0.7		346.2	(79)
Southwest _{0.9x}	0.77	$=$ \hat{x}	13.2		^ L x Г	62.67	 	0.63	$=$ $\frac{1}{x}$	0.7	- -	253.02	(79)
Southwest _{0.9x}	0.77	x x	5.5		x L	31.49	X	0.63	X	0.7	=	52.93 148.54	(77)
Southeast 0.9x	0.77	X			X L	44.07	X	0.63	× ر	0.7	┥ -	74.08	(77)
Southeast 0.9x	0.77	x			X Г	69.27	X	0.63	X	0.7	_ =	116.43	(77)
Southeast 0.9x	0.77	×	5.5		X	92.85	X	0.63	×	0.7	=	156.07	(77)
Southeast 0.9x	0.77	×			X	104.39	X	0.63	×	0.7	_ =	175.47	(77)
Southeast 0.9x	0.77	×	5.5		X	113.91	X	0.63	×	0.7	=	191.47	(77)
Southeast 0.9x	0.77	×	5.5		X	118.15	X	0.63	×	0.7	_ =	198.6	(77)
Southeast 0.9x	0.77	×	5.5	5	X	119.01	X	0.63	X	0.7	=	200.04	(77)
Southeast 0.9x	0.77	х	5.5	5	x	106.25	X	0.63	X	0.7	=	178.6	(77)
Southeast 0.9x	0.77	X	5.5	5	x	85.75	X	0.63	X	0.7	=	144.14	(77)

(86)m=	1	0.99	0.97	0.91	0.77	0.58	0.42	0.47	0.72	0.94	0.99	1		(86)
Mean in	nternal t	empera	ature in	living are	ea T1 (fc	ollow ste	ps 3 to 7	in Table	e 9c)					
	19.87	20.08	20.37	20.69	20.9	20.98	21	21	20.95	20.66	20.2	19.84		(87)
Temper	ature d	uring h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)					
· · ·	19.99	19.99	19.99	20.01	20.01	20.03	20.03	20.03	20.02	20.01	20.01	20		(88)
Utilisatio	on facto	or for ga	ains for i	rest of d	wellina. I	h2.m (se	e Table	9a)						
(89)m=	1	0.99	0.96	0.88	0.71	0.5	0.33	0.37	0.64	0.92	0.99	1		(89)
Mean in	nternal t	empera	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
	18.49	18.8	19.21	19.66	19.92	20.02	20.03	20.03	19.98	19.63	18.99	18.46		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.38	(91)
Mean in	nternal t	empera	ature (fo	r the wh	ole dwel	llina) = fl	A × T1	+ (1 – fL	A) x T2			!		_
	19.02	19.29	19.65	20.06	20.3	20.39	20.4	20.4	20.35	20.03	19.45	18.99		(92)
Apply a	djustme	ent to th	ne mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
(93)m= 1	19.02	19.29	19.65	20.06	20.3	20.39	20.4	20.4	20.35	20.03	19.45	18.99		(93)
8. Spac	e heati	ng requ	iirement											
				•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
		Feb	Mar	using Ta		Jun	Jul	Λιια	Son	Oct	Nov	Doo		
L_ Utilisatio	Jan on facto			Apr	May	Jun	Jui	Aug	Sep	Oct	INOV	Dec		
	0.99	0.98	0.96	0.88	0.73	0.53	0.37	0.41	0.67	0.92	0.99	1		(94)
Useful c	gains, h	mGm,	W = (94	1)m x (84	 1)m								I	
	98.32	850.4	962.81	1000.89	890.81	631.06	420.16	440.06	661.6	778.46	702.57	653.23		(95)
Monthly	/ avera	ge exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]			•	
(97)m= 17			1515.25		969.29	642.09	421.45	442.35	698.14	1062.76	1402.55	1691.21		(97)
· —	Ť	_)m – (95	í - `	<u> </u>		l	
(98)m= 7	751.9	546.95	411.02	188.25	58.4	0	0	0	0	211.52	503.99	772.26	0.444.00	7(00)
								Tota	l per year	(kwh/yeai	r) = Sum(9	8)15,912 =	3444.29	(98)
Space h	neating	require	ement in	kWh/m²	/year								33.18	(99)
9a. Energ	gy requ	iremen	ts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space I	-		4 fuo o.		ما مساما،									7(004)
				econdary		mentary	-	(000) 4	(004)				0	(201)
				ain syst	, ,			(202) = 1 -		,			1	(202)
			_	main sys				(204) = (204)	02) x [1 –	(203)] =			1	(204)
Efficiend	cy of m	ain spa	ce heat	ing syste	em 1								93.5	(206)
Efficiend	cy of se	condar	ry/supple	ementar	y heating	g system	າ, %			_		_	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
· —	Ť			alculated									l	
_ 7	751.9	546.95	411.02	188.25	58.4	0	0	0	0	211.52	503.99	772.26		
(211)m =	í	<u> </u>				1		1	1	i	1	i	ı	(211)
8	304.18	584.98	439.59	201.34	62.45	0	0	0	0	226.23	539.02	825.95		٦.
								rota	l (kWh/yea	ar) =5um(2	(11) _{15,1012}	F	3683.73	(211)

= {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0 0	1 o 1	0	0	0	0		
				ar) =Sum(2			0	(215
Water heating								J
Output from water heater (calculated above)						ı	I	
	51.41 145.11	159.65	159.49	179.92	190.62	204.63	70.0	(216
Efficiency of water heater (217)m= 87.93 87.54 86.77 85.03 82.29	79.8 79.8	79.8	79.8	85.25	87.29	88.03	79.8	ار 217)
Fuel for water heating, kWh/month	70.0	1 70.0	70.0	00.20	07.20	00.00		(= ,
(219)m = (64)m x 100 ÷ (217)m							I	
(219)m= 238.58 211.13 223.43 204.03 206.34 18	89.73 181.85	200.06	199.87	211.06	218.39	232.47		٦
Annual totals		rotal	= Sum(Z	19a) ₁₁₂ =	Wh/year		2516.93 kWh/year	(219)
Space heating fuel used, main system 1				N.	rvii/yeai		3683.73	7
Water heating fuel used							2516.93	ī
Electricity for pumps, fans and electric keep-hot								_
central heating pump:						30		(230
boiler with a fan-assisted flue						45		(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							412.99	」` <mark>](232</mark>
Total delivered energy for all uses (211)(221) +	(231) ± (232)	(237h) -	_				6688.66	\` ☐(338)
12a. CO2 emissions – Individual heating systems	` ' ` '						0000.00	
12a. 002 emissions – muividual neating system.	s including m	ICIO-CI II						
	Energy kWh/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x			0.2	16	=	795.69	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	543.66	(264
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1339.34	_ (265
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267
Liectricity for pumps, fans and electric keep-not								_
Electricity for lighting	(232) x			0.5	19	=	214.34	(268)

TER =

(273)

15.34

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:06*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 62.56m²Site Reference:Highgate Road - GREENPlot Reference: 05 - B

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

18.61 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.22 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 49.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 41.0 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

 Floor
 (no floor)
 OK

Roof (no floor)
(no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.71m²	
Windows facing: North West	3.46m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

Sasessor Name: Neil Ingham Stroma Number: STRO010943 Software Version: Version: 1.0.5.50			l lser I	Details: _										
### Coveral works Substitution S		sessor Name: Neil Ingham Stroma Number: ftware Name: Stroma FSAP 2012 Software Version: Property Address: 05 - B												
Area(m²)	Address :	F	Property	Address	: 05 - B									
Ground floor G.2.56 (1a) x 2.55 (2a) = 165.78 (3a)		ensions:												
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)			Are	a(m²)		Av. He	ight(m)		Volume(m	³)				
Dwelling volume	Ground floor			62.56	(1a) x	2	2.65	(2a) =	165.78	(3a)				
2. Ventilation rate: main heating heati	Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	62.56	(4)									
Number of chimneys	Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	165.78	(5)				
Number of chimneys Number of open flues 0	2. Ventilation rate:													
Number of chimneys			ry	other		total			m³ per hou	ır				
Number of intermittent fans 2	Number of chimneys] + [0	= [0	X 4	40 =	0	(6a)				
Number of passive vents	Number of open flues	0 + 0	+ [0	_ = [0	x 2	20 =	0	(6b)				
Number of flueless gas fires	Number of intermittent fa	ns				2	x ′	10 =	20	(7a)				
Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20	Number of passive vents				Ē	0	x '	10 =	0	(7b)				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20	Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20					L									
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)					_			Air ch	nanges per h	our				
Number of storeys in the dwelling (ns) Additional infiltration (19)-1)x0.1 = 0 (10) (10)	'	•						÷ (5) =	0.12	(8)				
Additional infiltration			ed to (17),	otherwise (continue ti	rom (9) to	(16)		0	(9)				
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	•	no awaming (no)					[(9)	-1]x0.1 =		_				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fc	r masoni	ry consti	ruction				=				
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = 0 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 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	• • • • • • • • • • • • • • • • • • • •		o the grea	ter wall are	ea (after									
If no draught lobby, enter 0.05, else enter 0	,	• /-	.1 (seal	ed), else	enter 0				0	(12)				
Window infiltration $0.25 - [0.2 \times (14) + 100] = 0.015$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0.016$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.37 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered $(20) = 1 - [0.075 \times (19)] = 0.37$ (21) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.37$ (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 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$	•	,	`	,,						=				
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.37 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 1$ (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 1$ $(21) = (18) \times (20) = 1$ $(21) = $	Percentage of windows	s and doors draught stripped							0	(14)				
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = $ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = $ Infiltration rate modified for monthly wind speed Many Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$ Wind Factor $(22a)m = (22)m \div 4$	Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)				
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $(21) = (18) \times (20) =$ Monthly average wind speed from Table 7 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$ Wind Factor $(22a)m = (22)m \div 4$									0	(16)				
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 1 (20)$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 1 \cdot (20) = 1 \cdot (20)$ 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 7 $(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$ Wind Factor $(22a)m = (22)m \div 4$	•	•	•	•	•	etre of e	envelope	area	5	= ' '				
Number of sides sheltered $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	•	•				is hoina u	ead		0.37	(18)				
Shelter factor $ (20) = 1 - [0.075 \times (19)] = 1 $			ne or a de	gree an pe	тпеаышу	is being u	360		0	(19)				
Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Shelter factor			(20) = 1 -	[0.075 x (19)] =				─				
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	Infiltration rate incorporat	ting shelter factor		(21) = (18	s) x (20) =				0.37	(21)				
Monthly average wind speed from Table 7 (22)m= $\begin{bmatrix} 5.1 & 5 & 4.9 & 4.4 & 4.3 & 3.8 & 3.8 & 3.7 & 4 & 4.3 & 4.5 & 4.7 \end{bmatrix}$ Wind Factor (22a)m = (22)m \div 4	Infiltration rate modified f	or monthly wind speed												
(22)m =	Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Wind Factor (22a)m = (22)m ÷ 4	Monthly average wind sp	eed from Table 7			•									
	(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7						
	Wind Factor (22a)m = (2	2)m ÷ 4												
			0.95	0.92	1	1.08	1.12	1.18						

Adjusted infiltr	ation rat	e (allowi	ing for st	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44		
Calculate effe		_	rate for t	he appli	cable ca	se	-		-	-	-		(226
If exhaust air h			endix N (2	3h) = (23a	a) × Fmv (e	equation (N	N5)) other	wise (23h) = (23a)			0	(238
If balanced with) = (20a)			0	(23k
a) If balance		•	•	J		`			Oh)m ı (22h) v [1 (22a)	. 1001	(230
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	+ 100j	(24a
b) If balance													
(24b)m= 0		0	0	0	0	0	0	0	0	0	0		(24k
c) If whole h							n from c	utsida					`
,	n < 0.5 ×				•				5 × (23b)		•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)r	ventilation $n = 1$, the			•					0.5]				
24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(240
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				•	
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. Heat losse	s and he	at loss r	naramet	≏r·									
ELEMENT	Gros area	SS	Openin	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		A X k kJ/K
Vindows Type		` /			12.29		/[1/(1.4)+		16.29	$\stackrel{\prime}{\lnot}$			(27)
Vindows Type					3.35	=	/[1/(1.4)+	0.04] =	4.44	=			(27)
Nalls Type1	46.7	′2	15.6	4	31.08	=	0.18		5.59	╡ ┌		$\neg \vdash$	(29)
Valls Type2	13.7	_	0		13.75	=	0.18	-	2.48	룩 ;		╡	(29)
otal area of e					60.47	=	0.10		2.10				(31)
Party wall		,			30.32	=	0		0	– 1			(32)
Party floor					62.56	=	<u> </u>		0			╡	(32)
Party ceiling						_				L		╡	
nternal wall **	k				62.56	_				L		╡	(32)
for windows and		owe uso e	affactive w	ndow I I-vs	100.8		ı formula 1	/[/1/ L-val	ارور مراجر	e aiven in	naragrank		(320
* include the area						atou using	TOTTIGIA 1	I (170 Valo	10)+0.0 1] 6	is giveri iii	paragrapi	. J. Z	
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				28.8	(33)
Heat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	9340.6	(34)
Thermal mass	parame	ter (TMF	P = Cm -	-TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
or design asses an be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						6.92	(36
f details of therma Fotal fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			35.73	(37)
entilation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))	-	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 33.46	33.23	32.99	31.9	31.7	30.75	30.75	30.57	31.11	31.7	32.11	32.54		(38)
Heat transfer	coefficier	nt, W/K	-				-	(39)m	= (37) + (38)m	-	•	
39)m= 69.19	68.95	68.72	67.63	67.42	66.47	66.47	66.29	66.84	67.42	67.84	68.27		
,													

Heat loss para	meter (l	-II P) \///	m²K					(40)m	= (39)m ÷	. (4)			
(40)m= 1.11	1.1	1.1	1.08	1.08	1.06	1.06	1.06	1.07	1.08	1.08	1.09		
(10)=			1.00	1.00	1.00	1.00	1.00	<u> </u>		Sum(40) ₁ .		1.08	(40)
Number of day	s in mo	nth (Tabl	le 1a)							Sum (10)1			(\ -/
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing one	rav requi	rement:								kWh/ye	ar:	
4. Water neat	ing ene	igy requi	rement.								KVVII/ye	tai.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		05		(42)
Annual average	l average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.96		(43)
not more that 125	litres per	person per	day (all w	ater use, l	not and co	ld) 	_						
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 91.25	87.94	84.62	81.3	77.98	74.66	74.66	77.98	81.3	84.62	87.94	91.25		
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		995.51	(44)
(45)m= 135.33	118.36	122.14	106.48	102.17	88.17	81.7	93.75	94.87	110.56	120.69	131.06		
L1									Total = Su	m(45) ₁₁₂ =	=	1305.27	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)			•		
(46)m= 20.3	17.75	18.32	15.97	15.33	13.22	12.25	14.06	14.23	16.58	18.1	19.66		(46)
Water storage									•				
Storage volume	` ′		•			Ū		ame ves	sel		150		(47)
If community h	•			•			` '		(01.1)				
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
Water storage a) If manufactor		eclared l	nss facto	nr is kna	wn (k\//ł	n/day).					39		(48)
Temperature fa				JI 13 KI10	WII (ICVVI	ı, day j.							
·				oor			(48) x (49)	\ _			54		(49)
Energy lost from b) If manufaction		_	-		or is not		(46) X (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	eating s	ee sectio	on 4.3										
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,		41	-4-1\			
(modified by					ı —	ı —		<u> </u>		<u> </u>	00.00		(50)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month (61)m = (60) \div 365 × (41)m													
(61)m= 0	0 0	or each		(61)m =	(60) ÷ 30	05 × (41))m 0	0	0	Ιο	0	1	(61)
	!						ļ			ļ		(50)== : (61)==	(01)
(62)m= 181.9		168.73	151.57	148.77	133.26	128.29	140.3		(45)III + 157.16	165.78	(57)III +	(59)m + (61)m 1	(62)
` /			<u> </u>	<u> </u>		l						J	(02)
Solar DHW inp									r contribut	ion to wate	er neaung)		
(63)m= 0	0	0	0	0	0) 300 Ap	0		0	0	0	1	(63)
Output from	<u> </u>											J	()
(64)m= 181.9		168.73	151.57	148.77	133.26	128.29	140.3	5 139.96	157.16	165.78	177.65]	
. ,		<u> </u>	<u> </u>	<u> </u>		<u> </u>	ļ	 utput from w		<u> </u>	12	1853.89	(64)
Heat gains	from water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m) + (61)	ml + 0.8	k [(46)m	+ (57)m	+ (59)m	1	_
(65)m= 82.2	1	77.89	71.48	71.25	65.39	64.44	68.45	1	74.04	76.2	80.85]	(65)
	7)m in cal	culation o	of (65)m	only if c	vlinder i	s in the ${\mathfrak a}$	dwellin	a or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	·				,			9 01 1101 11				.cag	
Metabolic g				<i>,</i>									
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 102.0	65 102.65	102.65	102.65	102.65	102.65	102.65	102.6	5 102.65	102.65	102.65	102.65	1	(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				•	
(67)m= 15.9	9 14.2	11.55	8.74	6.54	5.52	5.96	7.75	10.4	13.21	15.42	16.43		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5		•	•	
(68)m= 179.3	35 181.22	176.53	166.54	153.94	142.09	134.18	132.32	2 137.01	146.99	159.59	171.44]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	•	•	•	
(69)m= 33.2	7 33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27]	(69)
Pumps and	fans gains	(Table 5	. Ба)					•				•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (nega	tive valu	es) (Tab	le 5)				•	•	•	•	
(71)m= -82.	12 -82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12	-82.12		(71)
Water heati	ng gains (T	able 5)				•	•		•		•	•	
(72)m= 110.5	58 108.67	104.69	99.28	95.76	90.82	86.61	92	93.91	99.51	105.84	108.67]	(72)
Total intern	nal gains =	•			(66))m + (67)m	n + (68)n	n + (69)m +	(70)m + (7	'1)m + (72))m	•	
(73)m= 362.	72 360.88	349.56	331.36	313.03	295.22	283.55	288.86	6 298.12	316.51	337.64	353.34]	(73)
6. Solar ga	ins:					•	•	•	•	•	•		
Solar gains a	re calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to	convert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu			g_ Table Ch	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_	able 6c		(W)	_
Northeast 0.9		X	12.	29	X 1	1.28	x	0.63	x	0.7	=	42.38	(75)
Northeast 0.9	0.77	X	12.	29	X 2	22.97	X	0.63	x	0.7	=	86.26	(75)
Northeast 0.9	<u> </u>	X	12.	29	X	11.38	X	0.63	x	0.7	=	155.42	(75)
Northeast 0.9		X	12.	29	x 6	67.96	X	0.63	x	0.7	=	255.24	(75)
Northeast 0.9	0.77	X	12.	29	x 9	91.35	x	0.63	х	0.7	=	343.09	(75)

		_			_		_		_				_
Northeast _{0.9x}	0.77	X	12.	29	X	97.38	X	0.63	X	0.7	=	365.77	(75)
Northeast _{0.9x}	0.77	X	12.	29	X	91.1	X	0.63	X	0.7	=	342.17	(75)
Northeast _{0.9x}	0.77	X	12.	29	x	72.63	X	0.63	X	0.7	=	272.79	(75)
Northeast _{0.9x}	0.77	X	12.	29	X	50.42	X	0.63	X	0.7	=	189.38	(75)
Northeast _{0.9x}	0.77	X	12.	29	x	28.07	X	0.63	X	0.7	=	105.42	(75)
Northeast _{0.9x}	0.77	X	12.	29	x	14.2	X	0.63	X	0.7	=	53.32	(75)
Northeast 0.9x	0.77	х	12.	29	x	9.21	X	0.63	X	0.7	=	34.61	(75)
Northwest _{0.9x}	0.77	х	3.3	35	x	11.28	X	0.63	X	0.7	=	11.55	(81)
Northwest _{0.9x}	0.77	х	3.3	35	x	22.97	X	0.63	X	0.7	=	23.51	(81)
Northwest 0.9x	0.77	х	3.3	35	x	41.38	X	0.63	X	0.7	=	42.36	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	67.96	x	0.63	X	0.7	=	69.57	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	91.35	x	0.63	X	0.7	=	93.52	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	97.38	×	0.63	x	0.7	=	99.7	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	91.1	X	0.63	x	0.7		93.27	(81)
Northwest _{0.9x}	0.77	x	3.3	35	x	72.63	X	0.63	x	0.7		74.36	(81)
Northwest 0.9x	0.77	x	3.3	35	x	50.42	X	0.63	x	0.7	=	51.62	(81)
Northwest 0.9x	0.77	x	3.3	35	x	28.07	X	0.63	x	0.7	=	28.74	(81)
Northwest _{0.9x}	0.77	х	3.3	35	x	14.2	X	0.63	х	0.7	=	14.53	(81)
Northwest 0.9x	0.77	x	3.3	35	x	9.21	X	0.63	x	0.7	=	9.43	(81)
Solar gains in (83)m= 53.93 Total gains – i (84)m= 416.65	109.78 1	97.78	324.81	436.61	465.4	n , watts	(83)m 347	 	134.10 450.60		44.04 397.38]]	(83) (84)
7. Mean inter	nal temper	rature	(heating	season)								
Temperature	during hea	ating p	eriods ir	n the livi	ng are	a from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation fac	tor for gair	ns for I	iving are	ea, h1,m	(see	Table 9a)						1	
Jan	Feb	Mar	Apr	May	Jur	Jul	А	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.92	0.76	0.55	0.4	0.4	0.77	0.96	0.99	1		(86)
Mean interna	l temperati	ure in I	iving are	ea T1 (fo	ollow s	teps 3 to	7 in T	able 9c)		_	_		
(87)m= 19.88	20.03	20.3	20.67	20.91	20.99	21	2	1 20.93	20.59	20.18	19.86		(87)
Temperature	during hea	ating p	eriods ir	n rest of	dwelli	ng from Ta	able 9	9, Th2 (°C)					
(88)m= 20	20	20	20.02	20.02	20.03	20.03	20.	03 20.03	20.02	20.01	20.01		(88)
Utilisation fac	tor for gair	ns for r	est of d	welling,	h2,m (see Table	9a)	-	-	-	-		
(89)m= 1	_ <u> </u>	0.97	0.89	0.7	0.47	1	0.3	0.69	0.95	0.99	1		(89)
Mean interna	l temnerati	ure in 1	the rest	of dwell	ina T2	(follow st	ens 3	to 7 in Tah	le 9c)			l	
(90)m= 18.51		19.12	19.65	19.94	20.02	<u> </u>	20.		19.55	18.96	18.49		(90)
, , ,				L		1	1		<u> </u>	ving area ÷ (ļ	0.43	(91)
Many later	l damen and	/5	n Alexa . !	الماما	III: N	11 A T 1	. /4			`		L	` ′
Mean interna (92)m= 19.1	 	ure (fo _{19.63}	r the wh	ole dwe 20.36	lling) =		+ (1		20	19.48	19.08]	(92)
Apply adjustr				l	<u> </u>		1				19.06		(32)
Apply aujusti	HELIT TO THE	mean	micilia	remper	atul C I	וטווו ומטונ	J +C ,	where appl	opriate				

(02)	40.4	40.00	40.00	20.00	20.20	20.44	20.45	20.45	20.20	-00	40.40	40.00		(93)
(93)m=	19.1	19.28	19.63	20.09	20.36	20.44	20.45	20.45	20.38	20	19.48	19.08		(93)
			uirement				44 -4	Table O	41	4 T: /	70)	-11-	late	
			ernai ter or gains			ed at ste	ер ттог	rable 9i	o, so tha	t 11,m=(rojin an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	1:			,	,					•	
(94)m=	0.99	0.99	0.97	0.89	0.72	0.5	0.35	0.42	0.72	0.95	0.99	1		(94)
Usefu			W = (94)				ı	,			1	,	ı	
(95)m=		465.48	530.71	586.73	540.34	382.81	255.04	266.73	389.19	426.44	400.93	395.61		(95)
	nly avera	age exte	rnal tem	perature			•	,				,		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			i				-``	- ` 	– (96)m					
	1023.86		902.35	756.53	583.62	388.05	255.69	268.24	420.06	633.87	840.02	1015.78		(97)
Space		· · ·	ı	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		1	
(98)m=	453.5	353.71	276.5	122.25	32.2	0	0	0	0	154.32	316.14	461.4		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	2170.03	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								34.69	(99)
9a En	erav rec	wiremer	nts – Indi	ividual h	eating sy	vstems i	ncluding	micro-C	:HP)					
	e heatir		no ma	Madain	oainig oʻ	y otorno r	noraanig	, moro c)					
•		•	at from s	econdar	v/supple	mentary	system						0	(201)
	•		at from m			,	•	(202) = 1	- (201) =				1] (202)
	•		ng from	-	. ,			(204) = (2	02) × [1 –	(203)] =			1] (204)
			ace heat	-									93.5	(206)
	•	-	ry/suppl			a svstem	າ. %						0] (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ´ ar
Space			ement (c	<u> </u>			<u> </u>	/tug	СОР	000	1101	200	KVVIII y Oc	A1
	453.5	353.71	276.5	122.25	32.2	0	0	0	0	154.32	316.14	461.4		
(211)m) – \[(08	\m v (20	 (4)] } x 1	00 ÷ (20	16)			<u> </u>	<u> </u>			<u> </u>		(211)
(211)11	485.03	378.29	295.72	130.75	34.44	0	0	0	0	165.05	338.12	493.48		(211)
	.00.00	0.0.20			0				l (kWh/yea				2320.89	(211)
Casa	- h1:	a fuel (e		//- /					(***********************************		715,1012	2	2320.09	_(=11)
•		•	econdar 00 ÷ (20	• , .	month									
(215)m=		0	00 : (20	0	0	0	0	0	0	0	0	0		
(=:-)									l (kWh/yea		_		0	(215)
Motor	haatina									(- /15,1012	2	0	_(=.0)
	heating		ter (calc	ulated al	hove)									
Output	181.92	160.44	168.73	151.57	148.77	133.26	128.29	140.35	139.96	157.16	165.78	177.65		
Efficier		ater hea							l		ļ		79.8	(216)
(217)m=		86.87	86.12	84.25	81.51	79.8	79.8	79.8	79.8	84.77	86.51	87.25		」` (217)
. ,			kWh/mo								L			•
		•) ÷ (217)											
. ,	208.74	184.71	195.92	179.91	182.5	166.99	160.77	175.87	175.39	185.4	191.63	203.62		
			•					Tota	I = Sum(2	19a) ₁₁₂ =	-		2211.45	(219)
Annua	al totals									k'	Wh/year	,	kWh/year	_
Space	heating	fuel use	ed, main	system	1						=		2320.89	
												1	-	_

			,		_
Water heating fuel used				2211.45	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a)(230g) =		75	(231)
Electricity for lighting				282.38	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =			4889.72	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	F.,		_		
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	-		tor =		
Space heating (main system 1) Space heating (secondary)	kWh/year	kg CO2/kWh		kg CO2/yea	ar -
	kWh/year	kg CO2/kWh	=	kg CO2/yea	ar](261)
Space heating (secondary)	kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea	(261) (263)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	=	kg CO2/yea 501.31 0 477.67	(261) (263) (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= = =	kg CO2/yea 501.31 0 477.67 978.98	(261) (263) (264) (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.216	= = = =	kg CO2/yea 501.31 0 477.67 978.98 38.93	(261) (263) (264) (265) (267)

TER =

(273)

18.61

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:05*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 72.62m²Site Reference:Highgate Road - GREENPlot Reference: 05 - C

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 18.46 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.74 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 42.5 kWh/m²

OK

2 Fabric U-values

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

Floor (no floor) Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.71m²	
Windows facing: North West	3.46m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		1	Jser D	otaile:						
A a a a a a a a a a Maria a a	Nie il le ele e e	C			- NI	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012	2		Stroma Softwa					010943 on: 1.0.5.50	
Continui o Humo.				Address:		OlOII.		7 0 10 10	711 11010100	
Address :		·								
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(1a) v		ight(m)	(2a) =	Volume(m³) (3a)
	-) . (4 -) . (4 -) . (4 -) . (4 -)	(4.5)			(1a) x	2	65	(2a) =	192.44	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e))+(1n)	7:	2.62	(4)) (O.) (O.)	I) (O)	(0.)		_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	192.44	(5)
2. Ventilation rate:	main se	condary		other		total			m³ per hou	r
Number of allipsesses	heating he	eating	+ [1 _ [40 =		_
Number of chimneys		0	<u> </u>	0] = [0			0	(6a)
Number of open flues	0 +	0	+	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	3		10 =	30	(7a)
Number of passive vents	;					0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a	ı)+(6b)+(7a)+	+(7b)+(7	7c) =	Г	30		÷ (5) =	0.16	(8)
	peen carried out or is intended				ontinue fr			. (0) –	0.10	
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber for resent, use the value corresp				•	uction			0	(11)
deducting areas of openii		oriaing to the	e greate	er wan area	a (aner					
If suspended wooden t	floor, enter 0.2 (unseale	ed) or 0.1	(seale	d), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0								0	(13)
ŭ	s and doors draught str	ripped							0	(14)
Window infiltration				0.25 - [0.2		_			0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	q50, expressed in cubi	-		•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has					is heina u	sad		0.41	(18)
Number of sides sheltere		been done c	n a deg	пес ап рег	теаышу	is being u	seu		0	(19)
Shelter factor	-			(20) = 1 - [0.075 x (1	9)] =			1	(20)
Infiltration rate incorporat	ting shelter factor			(21) = (18)	x (20) =				0.41	(21)
Infiltration rate modified f	or monthly wind speed							'		_
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
` '			-			L			J	

Adjusted infiltration	on rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m				_	
).51	0.5	0.45	0.44	0.39	0.39	0.38	0.41	0.44	0.46	0.48		
<i>Calcul<mark>ate effectiv</mark></i> If mechanical v		•	rate for t	he appli	cable ca	se	-		-	-	-	· 	
If exhaust air heat			ndix N (2	3h) <i>– (2</i> 3a	a) × Fmv (e	equation (N5)) othe	wise (23h) = (23a)			0	(23
If balanced with he) = (23a)			0	(2:
		•	-	_					2h\m . /	22h) v [1 (220)	0 . 1001	(2:
a) If balanced r	0	0	0	0	0	0	0	0	0	0	0	- 100]	(2
b) If balanced r													,_
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole hous			_		<u> </u>								•
if (22b)m <				•	•				.5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural ver if (22b)m =									0.51	-			
	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61		(2
Effective air ch	ange i	rate - en	ter (24a	or (24b	o) or (24	c) or (24	·d) in box	(25)				I	
	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61		(2
							l						
3. Heat losses a									A 37.11				
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		X k J/K
Vindows Type 1					12.71	_x 1	/[1/(1.4)+	0.04] =	16.85				(2
Vindows Type 2					3.46	x1	/[1/(1.4)+	0.04] =	4.59	\equiv			(2
Valls Type1	72.6	2	16.17	7	56.45	5 X	0.18	i	10.16				(2
Valls Type2 ☐	17.78	8	0		17.78	3 x	0.18	=	3.2	Ħ i			<u> </u>
ــ otal area of elen	nents,	m²			90.4								 (3
Party wall					30.32	<u> </u>	0		0				(3
Party floor					72.62	=							(3
Party ceiling					72.62	=						╡	(3
nternal wall **					146.1	_				[(3
for windows and roo	of winda	ws. use e	ffective wi	ndow U-va			a formula 1	/[(1/U-valu	ıe)+0.041 a] as aiven in	paragraph		(0
* include the areas o								2(, ,	J	7-1-5-17		
abric heat loss,	W/K =	= S (A x	U)				(26)(30)	+ (32) =				34.8	(3
Heat capacity Cm	n = S(a)	Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	12217.13	(3
hermal mass pa	ramet	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
For design assessme ean be used instead o				construct	ion are noi	t known pi	recisely the	indicative	values of	TMP in T	able 1f		
hermal bridges	S (L	x Y) cal	culated u	using Ap	pendix l	<						7.11	(3
details of thermal brotal fabric heat I		are not kn	own (36) =	: 0.05 x (3	1)			(33) +	(36) =			41.91	(3
entilation heat lo		lculated	monthly	/					$= 0.33 \times ($	25)m x (5)		
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	9.93	39.6	38.08	37.8	36.47	36.47	36.23	36.98	37.8	38.37	38.98		(3
Heat transfer coe						<u> </u>			= (37) + (37)	<u> </u>	1	ı	
TOUL HAIRSTEI COE	HOIGH	ı, vv/IX					_	(00)111	- (01) 1° (1	•		1	
39)m= 82.16 8	1.83	81.51	79.99	79.71	78.38	78.38	78.14	78.89	79.71	80.28	80.88		

eat loss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
0)m= 1.13	1.13	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11		
umber of day	re in mo	nth (Tab	lo 1a)						Average =	Sum(40) ₁ .	12 /12=	1.1	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
-1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•				•	•	•	•	•			
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		31		(42)
nnual averag educe the annua ot more that 125	e hot wa al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.02		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•					
4)m= 97.92	94.36	90.8	87.24	83.67	80.11	80.11	83.67	87.24	90.8	94.36	97.92		_
nergy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1068.18	(44
5)m= 145.21	127	131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63		
		ı			l	l	l		Total = Su	m(45) ₁₁₂ =	= [1400.56	(45
instantaneous w									1	1			
6)m= 21.78 /ater storage	19.05	19.66	17.14	16.44	14.19	13.15	15.09	15.27	17.8	19.42	21.09		(46
torage volum) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47
community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)				<u> </u>		
therwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
/ater storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48
, emperature fa					`	3,					54		(49
nergy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50
) If manufact			-										,_,
ot water stora community h	•			e z (KVV	n/iitre/ua	iy)					0		(51
olume factor	_										0		(52
emperature fa	actor fro	m Table	2b								0		(53
nergy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter (50) or (, ,	,								0.	75		(55
/ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m 				
cylinder contains	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)ı	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Appendix	кН	(56
7)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57
rimary circuit			m Table	<u> </u>			<u> </u>	I		<u> </u>	0		(58
rimary circuit	loss cal	culated f	for each	month (•	. ,	, ,				~		(30
(modified by					ı —	ı —		<u> </u>		stat)			
9)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59

Combi loso	a a la ulata d	for oach	month /	(64)m	(CO) + 2(SE (41)	\						
Combi loss of (61)m= 0	o localizated	o each	0	0	00) - 30	05 × (41)	0	0	0	0	0	1	(61)
	!						<u> </u>	ļ		<u> </u>	<u> </u>	(50)== : (61)==	(01)
(62)m= 191.8	-i	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	· (59)m + (61)m]	(62)
Solar DHW inpu]	(02)
(add addition									i contribut	ion to wate	er neating)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	1	(63)
Output from	l		-									J	` ,
(64)m= 191.8		177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22]	
` '	_ l					l	<u> </u>	put from w		ļ	I12	1949.18	(64)
Heat gains f	rom water	heating.	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)r	nl + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	_
(65)m= 85.56	_	80.85	74.06	73.73	67.53	66.42	70.72	69.92	76.72	79.13	84.03]	(65)
include (5	L 7)m in cal	culation o	of (65)m	only if c	vlinder i	ເ s in the ເ	dwelling	or hot w	ater is f	om com	munity h	neating	
5. Internal	<u> </u>			•	y		z c					9	
Metabolic ga				, •									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m= 115.4	1 115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 18.13	i	13.09	9.91	7.41	6.26	6.76	8.79	11.79	14.97	17.48	18.63	1	(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5			4	
(68)m= 203.3	<u> </u>	200.13	188.81	174.52	161.09	152.12	150.01	155.32	166.64	180.93	194.36	1	(68)
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a	, also s	ee Table	5			•	
(69)m= 34.54	<u> </u>	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	1	(69)
Pumps and	fans gains	(Table 5	ia)									1	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)		Į.			!	!		
(71)m= -92.3	2 -92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32	-92.32]	(71)
Water heating	ng gains (T	able 5)				!			!			•	
(72)m= 115	112.94	108.67	102.87	99.1	93.79	89.28	95.06	97.11	103.12	109.9	112.95]	(72)
Total intern	al gains =				(66))m + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	(1)m + (72))m	•	
(73)m= 397.0	8 395.1	382.51	362.21	341.65	321.75	308.78	314.47	324.85	345.36	368.93	386.56]	(73)
6. Solar gai	ins:									•	•		
Solar gains ar	e calculated	using sola	flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ 	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast 0.9		Х	12.	71	x 1	1.28	х	0.63	x	0.7	=	43.83	(75)
Northeast 0.9	0	Х	12.	71	x 2	22.97	х	0.63	x	0.7	=	89.21	(75)
Northeast 0.9	0	х	12.	71	X 4	11.38	х	0.63	x	0.7	=	160.73	(75)
Northeast 0.9		X	12.	71	× 6	67.96	x	0.63	x	0.7	=	263.96	(75)
Northeast 0.93	× 0.77	X	12.	71	x g	91.35	Х	0.63	х	0.7	=	354.82	(75)

		_							_				_
Northeast _{0.9x}	0.77	X	12.	71	х !	97.38	X	0.63	X	0.7	=	378.27	(75)
Northeast _{0.9x}	0.77	X	12.	71	Х	91.1	X	0.63	X	0.7	=	353.87	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	72.63	X	0.63	X	0.7	=	282.11	(75)
Northeast _{0.9x}	0.77	X	12.	71	X .	50.42	X	0.63	X	0.7	=	195.85	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	28.07	X	0.63	X	0.7	=	109.02	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	14.2	X	0.63	X	0.7	=	55.15	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	9.21	X	0.63	X	0.7	=	35.79	(75)
Northwest 0.9x	0.77	X	3.4	16	X	11.28	X	0.63	X	0.7	=	11.93	(81)
Northwest _{0.9x}	0.77	X	3.4	16	x	22.97	X	0.63	X	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.4	16	X	41.38	X	0.63	X	0.7	=	43.75	(81)
Northwest _{0.9x}	0.77	x	3.4	16	х	67.96	x	0.63	x	0.7		71.86	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x	91.35	x	0.63	x	0.7		96.59	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x .	97.38	X	0.63	x	0.7	_ =	102.98	(81)
Northwest _{0.9x}	0.77	×	3.4	16	х	91.1	x	0.63	x	0.7	_ =	96.33	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	×	3.4	16	x .	50.42	х	0.63	x	0.7	=	53.32	(81)
Northwest 0.9x	0.77	×	3.4	16	x	28.07	х	0.63	x	0.7	=	29.68	(81)
Northwest 0.9x	0.77	×	3.4	16	х	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest 0.9x	0.77	×	3.4	16	х	9.21	x	0.63	x	0.7	=	9.74	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m= 55.76	ļ)4.48	335.82	451.41	481.25	450.2	358	.9 249.17	138.7	70.16	45.53		(83)
Total gains – i		-		<u> </u>	`	, watts						1	
(84)m= 452.84	508.6 58	36.99	698.03	793.06	803.01	758.98	673.	38 574.02	484.0	439.09	432.1		(84)
7. Mean inter	nal tempera	ature	(heating	season)								
Temperature	during heat	ting p	eriods ir	n the livi	ng area	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for I	iving are	ea, h1,m	(see Ta	able 9a)				_		1	
Jan	Feb I	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 1	1 0).99	0.94	0.81	0.6	0.45	0.5	2 0.82	0.97	1	1		(86)
Mean_interna	l temperatu	re in I	iving are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)		-	-	_	
(87)m= 19.81	19.95 20	0.22	20.59	20.87	20.98	21	20.9	99 20.9	20.53	20.11	19.79		(87)
Temperature	during heat	ting p	eriods ir	n rest of	dwelling	g from Ta	able 9), Th2 (°C)					
(88)m= 19.98	19.98 1	9.98	20	20	20.02	20.02	20.0	02 20.01	20	20	19.99]	(88)
Utilisation fac	tor for gains	s for r	est of d	welling,	h2,m (s	ee Table	9a)	•		-		•	
(89)m= 1		0.98	0.92	0.75	0.52	0.35	0.4	2 0.74	0.96	0.99	1]	(89)
Mean interna	l temperatu	re in 1	the rest	of dwell	ina T2 (f	follow ste	ne 3	to 7 in Tabl	 _ ()c)		!	J	
(90)m= 18.39	 	8.99	19.53	19.88	20	20.02	20.0	1	19.46	18.85	18.38]	(90)
()	1									ving area ÷ (0.38	(91)
Many late	l tamen a sect	/*	n Alexa . !	الماما	III: \	: A . T4	. /4			•			 ` ′
Mean interna	ı temperatu	re (to	r tne wh	ioie awe	iiing) = 1	LA X I1	+ (1 ·	– TLA) × 12				1	
(02)m- 10 02	10 14 44	വംI	10.04	20.26	20.20	20.20	201	20 20 24	10 07	1004	10 00		(02)
(92)m= 18.93 Apply adjustr		9.46 mean	19.94	20.26	20.38	20.39	20.3		19.87		18.92		(92)

(93)m= 18.93 19.11 19.46 19.94 20.26 20.38 20.39 20.39 20.31 19.87 19.34 18.92 (93)m= 18.93 19.11 19.46 19.94 20.26 20.38 20.39 20.39 20.31 19.87 19.34 18.92 (93)m= 19.34 18.92 (93)m= 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 19.34 18.92 (93)m= 19.34 19.34 18.92 (93)m= 19.34 19.34 19.34 18.92 (93)m= 19.34 19	93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	
(94)m= 1 0.99 0.98 0.92 0.77 0.55 0.39 0.46 0.77 0.96 0.99 1	94)
Useful gains, hmGm , W = (94)m x (84)m	
	95)
Monthly average external temperature from Table 8	00)
	96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]	07)
	97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 558.99	
	00)
Total per year (kWh/year) = Sum(98) _{15,912} = 2751.48	98)
Space heating requirement in kWh/m²/year 37.89	99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary system 0	201)
Fraction of space heat from main system(s) $(202) = 1 - (201) = 1$	202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1	204)
Efficiency of main space heating system 1	206)
Efficiency of secondary/supplementary heating system, %	208)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	
Space heating requirement (calculated above)	
558.99 442.69 359.01 173.64 53.28 0 0 0 0 204.44 393.93 565.49	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	211)
597.85 473.47 383.97 185.71 56.99 0 0 0 0 218.66 421.32 604.8	
Total (kWh/year) =Sum(211) _{15,1012} = 2942.76 (2	211)
Space heating fuel (secondary), kWh/month	
$= \{[(98)m \times (201)] \} \times 100 \div (208)$	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	
Total (kWh/year) = Sum(215) _{15,1012} = 0 (2	215)
Water heating	
Output from water heater (calculated above)	
191.8 169.09 177.65 159.35 156.22 139.69 134.26 147.19 146.89 165.23 174.59 187.22	
Efficiency of water heater 79.8	216)
(217)m= 87.5 87.27 86.65 85.04 82.27 79.8 79.8 79.8 79.8 85.38 86.92 87.58	217)
Fuel for water heating, kWh/month	
(219)m = (64)m x 100 ÷ (217)m	
(219)m= 219.2 193.76 205.01 187.37 189.88 175.06 168.24 184.45 184.07 193.51 200.86 213.77	
	219)
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 2942.76	
Space heating fuel used, main system 1 2942.76	

					_					
Water heating fuel used				2315.18						
Electricity for pumps, fans and electric keep-hot										
central heating pump:			30		(230c)					
boiler with a fan-assisted flue			45		(230e)					
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =		75	(231)					
Electricity for lighting	320.14	(232)								
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 5653.09 (338										
12a. CO2 emissions – Individual heating systems including micro-CHP										
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea						
Space heating (main system 1)	(211) x	0.216	=	635.64	(261)					
Space heating (secondary)	(215) x	0.519	=	0	(263)					
Water heating	(219) x	0.216	=	500.08	(264)					
Space and water heating	(261) + (262) + (263) + (264) =			1135.72	(265)					
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)					
Electricity for lighting	(232) x	0.519	=	166.15	(268)					
Total CO2, kg/year	sum	of (265)(271) =		1340.79	(272)					

TER =

(273)

18.46

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:03*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 53.96m²Site Reference:Highgate Road - GREENPlot Reference: 05 - D

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 20.99 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.99 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 57.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 46.3 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.17 (max. 0.30) 0.18 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK

Floor (no floor)

Roof 0.13 (max. 0.20) 0.13 (max. 0.35) **OK**Openings 1.40 (max. 2.00) 1.40 (max. 3.30) **OK**

 Openings
 1.40 (max. 2.00)
 1.40 (max. 3.30)

 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	12.07m ²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	: 05 - D					
Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor			53.96	(1a) x	2	2.65	(2a) =	142.99	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	53.96	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	142.99	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0] + [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0	_ = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				2	x '	10 =	20	(7a)
Number of passive vents				Ē	0	x '	10 =	0	(7b)
Number of flueless gas fi	res			F	0	x	40 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				20		÷ (5) =	0.14	(8)
Number of storeys in the	een carried out or is intended, procee ne dwelling (ns)	ed to (17),	otherwise (continue ti	om (9) to	(16)		0	(9)
Additional infiltration	io arrowing (rio)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are pri deducting areas of openir	resent, use the value corresponding t	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	etre of e	envelope	area	5	(17)
•	s if a pressurisation test has been do				is being u	sed		0.39	(18)
Number of sides sheltere			,	Í	J			0	(19)
Shelter factor			(20) = 1 -	[0.075 x (′	19)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.39	(21)
Infiltration rate modified for		1		1			ı	1	
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	 	1	1 07		1	1		1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = $(22a)$ m =	2)m ÷ 4							_	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.5	0.49	0.48	0.43	0.42	0.37	0.37	(21a) x	0.39	0.42	0.44	0.46	1	
Calculate effe		U	rate for t	he appli	cable ca	se	l .		l				
If mechanic							.=					0	(2
If exhaust air h		0		, ,	, ,	. ,	,, .	,) = (23a)			0	(2
If balanced wit		-	-	_								0	(2
a) If balance					·	- 	, ``	í `	 	- 	' ' ') ÷ 100] 1	(0
24a)m= 0	0		0	0	0	0	0	0	0	0	0]	(2
b) If balance					ı —	<u> </u>	É È	ŕ	 	- 	Ι ,	1	(2
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(2
c) If whole h	nouse ext n < 0.5 ×			•	•				5 v (23h	,)			
$\frac{11(220)1}{24c)m=0}$	0.5 x	0	0) – (23L 0	0	0	0	0	0	0	0	1	(2
d) If natural					<u> </u>	<u> </u>		<u> </u>				J	
,	n = 1, the			•	•				0.5]				
24d)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6]	(2
Effective air	change	rate - en	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	•	•	•	•	
25)m= 0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6]	(2
2 Haat laass	o and he	act loss r	aramata	\r.								_	
3. Heat losse		•			Not Am		اميدا		A V I I		المراجع الما	_	A V I.
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
/indows					12.07	7 x1.	/[1/(1.4)+	0.04] =	16	,			(2
/alls Type1	27.6	66	12.07	7	15.59) x	0.18		2.81	=		\neg \vdash	(2
Valls Type2	24.2	24	0	=	24.24	x	0.18	╡┇	4.36	=		-	(2
oof	53.9	96	0		53.96	x	0.13	╡ ₌ ˈi		=		╡ ├	(3
	53.9		0		53.96	=	0.13	= [7.01				(3
otal area of e			0		105.8	6			7.01				(3
Roof Total area of e Party wall			0		105.8 31.67	6 x	0.13	= [(3
otal area of e Party wall Party floor	elements		0		105.8 31.67 53.96	6 x			7.01] [] []			(3)
otal area of earty wall earty floor	elements	, m²		ndow U-ve	105.8 31.67 53.96 95.03	6 x	0	= [7.01	[]	paragraph		(3)
otal area of e arty wall arty floor	elements	, m²	ffective wi		105.8 31.67 53.96 95.03	6 x	0	= [7.01	[[[as given in	paragraph	h 3.2	(3)
otal area of earty wall arty floor nternal wall ** for windows and include the are	elements I roof windo	, m² ows, use e sides of in	ffective wil		105.8 31.67 53.96 95.03	6 X	0	= [/[(1/U-valu	7.01	[] [as given in	paragraph	h 3.2	(;
otal area of earty wall arty floor aternal wall ** for windows and include the are abric heat lo	elements I roof windows on both ss, W/K =	ows, use e sides of in	ffective wil		105.8 31.67 53.96 95.03	6 X	0 g formula 1	= [/[(1/U-valu) + (32) =	7.01				9 ((
otal area of earty wall arty floor oternal wall ** for windows and include the are abric heat located to the are abric heat located to the are abric heat located to the are abric heat located to the are abric heat located to the are abric heat located to the are abric heat located to the are abric heat located to the are abric heat located to the area.	elements I roof winder as on both as, W/K = Cm = S(ows, use e sides of in = S (A x (A x k)	ffective wi ternal wali U)	s and part	105.8 31.67 53.96 95.03 alue calcul	6 X	0 g formula 1	= [/[(1/U-value) + (32) = ((28)	7.01 0 (e)+0.04] a	2) + (32a).		30.1	(; (; (; (; (; (; (; (; (; (; (; (; (; (
otal area of earty wall earty floor enternal wall ** for windows and include the are abric heat loo leat capacity hermal mass or design asses	elements I roof winder as on both as, W/K = Cm = S(as parame asments who	ows, use e sides of in = S (A x (A x k) ster (TMF	ffective winternal wall U) P = Cm ÷ tails of the	s and part	105.8 31.67 53.96 95.03 95.03 alue calcul titions	6 x	0 formula 1. (26)(30)	= [/[(1/U-valu) + (32) = ((28) Indica	7.01 0 (e)+0.04] a (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	30.1 7314.	(3 (3) (3) (4) (4) (5) (5) (6) (6) (7) (7) (8) (9) (9) (9) (10) (10) (10) (10) (10) (10) (10) (10
otal area of e arty wall arty floor aternal wall ** for windows and include the are abric heat loo eat capacity hermal mass or design asses an be used inste	elements I roof windo as on both ss, W/K = Cm = S(a parame sments whead of a det	ows, use e sides of in = S (A x (A x k) eter (TMF ere the dec	ffective winternal wall U) P = Cm ÷ tails of the lation.	s and part - TFA) ir constructi	105.8 31.67 53.96 95.03 alue calcul titions kJ/m²K	6 X 3 Sated using	0 formula 1. (26)(30)	= [/[(1/U-valu) + (32) = ((28) Indica	7.01 0 (e)+0.04] a (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	30.1 7314. 250	9 (C) (C) (C) (C) (C) (C) (C) (C) (C) (C)
otal area of earty wall arty floor aternal wall ** for windows and include the are abric heat lose eat capacity hermal mass or design assessan be used instead hermal bridge	elements I roof windo as on both ss, W/K = Cm = S(s parame sments whead of a det es : S (L	ows, use e sides of in = S (A x (A x k) ter (TMF ere the dec tailed calco x Y) calco	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to	s and part - TFA) ir constructi	105.8 31.67 53.96 95.03 alue calculations a kJ/m²K ion are not	6 X 3 Sated using	0 formula 1. (26)(30)	= [/[(1/U-valu) + (32) = ((28) Indica	7.01 0 (e)+0.04] a (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	30.1 7314.	9 (X
otal area of earty wall arty floor ternal wall ** for windows and include the are abric heat lose eat capacity hermal mass or design asses in be used inste hermal bridg details of therm	elements If roof winder as on both as, W/K = Cm = S(as parame asments where and of a det es : S (L al bridging	ows, use e sides of in = S (A x (A x k) ter (TMF ere the dec tailed calco x Y) calco	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to	s and part - TFA) ir constructi	105.8 31.67 53.96 95.03 alue calculations a kJ/m²K ion are not	6 X 3 Sated using	0 formula 1. (26)(30)	= [/[(1/U-valu) + (32) = ((28) Indica e indicative	7.01 0 (e)+0.04] a (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	30.1 7314. 250	9 (3 26 (3 5 (4)
otal area of earty wall arty floor ternal wall ** for windows and include the are abric heat lose eat capacity hermal mass or design asses an be used instead thermal bridg details of therm otal fabric he	elements I roof windo as on both ss, W/K = Cm = S(s parame sments whe ad of a det es : S (L al bridging eat loss	ows, use e sides of in S (A x k) ter (TMF ere the detailed calcular x Y) calculare not known.	ffective winternal wall U) P = Cm ÷ tails of the plation. Culated to the culate	s and part TFA) ir constructi using Ap	105.8 31.67 53.96 95.03 alue calculations a kJ/m²K ion are not	6 X 3 Sated using	0 formula 1. (26)(30)	= [/[(1/U-valu) + (32) = ((28) Indica e indicative	7.01 0 ue)+0.04] a (30) + (32 tive Value	2) + (32a). : Medium : TMP in Ta	(32e) =	30.1 7314. 250	9 (3 26 (3 5 (4)
otal area of earty wall arty floor aternal wall ** for windows and include the are abric heat lose eat capacity hermal mass or design assess an be used instead thermal bridg details of thermotal fabric hermal fab	elements I roof windo as on both ss, W/K = Cm = S(s parame sments whe ad of a det es : S (L al bridging eat loss	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calc are not known	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to the cown (36) =	s and part TFA) ir constructi using Ap	105.8 31.67 53.96 95.03 alue calcul titions n kJ/m²K ion are not opendix h	6 X 3 Sated using	o formula 1 (26)(30)	= [/[(1/U-valu) + (32) = ((28) Indica e indicative (33) + (38)m	7.01 0 ue)+0.04] a (30) + (32 tive Value e values of	2) + (32a). : Medium : <i>TMP in T</i> 3	(32e) =	30.1 7314. 250	9 (3 26 (3 5 (4)
otal area of earty wall arty floor arty floor arternal wall ** for windows and include the are abric heat look eat capacity hermal mass or design assessan be used instead thermal bridg details of thermotal fabric hereatilation hereatily wall fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area fabric hereatily wall area for which wall area fabric hereatily wall area fa	elements I roof windo as on both ss, W/K = Cm = S(s parame sments wh had of a det es : S (L al bridging eat loss at loss ca	ows, use e sides of in S (A x k) ter (TMF ere the detailed calcular x Y) calculare not known.	ffective winternal wall U) P = Cm ÷ tails of the plation. Culated to the culate	s and part TFA) ir constructi using Ap	105.8 31.67 53.96 95.03 alue calculations a kJ/m²K ion are not	6 x 6 3 8 dated using	0 formula 1. (26)(30)	= [/[(1/U-valu) + (32) = ((28) Indica e indicative	7.01 0 (30) + (32) tive Value e values of (36) = = 0.33 × (2) + (32a). : Medium : TMP in Ta	(32e) = able 1f	30.1 7314. 250	9 (3 26 (3
otal area of earty wall arty floor aternal wall ** for windows and include the are abric heat lose eat capacity hermal mass or design assess an be used instead details of thermotal fabric hermal bridg details of thermotal fabric hermal bridgentilation hermal bridgentilation hermal bridgentilation hermal Jan	elements I roof winder as on both as, W/K = Cm = S(a parame and of a det es : S (L al bridging at loss at loss ca Feb 29.2	ows, use e sides of in S (A x k) eter (TMF) ere the detailed calculated are not known alculated Mar 28.98	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to the cown (36) = monthly	s and part TFA) ir constructi using Ap 0.05 x (3	105.8 31.67 53.96 95.03 alue calcultitions n kJ/m²K ion are not	6 X 3 Sated using	o formula 1. (26)(30)	= [/[(1/U-value) + (32) = ((28) Indica e indicative (33) + (38)m Sep 27.18	7.01 0 1e)+0.04] a 1.(30) + (32) tive Value a values of (36) = = 0.33 × (Oct	2) + (32a). : Medium : TMP in Ta 25)m x (5) Nov 28.13	(32e) = able 1f Dec	30.1 7314. 250	9 (3 26 (3 4 (3

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
0)m= 1.22	1.22	1.21	1.19	1.19	1.17	1.17	1.17	1.18	1.19	1.2	1.21		
umber of day	e in moi	oth (Tabl	la 1a)			•		,	Average =	Sum(40) ₁ .	12 /12=	1.19	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
-1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
4. Water heat	ing ener	rgy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		81		(42
nnual averag educe the annua ot more that 125	l average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.11		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m= 84.82	81.74	78.65	75.57	72.49	69.4	69.4	72.49	75.57	78.65	81.74	84.82		— ,,,
nergy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	<u></u>	925.35	(44
5)m= 125.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82		
	- 1 1 C		-5		()		h (40		Total = Su	m(45) ₁₁₂ =		1213.27	(45
instantaneous w													(4)
6)m= 18.87 /ater storage	16.5 loss:	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27		(40
torage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47
community h	•			•			` '						
therwise if no /ater storage		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
a) If manufact		eclared lo	oss facto	or is kno	wn (kWh	n/day):				1.	39		(4
, emperature fa					`	,					54		(4
nergy lost fro				ear			(48) x (49)) =			75		(50
) If manufact			-										
ot water stora community h	•			e 2 (KVV	n/litre/da	ay)					0		(5
olume factor	_		JII 4 .5								0		(52
emperature fa	actor fro	m Table	2b							—	0		(53
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter (50) or (54) in (5	55)								0.	75		(5
/ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m		_		
6)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	κН	
7)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
rimary circuit	loss (an	nnual) fro	m Table	 3							0		(58
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor fr	rom Tabl	le H5 if t	here is	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
9)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(5

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m$	
(62)m= 172.39 152.1 160.12 144.07 141.57 127.04 122.54 133.74 133.28 149.36 157.27 168.42	+ (01 <i>)</i> 111 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	(- /
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 172.39 152.1 160.12 144.07 141.57 127.04 122.54 133.74 133.28 149.36 157.27 168.42	
	61.89 (64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]	
(65)m= 79.1 70.25 75.02 68.98 68.85 63.32 62.53 66.25 65.39 71.45 73.37 77.78	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
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= 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34 90.34	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 14.04 12.47 10.14 7.68 5.74 4.85 5.24 6.81 9.13 11.6 13.54 14.43	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 157.5 159.14 155.02 146.25 135.18 124.78 117.83 116.2 120.31 129.08 140.15 150.55	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03 32.03	(69)
Pumps and fans gains (Table 5a)	
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27 -72.27	(71)
Water heating gains (Table 5)	
(72)m= 106.32 104.54 100.84 95.81 92.55 87.95 84.04 89.05 90.83 96.03 101.91 104.55	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 330.96 329.25 319.1 302.84 286.57 270.67 260.21 265.15 273.38 289.81 308.7 322.63	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gain	
Table 6d m² Table 6a Table 6b Table 6c (W	')
Northeast 0.9x 0.77 x 12.07 x 11.28 x 0.63 x 0.7 = 4	1.62 (75)
Northeast 0.9x 0.77 x 12.07 x 22.97 x 0.63 x 0.7 = 8.	4.72 (75)
Northeast 0.9x 0.77 x 12.07 x 41.38 x 0.63 x 0.7 = 15	(75)
Northeast 0.9x 0.77 x 12.07 x 67.96 x 0.63 x 0.7 = 25	(75)
Northeast 0.9x 0.77 x 12.07 x 91.35 x 0.63 x 0.7 = 33	66.95 (75)

Northeast _{0.9x}	0.77	X	12.	07	x	97.3	38	x		0.63	x	0.7	=	359.23	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	91.	.1	x		0.63	x [0.7	=	336.05	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	72.0	63	x		0.63	x [0.7	=	267.9	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	50.4	42	X		0.63	x [0.7	=	185.99	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	28.0	07	X		0.63	x [0.7	=	103.53	(75)
Northeast _{0.9x}	0.77	X	12.0	07	x	14.	.2	x		0.63	x [0.7	=	52.37	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	9.2	21	X		0.63	x [0.7	=	33.99	(75)
Solar gains in v	vatts, ca	lculated						(83)m	= St	um(74)m .	(82)m		1	Ī	
(83)m= 41.62	84.72	152.64	250.67	336.95			336.05	267	'.9	185.99	103.53	52.37	33.99		(83)
Total gains – in		-	` 		`				1			T	l	1	(0.4)
(84)m= 372.58	413.97	471.74	553.51	623.52	62	29.9 5	596.26	533.	.05	459.37	393.35	361.07	356.62		(84)
7. Mean intern	nal temp	erature	(heating	season)										
Temperature of	during h	eating p	eriods ir	the livi	ng a	area fro	om Tab	ole 9,	Th	1 (°C)				21	(85)
Utilisation fact	or for ga	ains for I	iving are	a, h1,m	(se	e Tabl	le 9a)							Ī	
Jan	Feb	Mar	Apr	May	٦	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.94	0.81	0.	.62	0.46	0.5	3	0.81	0.97	0.99	1		(86)
Mean internal	tempera	ature in l	iving are	ea T1 (fo	ollov	w steps	s 3 to 7	' in T	able	9c)				_	
(87)m= 19.75	19.89	20.16	20.55	20.84	20).97	20.99	20.9	99	20.88	20.5	20.07	19.73		(87)
Temperature of	during h	eating p	eriods ir	rest of	dwe	elling fr	rom Ta	ıble 9), Th	n2 (°C)					
(88)m= 19.9	19.91	19.91	19.92	19.93	19	9.94	19.94	19.9	94	19.94	19.93	19.92	19.92		(88)
Utilisation fact	or for a	ains for r	est of d	vellina	h2 r	m (see	Table	9a)				•		•	
(89)m= 1	0.99	0.98	0.92	0.76	г —	<u> </u>	0.35	0.4	2	0.73	0.95	0.99	1		(89)
Mean internal	tompor	nturo in t	ho roct	of dwalli	na -	T2 (fall	low eta	nc 2	+0.7	in Tabl	0.00)			l	
(90)m= 18.25	18.45	18.86	19.41	19.78	-	`	19.94	19.9		19.85	19.36	18.73	18.23		(90)
(60)												ing area ÷ (1	0.47	(91)
						\ (I A		/4		A) TO					` `
Mean internal (92)m= 18.95	19.13	19.47	19.95	20.28	~~	"	20.44	+ (1 ·	_	A) × 12 20.34	19.9	19.36	18.94]	(92)
(92)m= 18.95 Apply adjustm												19.36	10.94		(32)
(93)m= 18.95	19.13	19.47	19.95	20.28	_		20.44	20.4		20.34	19.9	19.36	18.94		(93)
8. Space heat												10100	1 1 1 1		. ,
Set Ti to the m			nperatur	e obtair	ned	at step	11 of	Tabl	e 9b	, so tha	t Ti,m=	(76)m an	d re-calc	culate	
the utilisation											·	· ,		•	
Jan	Feb	Mar	Apr	May	J	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fact		i			_	-						_		1	(- ·)
(94)m= 0.99	0.99	0.97	0.92	0.78	0.	.57	0.4	0.4	7	0.77	0.95	0.99	0.99		(94)
Useful gains, I		<u> </u>			L 05	700 1	044.44	054	40 [054.77	074.04	1 050 70	054.75	1	(OE)
(95)m= 370.19	409.32	458.98	506.79	483.59			241.41	251.	.46	351.77	374.31	356.73	354.75		(95)
Monthly avera	4.9	6.5	8.9	11.7		4.6	16.6	16.	4	14.1	10.6	7.1	4.2		(96)
Heat loss rate					<u> </u>							1			(-0)
(97)m= 966.57	935.48	849.89	712.17	551.6	_		243.12	254.		397.39	597.66	792.93	959.18		(97)
Space heating							= 0.02						I .	I	
(98)m= 443.71	353.58	290.84	147.87	50.6		0	0	0	Ť	0	166.17		449.7		
<u> </u>	!										·	-!		1	

			Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	2216.54	(98)
Space heating requirement in kWh/m²/year								41.08	(99)
9a. Energy requirements – Individual heating sys	stems i	ncluding	micro-C	CHP)					
Space heating:							Г		¬
Fraction of space heat from secondary/supplem	nentary	-	(222)	(224)			ļ	0	(201)
Fraction of space heat from main system(s)			(202) = 1 -	` ,	/\ -		ļ	1	(202)
Fraction of total heating from main system 1			(204) = (204)	02) × [1 –	(203)] =		ļ	1	(204)
Efficiency of main space heating system 1							ļ	93.5	(206)
Efficiency of secondary/supplementary heating	system	ı, %				,	<u> </u>	0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above) 443.71 353.58 290.84 147.87 50.6	0	0	0	0	166.17	314.06	449.7		
	U	U	U	U	100.17	314.06	449.7		(044)
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$ $474.56 378.16 311.06 158.15 54.12$	0	0	0	0	177.72	335.89	480.96		(211)
		Ů		I (kWh/yea				2370.63	(211)
Space heating fuel (secondary), kWh/month							L		
$= \{[(98)\text{m x } (201)]\} \times 100 \div (208)$						_			
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_
			Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	F	0	(215)
Water heating									
Output from water heater (calculated above) 172.39	127.04	122.54	133.74	133.28	149.36	157.27	168.42		
Efficiency of water heater							<u> </u>	79.8	(216)
(217)m= 87.23 86.99 86.39 84.88 82.36	79.8	79.8	79.8	79.8	85.1	86.62	87.31		(217)
Fuel for water heating, kWh/month						•			
(219) m = (64) m x $100 \div (217)$ m (219)m = 197.63 174.85 185.35 169.72 171.88	159.2	153.55	167.59	167.01	175.52	181.56	192.89		
(219)111- 197.03 174.03 103.33 103.72 171.00	133.2	100.00		I = Sum(2:		101.50	192.09	2096.76	(219)
Annual totals						Wh/year		kWh/yea	
Space heating fuel used, main system 1						•		2370.63	
Water heating fuel used							Ī	2096.76	Ī
Electricity for pumps, fans and electric keep-hot							L		_
central heating pump:							30		(2300
boiler with a fan-assisted flue							45		(230e
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							ا [247.96	(232)
, , ,	ı (221\	ㅜ (232)	(227h)	_			<u>[</u>	4790.35	╡
Total delivered energy for all uses (211)(221) +	` ′	` ′	` ,					4/80.33	(338)
12a. CO2 emissions – Individual heating systen	ns inclu	lding mi	cro-CHP						
		ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	

Space heating (main system 1)	(211) x	0.216 =	512.06 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	452.9 (264)
Space and water heating	(261) + (262) + (263) + (264) =		964.96 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	128.69 (268)
Total CO2, kg/year	sum (of (265)(271) =	1132.57 (272)

 $TER = 20.99 \tag{273}$

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:02*

Proiect Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 86.78m²

Site Reference: Highgate Road - GREEN

Plot Reference: 05 - E

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)

18.07 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

16.12 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 55.1 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 46.7 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK
Floor (no floor)

(110 11001)

 Roof
 0.13 (max. 0.20)
 0.13 (max. 0.35)
 OK

 Openings
 1.40 (max. 2.00)
 1.40 (max. 3.30)
 OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	15.46m²	
Windows facing: South West	5.57m ²	
Windows facing: South West	5.9m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		Llee	r Details:						
Access on Names	No: Usahan	USE		- M	L		CTDO	010010	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012)	Strom Softwa					010943 on: 1.0.5.50	
Continui o Humo.			ty Address		0.011.		7 0 10 10	11010100	
Address :		·							
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(10) ×		ight(m)	(2a) =	Volume(m ³	(3a)
	-) . (4 -) . (4 -) . (4 -) . (4 -)	. (4.5)		(1a) x	2	65	(2a) =	229.97	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	86.78	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	229.97	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	ır
Number of allipsychia	heating	eating		,			40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				L	3		10 =	30	(7a)
Number of passive vents	;				0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)+(6b)+(7a)+(7b	o)+(7c) =	Г	30		÷ (5) =	0.13	(8)
	peen carried out or is intended			continue fr			. (0) –	0.13	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fr resent, use the value corresp			•	ruction			0	(11)
deducting areas of openii		onaing to the gi	realer wall are	a (aner					
If suspended wooden t	floor, enter 0.2 (unseale	ed) or 0.1 (se	aled), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
ŭ	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			(8) + (10)					0	(16)
,	q50, expressed in cubi	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has				is heina u	sad		0.38	(18)
Number of sides sheltere		been done or a	acgree an per	meability	is being u	3CU		0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	x (20) =				0.38	(21)
Infiltration rate modified f	or monthly wind speed						'		
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08	0.95 0.9	5 0.92	1	1.08	1.12	1.18		
` '					L			J	

Adjusted	d infiltra	ation rat	e (allowi	ng for sh	nelter an	nd wind s	peed) =	(21a) x	(22a)m						
	0.49	0.48	0.47	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.43	0.45]		
Calculate			_	rate for t	he appli	cable ca	se					!			_
		l ventila		or disciplination	OL) (OO)	-) - - (-		(IE)) - (I		\ (00-)				0	(23a
						a) × Fmv (e) = (23a)				0	(23b
			•	•	ŭ	for in-use f	`		,					0	(230
	i					1	<u> </u>	, ``	í `	2b)m + (2		1 ` '	i ÷ 100] I		(0.4-
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24a
´ —			ı —					- ´ ` -	í `	2b)m + (2		<u> </u>	1		(0.4)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b
,					•	e input v				F (00)	,				
	` 		<u> </u>	<u> </u>	<u> </u>	í	· ·		ŕ	.5 × (23b		Ι ,	1		(240
(24c)m=	0	0	0		0	0	0	0	0	0	0	0	J		(24c
,					•	ve input erwise (2				0.5]			-		
(24d)m=	0.62	0.61	0.61	0.59	0.58	0.57	0.57	0.56	0.57	0.58	0.59	0.6			(24d
Effecti	ive air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in box	x (25)				_		
(25)m=	0.62	0.61	0.61	0.59	0.58	0.57	0.57	0.56	0.57	0.58	0.59	0.6			(25)
3. Heat	losses	s and he	eat loss r	paramete	āt.										
ELEME		Gros	•	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	9	Α >	X k
		area	_	m		A ,r		W/m2		(W/ł	<)	kJ/m²-	K	kJ/	
Windows	s Type	1				12.45	x1	/[1/(1.4)+	0.04] =	16.51					(27)
Windows	s Type	2				4.49	x1	/[1/(1.4)+	0.04] =	5.95					(27)
Windows	s Туре	3				4.75	x1.	/[1/(1.4)+	0.04] =	6.3					(27)
Walls Ty	rpe1	62.7	' 1	21.69	9	41.02	2 x	0.18		7.38	= [(29)
Walls Ty	rpe2	20.9	9	0		20.9	X	0.18	<u> </u>	3.76	=				(29)
Roof		86.7	<u>'8</u>	0	=	86.78		0.13	=	11.28	=		≓ ¦		(30)
Total are	ea of el					170.3	=	0.10		11.20					(31)
Party wa			,			26.3	_	0		0			r		(32)
Party floo							=			U					=
Internal v						86.78	=				Ĺ		닠 ¦		(32a
				<i>(()</i>		169.0		. (1/5/4/11) 0.047 -					(320
* for windo ** include t							atea using	i tormula 1	/[(1/U-vail	ie)+0.04j a	is given in	paragrapr	1 3.2		
Fabric he	eat los	s, W/K :	= S (A x	U)	·			(26)(30)) + (32) =				51	I.18	(33)
Heat cap	oacity (Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =		672.1	(34)
Thermal	-		,	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium			50	(35)
For design can be use	assess	ments wh	ere the de	tails of the	,			ecisely the	e indicative	e values of	TMP in Ta	able 1f		-	` ′
Thermal					usina Ar	pendix k	<						Ω	.51	(36)
if details of	•	,	,		•	•	-						°		(00)
Total fab				(- /	, -	,			(33) +	(36) =			59	9.69	(37)
															_
Ventilatio	on hea	t loss ca	alculated	l monthly	y				(38)m	$= 0.33 \times ($	25)m x (5))			

													l	
(38)m=	46.87	46.53	46.19	44.59	44.29	42.9	42.9	42.64	43.44	44.29	44.9	45.53		(38)
	ransfer o								· · · ·	= (37) + (ı	
(39)m=	106.57	106.22	105.88	104.28	103.98	102.59	102.59	102.34	103.13	103.98	104.59	105.22		7(20)
Heat lo	oss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	104.28	(39)
(40)m=	1.23	1.22	1.22	1.2	1.2	1.18	1.18	1.18	1.19	1.2	1.21	1.21		_
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.2	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	-		-		-			-	-			-		
4. Wa	ater heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
Δeeum	ned occu	inancy I	N									50		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		58	I	(42)
Annua	l averag	e hot wa						(25 x N)				5.45		(43)
		•	hot water person per	0,		Ū	•	to achieve	a water us	se target o	f			
not more			<i>'</i>			_	<u> </u>						İ	
Hot wate	Jan er usage in	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
		•		1			1		00.54	07.00	104.40	405		
(44)m=	105	101.18	97.36	93.54	89.72	85.91	85.91	89.72	93.54	97.36	101.18 m(44) ₁₁₂ =	105	1145.42	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			· /		1143.42	(++)
(45)m=	155.71	136.18	140.53	122.52	117.56	101.44	94	107.87	109.16	127.21	138.86	150.79		
If instan	tanoous w	rator hoati	na at naint	of uso (no	hot water	: storago)	ontor O in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1501.83	(45)
				·			1		` '				l	(40)
(46)m= Water	23.36 storage	20.43 loss:	21.08	18.38	17.63	15.22	14.1	16.18	16.37	19.08	20.83	22.62		(46)
	•		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150	I	(47)
If com	munity h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
	•	_			•			mbi boil	ers) ente	er '0' in (47)			
	storage												•	
•			eclared I		or is kno	wn (kWh	n/day):				1.	39		(48)
•			m Table								0.	54		(49)
•			storage eclared o	-		or io not		(48) x (49)) =		0.	75		(50)
			factor fr	-								0		(51)
		_	ee secti		`		,						I	· ,
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	(50) or (, ,	•								0.	75		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	m			-	
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

Primary circuit loss (annual) from Table 3	0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m		
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		
(61)m= 0 0 0 0 0 0 0 0 0	0 0	(61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +		m + (61)m
(62)m= 202.3 178.27 187.12 167.61 164.15 146.53 140.6 154.46 154.25 173.81	183.95 197.39	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu		
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater		
(64)m= 202.3 178.27 187.12 167.61 164.15 146.53 140.6 154.46 154.25 173.81	183.95 197.39	
Output from water heat	· · · · · · · · · · · · · · · · · · ·	2050.45 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m		
(65)m= 89.05 78.95 84 76.81 76.36 69.8 68.53 73.14 72.37 79.57	82.24 87.42	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is		
. ,	nom community neath	ig
5. Internal gains (see Table 5 and 5a):		
Metabolic gains (Table 5), Watts	1	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec	(00)
(66)m= 128.95 128.95 128.95 128.95 128.95 128.95 128.95 128.95 128.95 128.95 128.95	128.95 128.95	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(67)m= 20.77 18.45 15.01 11.36 8.49 7.17 7.75 10.07 13.52 17.16	20.03 21.35	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 233.03 235.45 229.35 216.38 200 184.61 174.33 171.91 178.01 190.98	207.36 222.75	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5		
(69)m= 35.9 35.9 35.9 35.9 35.9 35.9 35.9 35.9	35.9 35.9	(69)
Pumps and fans gains (Table 5a)		
(70)m= 3 3 3 3 3 3 3 3 3 3	3 3	(70)
Losses e.g. evaporation (negative values) (Table 5)	· · · · · · · · · · · · · · · · · · ·	
(71)m= -103.16 -103.16 -103.16 -103.16 -103.16 -103.16 -103.16 -103.16 -103.16 -103.16 -103.16	-103.16 -103.16	(71)
Water heating gains (Table 5)	<u> </u>	
(72)m= 119.69 117.48 112.91 106.68 102.64 96.95 92.11 98.31 100.51 106.95	114.23 117.49	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m + (60)m$	71)m + (72)m	
(73)m= 438.18 436.07 421.95 399.11 375.82 353.42 338.88 344.98 356.72 379.78	406.3 426.28	(73)
6. Solar gains:		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applications	ble orientation.	
Orientation: Access Factor Area Flux g_	FF G	ains
	Table 6c	(W)
Northeast 0.9x 0.77 x 12.45 x 11.28 x 0.63 x	0.7 =	42.93 (75)
Northeast 0.9x	0.7 =	87.39 (75)

				-		,						_
Northeast _{0.9x}	0.77	X	12.45	X	41.38	Х	0.63	×	0.7	=	157.44	(75)
Northeast _{0.9x}	0.77	X	12.45	X	67.96	Х	0.63	x	0.7	=	258.56	(75)
Northeast _{0.9x}	0.77	X	12.45	X	91.35	X	0.63	x	0.7	=	347.56	(75)
Northeast _{0.9x}	0.77	X	12.45	X	97.38	X	0.63	x [0.7	=	370.54	(75)
Northeast _{0.9x}	0.77	X	12.45	X	91.1	X	0.63	x [0.7	=	346.63	(75)
Northeast _{0.9x}	0.77	X	12.45	X	72.63	X	0.63	x [0.7	=	276.34	(75)
Northeast 0.9x	0.77	X	12.45	X	50.42	x	0.63	x [0.7	=	191.84	(75)
Northeast _{0.9x}	0.77	X	12.45	X	28.07	x	0.63	x [0.7	=	106.79	(75)
Northeast _{0.9x}	0.77	X	12.45	X	14.2	X	0.63	x	0.7	=	54.02	(75)
Northeast 0.9x	0.77	X	12.45	X	9.21	X	0.63	x [0.7	=	35.06	(75)
Southwest _{0.9x}	0.77	X	4.49	X	36.79		0.63	x [0.7	=	50.49	(79)
Southwest _{0.9x}	0.77	X	4.75	X	36.79]	0.63	x [0.7	=	53.41	(79)
Southwest _{0.9x}	0.77	X	4.49	X	62.67]	0.63	x	0.7	=	86	(79)
Southwest _{0.9x}	0.77	X	4.75	X	62.67]	0.63	x [0.7	=	90.98	(79)
Southwest _{0.9x}	0.77	X	4.49	X	85.75]	0.63	x [0.7	=	117.67	(79)
Southwest _{0.9x}	0.77	X	4.75	X	85.75]	0.63	x	0.7	=	124.48	(79)
Southwest _{0.9x}	0.77	X	4.49	X	106.25]	0.63	x [0.7	=	145.8	(79)
Southwest _{0.9x}	0.77	X	4.75	X	106.25		0.63	x [0.7	=	154.24	(79)
Southwest _{0.9x}	0.77	X	4.49	X	119.01		0.63	x	0.7	=	163.31	(79)
Southwest _{0.9x}	0.77	X	4.75	X	119.01]	0.63	x	0.7	=	172.76	(79)
Southwest _{0.9x}	0.77	X	4.49	X	118.15		0.63	x [0.7	=	162.13	(79)
Southwest _{0.9x}	0.77	X	4.75	X	118.15]	0.63	x	0.7	=	171.51	(79)
Southwest _{0.9x}	0.77	X	4.49	X	113.91]	0.63	x [0.7	=	156.31	(79)
Southwest _{0.9x}	0.77	X	4.75	X	113.91]	0.63	x	0.7	=	165.36	(79)
Southwest _{0.9x}	0.77	X	4.49	X	104.39		0.63	x	0.7	=	143.24	(79)
Southwest _{0.9x}	0.77	X	4.75	X	104.39]	0.63	x	0.7	=	151.54	(79)
Southwest _{0.9x}	0.77	X	4.49	X	92.85]	0.63	x	0.7	=	127.41	(79)
Southwest _{0.9x}	0.77	X	4.75	X	92.85]	0.63	x [0.7	=	134.79	(79)
Southwest _{0.9x}	0.77	X	4.49	X	69.27]	0.63	x	0.7	=	95.05	(79)
Southwest _{0.9x}	0.77	X	4.75	X	69.27]	0.63	x [0.7	=	100.55	(79)
Southwest _{0.9x}	0.77	X	4.49	X	44.07		0.63	x [0.7	=	60.47	(79)
Southwest _{0.9x}	0.77	X	4.75	X	44.07]	0.63	x [0.7	=	63.98	(79)
Southwest _{0.9x}	0.77	X	4.49	X	31.49	ĺ	0.63	x	0.7	=	43.21	(79)
Southwest _{0.9x}	0.77	X	4.75	X	31.49]	0.63	x [0.7	=	45.71	(79)
_				-								
Solar gains in v	vatts, cal	culated	for each mon	th		(83)m	= Sum(74)m .	(82)m			ı	
` '		399.6	558.6 683.6		04.18 668.29	571	.12 454.05	302.39	178.47	123.98		(83)
Total gains – in			` ' 	`							l	
(84)m= 585.01	700.43	821.54	957.71 1059.	45 10	057.59 1007.17	916	810.77	682.17	584.77	550.25		(84)
7. Mean intern	al tempe	rature (heating seas	on)								
Temperature of	during he	ating pe	eriods in the I	ving	area from Tal	ole 9	Th1 (°C)				21	(85)
Utilisation fact	or for gai	ns for li	ving area, h1	,m (s	ee Table 9a)					·		
Jan	Feb	Mar	Apr Ma	у	Jun Jul	Α	ug Sep	Oct	Nov	Dec		

(86)m=	1	0.99	0.98	0.92	0.79	0.6	0.44	0.5	0.77	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.72	19.92	20.22	20.59	20.86	20.97	20.99	20.99	20.91	20.54	20.06	19.7		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ıble 9, Ti	h2 (°C)					
(88)m=	19.9	19.9	19.9	19.92	19.92	19.93	19.93	19.94	19.93	19.92	19.92	19.91		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)		-				
(89)m=	1	0.99	0.97	0.9	0.73	0.51	0.34	0.39	0.69	0.94	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.21	18.49	18.93	19.46	19.79	19.92	19.93	19.93	19.86	19.4	18.72	18.18		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	.A) × T2			'		
(92)m=	18.98	19.22	19.58	20.04	20.34	20.45	20.47	20.47	20.39	19.98	19.41	18.95		(92)
Apply	adjustn	nent to tl	ne mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.98	19.22	19.58	20.04	20.34	20.45	20.47	20.47	20.39	19.98	19.41	18.95		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	Jan	factor fo	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g		•	iviay	Juli	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m=	0.99	0.99	0.97	0.9	0.75	0.55	0.39	0.45	0.73	0.94	0.99	1		(94)
	ıl gains,	hmGm .	W = (94	1)m x (84	4)m								I	
(95)m=	581.64	691.06	792.85	860.32	799.4	584.01	394.9	411.95	589.47	641.14	577.69	547.85		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
						1	-`` 		– (96)m	ī —			1	
		1520.75			898.09	600.68	397.4	416.68	649.12	975.71	1286.96	1552.15		(97)
			ement fo			//h/mont)m – (95 0	i - `	1)m _{510.67}	747.0	1	
(98)m=	731.22	557.55	440.6	216.79	73.43	U	0	O Tota		248.92		747.2	2526.50	(98)
					.,			Tota	i per year	(KWII/yeai	r) = Sum(9	6) 15,912 =	3526.59	╡```
·		g require											40.64	<u>(99)</u>
			nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	ng: bace hea	t from s	acondar	u/sunnla	montary	evetem							(201)
	-					memary	-	(202) = 1 -	(201) -				0	╡ `
		ace hea		-	` ,				` '	(000)1			1	(202)
		tal heatii	_	-				(204) = (2	02) x [1 –	(203)] =			1	(204)
	•	main spa											93.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		g require											l	
	731.22	557.55	440.8	216.79	73.43	0	0	0	0	248.92	510.67	747.2		
(211)m)m x (20						_					l	(211)
	782.06	596.32	471.44	231.87	78.53	0	0	0 Tota	0 L (k\\/b\/yos	266.22	546.18	799.15		7(04.1)
								rota	ı (KVVII/YES	ai) =0um(2	211) _{15,1012}	.	3771.75	(211)

215)m= 0 0 0 0 0	0 0	0	0	0	0	0		
		Total ((kWh/yea	ar) =Sum(2	215) _{15,1012}	<u> </u>	0	(2
Vater heating								_
Output from water heater (calculated above)		l l				T	1	
	46.53 140.6	154.46	154.25	173.81	183.95	197.39	70.0	7(2
fficiency of water heater 117)m= 87.94 87.65 87.02 85.5 82.83	79.8 79.8	79.8	79.8	85.77	87.4	88.03	79.8	ے\ 2)
ruel for water heating, kWh/month	70.0	7 0.0	70.0	00.77	07.4	00.00		(-
219)m = (64)m x 100 ÷ (217)m						ī	•	
119)m= 230.03 203.38 215.03 196.03 198.19 1	83.63 176.19		193.29	202.64 19a) ₁₁₂ =	210.48	224.22		٦.
musel totals		2426.68	(2					
nnual totals pace heating fuel used, main system 1				K	Wh/year		kWh/year 3771.75	1
/ater heating fuel used							2426.68	<u> </u>
lectricity for pumps, fans and electric keep-hot								١
central heating pump:						30		(2
boiler with a fan-assisted flue								
		oum o	f (220a)	(220a) -		45		(2 ص
otal electricity for the above, kWh/year		Sum o	i (230a).	(230g) =			75](2] (3
lectricity for lighting							366.89](2
otal delivered energy for all uses (211)(221) +	(231) + (232).	(237b) =	:				6640.31	(3
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	Energy kWh/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
pace heating (main system 1)	(211) x			0.2	16	=	814.7	(2
pace heating (secondary)	(215) x			0.5	19	=	0	(2
/ater heating	(219) x			0.2	16	=	524.16	_](2
pace and water heating	(261) + (262)	+ (263) + (26	64) =				1338.86	_](2
	(231) x			0.5	19	=	38.93	_](2
lectricity for pumps, fans and electric keep-hot								_
lectricity for pumps, fans and electric keep-hot lectricity for lighting	(232) x			0.5	19	=	190.41	7(2

TER =

(273)

18.07

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 11:03:01

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 103.81m²

Site Reference: Highgate Road - GREEN

Plot Reference: 06 - A

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 17.03 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

14.76 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.4 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 44.2 kWh/m²

OK

2 Fabric U-values

Element Average

 Element
 Average
 Highest

 External wall
 0.18 (max. 0.30)
 0.18 (max. 0.70)
 OK

 Party wall
 0.00 (max. 0.20)
 OK

 Floor
 (no floor)
 OK

 Roof
 0.13 (max. 0.20)
 0.13 (max. 0.35)
 OK

 Openings
 1.40 (max. 2.00)
 1.40 (max. 3.30)
 OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ok
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	13.21m²	
Windows facing: South East	5.5m²	
Windows facing: North West	4.61m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		l Iser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	F	Property	Address	06 - A					
1. Overall dwelling dime	ensions:								
3		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor		1	03.81	(1a) x	2	2.65	(2a) =	275.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 1	03.81	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	275.1	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī - Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ns				4	x ²	10 =	40	(7a)
Number of passive vents				Ē	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per h	our
	ys, flues and fans = (6a)+(6b)+(ontinus fr	40		÷ (5) =	0.15	(8)
Number of storeys in the	een carried out or is intended, procee he dwelling (ns)	ea 10 (17),	otrierwise	onunue ir	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t nas): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (45)		0	(15)
Infiltration rate	q50, expressed in cubic metre	se nar h	(8) + (10)				area	0	(16)
•	lity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	elle oi e	rivelope	aica	0.4	(17)
•	es if a pressurisation test has been do				is being u	sed			` ′
Number of sides sheltere	ed		(20) 4	10 07E v (4	10)1			0	(19)
Shelter factor Infiltration rate incorporate	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			1	(20)
Infiltration rate modified f	•		(21) = (10	/ X (20) =				0.4	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1		<u> </u>	•	•	1		ı	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (20-) (2	2)				-	-		-	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18]	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.93	1 0.95	0.92		1.00	1.12	1.10	J	

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.5 0.49 0.48 0.43 0.43 0.38 0.38 0.37 0.4 0.43 0.44 0.46	
Calculate effective air change rate for the applicable case	1
If mechanical ventilation: [0]	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]	(24a)
(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24a)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0 0 0 0 0 0 0 0 0	(24b)
	(240)
c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$; otherwise $(24c) = (22b)m + 0.5 \times (23b)$	
(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24c)
d) If natural ventilation or whole house positive input ventilation from loft	
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	
(24d)m= 0.63 0.62 0.62 0.59 0.59 0.57 0.57 0.57 0.58 0.59 0.6 0.61	(24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.63 0.62 0.62 0.59 0.59 0.57 0.57 0.57 0.58 0.59 0.6 0.61	(25)
3. Heat losses and heat loss parameter:	
ELEMENT Gross Openings Net Area U-value A X U k-value A X	k
area (m²)	
Windows Type 1 13.21 $x^{1/[1/(1.4) + 0.04]} = 17.51$	(27)
Windows Type 2 5.5 $x^{1/[1/(1.4) + 0.04]} = 7.29$	(27)
Windows Type 3 4.61 $x^{1/[1/(1.4) + 0.04]} = 6.11$	(27)
Walls Type1 76.16 23.32 52.84 x 0.18 = 9.51	(29)
Walls Type2 49.77 0 49.77 x 0.18 = 8.96	(29)
Roof 103.81 0 103.81 x 0.13 = 13.5	(30)
Total area of elements, m ² 229.74	(31)
Party wall	(32)
Party floor 103.81	(32a)
Internal wall **	(32c)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions	ı
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$ 62.88	(33)
Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 13528.12	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250	(35)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.	•
Thermal bridges : S (L x Y) calculated using Appendix K	(36)
if details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss $(33) + (36) = 73.17$	(37)
Ventilation heat loss calculated monthly $ (38)m = 0.33 \times (25)m \times (5) $	1, ,
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	

(20) = 56.02	EC 40	FC 04	53.98	53.59	51.8	51.8	F1 46	F2 40	53.59	54.37	FF 10		(38)
` '	56.48	56.04	55.96	55.59	31.0	31.0	51.46	52.49			55.19		(30)
Heat transfer co	129.65	129.21	127.15	126.76	124.97	124.97	124.63	125.66	= (37) + (3 126.76	127.54	128.36		
(66)	120.00	120.21	127.10	120.10	12 1.01	121.01	121.00			Sum(39) ₁	<u> </u>	127.15	(39)
Heat loss param	neter (F	ILP), W/	m²K			•			= (39)m ÷				
(40)m= 1.25	1.25	1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.23	1.24		7,40
Number of days	in mor	nth (Tabl	e 1a)					,	Average =	Sum(40) ₁	12 /12=	1.22	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heatin	ng ener	gy requi	rement:								kWh/ye	ar:	
Assumed occup	ancv. N	N								2	77		(42)
if TFA > 13.9,	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.				()
if TFA £ 13.9, Annual average		iter usac	ie in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		100	0.04		(43)
Reduce the annual a	average	hot water	usage by	5% if the a	lwelling is	designed t			se target o				, ,
not more that 125 lit			, ,			<u> </u>							
Jan Hot water usage in I	Feb litres per	Mar day for ea	Apr	Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	106.04	102.04	98.04	94.04	90.03	90.03	94.04	98.04	102.04	106.04	110.04		
(44)///= 110.04	100.04	102.04	30.04	04.04	00.00	00.00	04.04			m(44) ₁₁₂ =	\vdash	1200.45	(44)
Energy content of ho	ot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,n	n x nm x C	OTm / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		
(45)m= 163.19	142.73	147.28	128.4	123.2	106.32	98.52	113.05	114.4	133.32	145.53	158.04		_
If instantaneous wat	ter heatir	na at point	of use (no	hot water	storage).	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1573.98	(45)
	21.41	22.09	19.26	18.48	15.95	14.78	16.96	17.16	20	21.83	23.71		(46)
Water storage lo		22.00	10.20	10.40	10.00	14.70	10.00	17.10		21.00	20.71		(1-)
Storage volume	(litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community he	_			•			, ,		(01.1 /	47)			
Otherwise if no s Water storage lo		not wate	er (tnis in	iciuaes i	nstantar	neous co	iloa iamo	ers) ente	er or in (47)			
a) If manufactur		eclared le	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Temperature fac	ctor fro	m Table	2b							0.	54		(49)
Energy lost from		_	-				(48) x (49)	=		0.	75		(50)
b) If manufactur Hot water storage			-								0		(51)
If community he	•			C 2 (KVV)	1711110700	·y <i>)</i>					0		(31)
Volume factor from	om Tal	ole 2a									0		(52)
Temperature fac	ctor fro	m Table	2b								0		(53)
Energy lost from		-	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (5	, ,	•	or oach	month			((56)m = (55) v (44)-	m	0.	75		(55)
Water storage lo					22.50		((56)m = (20.50	22.22		(56)
(56)m= 23.33 If cylinder contains of	21.07 dedicated	23.33 d solar sto	22.58 rage, (57)ı	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Appendix	¢Η	(56)
	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
(37)111= 23.33	∠1.U <i>l</i>	۷۵.۵۵	۷۷.۵۵	20.00	22.00	23.33	23.33	22.00	20.00	22.00	23.33		(01)

Primary circuit loss (annual) fro	om Table 3				(0		(58)
Primary circuit loss calculated		59)m = (58) ÷ 3	65 × (41)m	า				
(modified by factor from Tab	le H5 if there is s	solar water heat	ing and a c	cylinder th	hermostat)			
(59)m= 23.26 21.01 23.26	22.51 23.26	22.51 23.26	23.26	22.51 2	23.26 22.51	23.26		(59)
Combi loss calculated for each	month (61)m = ((60) ÷ 365 × (4°	I)m					
(61)m= 0 0 0	0 0	0 0	0	0	0 0	0		(61)
Total heat required for water h	eating calculated	for each montl	1 (62) m = 0).85 × (45	5)m + (46)m +	 (57)m +	(59)m + (61)m	
(62)m= 209.78 184.81 193.87	173.49 169.8	151.41 145.11	``		79.92 190.62	204.63		(62)
Solar DHW input calculated using App	endix G or Appendix	H (negative quanti	ty) (enter '0' if	f no solar co	ontribution to wate	r heating)		
(add additional lines if FGHRS						3,		
(63)m= 0 0 0	0 0	0 0	0	0	0 0	0		(63)
Output from water heater		!		I	<u> </u>			
(64)m= 209.78 184.81 193.87	173.49 169.8	151.41 145.11	159.65	159.49 1	79.92 190.62	204.63		
	<u> </u>	<u> </u>	Outpu	t from water	r heater (annual) _{1.}	12	2122.6	(64)
Heat gains from water heating	. kWh/month 0.25	5 ´ [0.85 × (45)r	n + (61)ml	+ 0.8 x [((46)m + (57)m	+ (59)m	1	1
(65)m= 91.54 81.12 86.25	78.77 78.24	71.42 70.03	1 1		81.61 84.46	89.82	•	(65)
include (57)m in calculation		Vlinder is in the	dwelling o	r hot wate	er is from com	munity h	eating	
5. Internal gains (see Table 5		yiii aa ii a ii a ii	awoning o	THO Wate		inanity in	outing	
	,							
Metabolic gains (Table 5), Wat	tts Apr May	Jun Jul	Aug	Sep	Oct Nov	Dec		
(66)m= 138.61 138.61 138.61	138.61 138.61	138.61 138.61	 		38.61 138.61	138.61		(66)
` '					100.01	100.01		()
Lighting gains (calculated in Ap (67)m= 23.39 20.77 16.89	12.79 9.56	8.07 8.72			19.32 22.55	24.04		(67)
						24.04		(07)
Appliances gains (calculated in (68)m= 262.34 265.07 258.21	243.6 225.17	207.84 196.26	1 1		215.01 233.44	250.77		(68)
	<u> </u>	<u> </u>			215.01 233.44	250.77		(00)
Cooking gains (calculated in A	1 1	I I						(00)
(69)m= 36.86 36.86 36.86	36.86 36.86	36.86 36.86	36.86	36.86	36.86 36.86	36.86		(69)
Pumps and fans gains (Table !	, , , , , , , , , , , , , , , , , , , 							(70)
(70)m= 3 3 3	3 3	3 3	3	3	3 3	3		(70)
Losses e.g. evaporation (nega	, , , , , , , , , , , , , , , , , , , 	'						
(71)m= -110.88 -110.88 -110.88	-110.88 -110.88	-110.88 -110.88	-110.88 -	-110.88 -1	110.88 -110.88	-110.88		(71)
Water heating gains (Table 5)								
(72)m= 123.03 120.72 115.92	109.4 105.16	99.2 94.13	100.63	102.93 1	09.69 117.31	120.73		(72)
Total internal gains =		(66)m + (67)	m + (68)m + ((69)m + (70))m + (71)m + (72)	m		
(73)m= 476.34 474.14 458.6	433.37 407.47	382.69 366.7	373.08	386.13 4	111.59 440.88	463.12		(73)
6. Solar gains:								
Solar gains are calculated using sola		·	ations to conv	vert to the a	• •	ion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table 6a		g_ ble 6b	FF Table 6c		Gains (W)	
		l abie 0d	1 a	<u> </u>	i abie 00		. ,	1
Southeast 0.9x 0.77 x		x 36.79	x	0.63	× 0.7	_ =	61.85	(77)
Southeast 0.9x 0.77 x	5.5	x 62.67	X	0.63	x 0.7	= [105.35	(77)

(83)m= 226.28 Total gains – ir		548.63 nd sola	703.29 r (84)m =	809.2 (73)m		2.79 779.69 3)m , watts	699	.23 601.97	435.62	2 272	193.03		(83)
Solar gains in	watts, cal	lculated	for each	n month			(83)m	n = Sum(74)m	(82)m				
Northwest _{0.9x}	0.77	х	4.6	1	x [9.21	x	0.63	X	0.7	=	12.98	(81)
Northwest 0.9x	0.77	×	4.6	1	x [14.2	x	0.63	x	0.7	=	20	(81)
Northwest _{0.9x}	0.77	×	4.6	1	x [28.07	x	0.63	x	0.7	=	39.54	(81)
Northwest _{0.9x}	0.77	x		==	x [50.42	x	0.63	×	0.7		71.04	(81)
Northwest 0.9x	0.77	×			x [72.63	x	0.63	×	0.7	= =	102.32	(81)
Northwest 0.9x	0.77	$=$ \hat{x}	4.6		^ L х Г	91.1	_ ^ x	0.63	$=$ $\begin{bmatrix} \cdot \\ \times \end{bmatrix}$	0.7	-	128.35	(81)
Northwest 0.9x	0.77	x x			x L	91.35 97.38	x	0.63	X x	0.7	=	128.7 137.2	(81)
Northwest 0.9x	0.77	×			× L	67.96	X	0.63	_	0.7	╡ -	95.74	(81)
Northwest 0.9x	0.77	×	4.6		х <u>Г</u>	41.38	X	0.63	×	0.7	=	58.3	(81)
Northwest 0.9x	0.77	×			X	22.97	X	0.63	×	0.7	=	32.36	(81)
Northwest 0.9x	0.77	x	4.6		X	11.28	X	0.63	×	0.7	=	15.9	(81)
Southwest _{0.9x}	0.77	×	13.2		X	31.49		0.63	×	0.7	=	127.12	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	44.07		0.63	x	0.7	=	177.92	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	69.27		0.63	x	0.7	=	279.64	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x [92.85		0.63	×	0.7	=	374.86	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	104.39		0.63	×	0.7	=	421.44	(79)
Southwest _{0.9x}	0.77	x	13.2	21	x	113.91		0.63	x	0.7	=	459.87	(79)
Southwest _{0.9x}	0.77	×	13.2	21	x	118.15		0.63	x	0.7	=	476.99	(79)
Southwest _{0.9x}	0.77	×	13.2	21	х	119.01		0.63	x	0.7		480.46	(79)
Southwest _{0.9x}	0.77	×	13.2	21	х	106.25		0.63	x	0.7	-	428.95	(79)
Southwest _{0.9x}	0.77	×			x [85.75		0.63	×	0.7		346.2	(79)
Southwest _{0.9x}	0.77	$=$ \hat{x}	13.2		^ L x Г	62.67	 	0.63	$=$ $\frac{1}{x}$	0.7	- -	253.02	(79)
Southwest _{0.9x}	0.77	x x	5.5		x L	31.49	X	0.63	X	0.7	=	52.93 148.54	(77)
Southeast 0.9x	0.77	X			X L	44.07	X	0.63	× ر	0.7	┥ -	74.08	(77)
Southeast 0.9x	0.77	x			X Г	69.27	X	0.63	X	0.7	=	116.43	(77)
Southeast 0.9x	0.77	×	5.5		X	92.85	X	0.63	×	0.7	=	156.07	(77)
Southeast 0.9x	0.77	×			X	104.39	X	0.63	×	0.7	_ =	175.47	(77)
Southeast 0.9x	0.77	×	5.5		X	113.91	X	0.63	×	0.7	=	191.47	(77)
Southeast 0.9x	0.77	×	5.5		X	118.15	X	0.63	×	0.7	_ =	198.6	(77)
Southeast 0.9x	0.77	×	5.5	5	X	119.01	X	0.63	X	0.7	=	200.04	(77)
Southeast 0.9x	0.77	х	5.5	5	x	106.25	X	0.63	X	0.7	=	178.6	(77)
Southeast 0.9x	0.77	X	5.5	5	x	85.75	X	0.63	X	0.7	=	144.14	(77)

(86)m=	1	0.99	0.97	0.93	0.81	0.63	0.47	0.52	0.77	0.95	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.69	19.91	20.21	20.57	20.83	20.96	20.99	20.99	20.91	20.54	20.05	19.66		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwellina	from Ta	ble 9, Ti	h2 (°C)	•			ı	
(88)m=	19.88	19.88	19.88	19.9	19.9	19.92	19.92	19.92	19.91	19.9	19.9	19.89		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling	h2 m (se	e Table	9a)					l	
(89)m=	1	0.99	0.97	0.9	0.76	0.54	0.36	0.41	0.68	0.93	0.99	1		(89)
Mean	interna	l tampar	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to 7	Tin Tahl	L a_0c)	<u>I</u>			
(90)m=	18.15	18.46	18.9	19.41	19.75	19.89	19.91	19.92	19.84	19.39	18.69	18.12		(90)
, ,									1	L fLA = Livin	g area ÷ (4	1) =	0.38	(91)
Maan	intorno	l tompor	oturo (fo	r tha wh	olo duro	lling) – fl	. ∧ ⊤1	. /1 fl	۸) T2					_
(92)m=	18.74	19.02	19.4	19.85	20.16	20.3	20.33	+ (1 – fL 20.33	20.25	19.84	19.21	18.71		(92)
								4e, whe	<u> </u>		10.21	10.71		(/
(93)m=	18.74	19.02	19.4	19.85	20.16	20.3	20.33	20.33	20.25	19.84	19.21	18.71		(93)
8. Sp	ace hea	ting requ	uirement											
Set T	i to the r	mean int	ernal ter	nperatur	e obtain	ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a								1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		tor for g			0.77	0.50		0.45	0.74		0.00			(04)
(94)m=	0.99	0.98	0.96	0.9	0.77	0.58	0.4	0.45	0.71	0.93	0.99	1		(94)
(95)m=	698.27	851.29	968.06	4)m x (84 1022.14	938.7	688.13	462.38	483.48	705.18	788.47	703.15	653.13		(95)
				perature			402.00	400.40	700.10	700.47	700.10	000.10		(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	 =[(39)m :	x [(93)m	– (96)m	1				
		1830.43			1072.86	712.82	465.92	489.44	772.78	1170.7	1544.49	1862.51		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	878.49	657.98	519.98	266.84	99.81	0	0	0	0	284.38	605.77	899.78		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	4213.03	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								40.58	(99)
9a. En	ergy rec	uiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:					<u> </u>		,					
Fracti	on of sp	ace hea	it from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	m 1								93.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	⊐ ar
Space				alculate			0 0.1	7.09			1101		1 1111111111111111111111111111111111111	. .
•	878.49	657.98	519.98	266.84	99.81	0	0	0	0	284.38	605.77	899.78		
(211)m	n = {[(98)m x (20	4)] } x 1	00 ÷ (20	6)								ı	(211)
` ,"-	939.56	703.72	556.13	285.39	106.75	0	0	0	0	304.14	647.88	962.33		
				<u> </u>			1	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	4505.91	(211)
														_

215)m= 0 0 0 0 0	0 0	0	0	0	0	0		
	!	Total ((kWh/yea	ar) =Sum(2		<u> </u>	0	(2
Vater heating								_
Output from water heater (calculated above)		l l				T	1	
209.78 184.81 193.87 173.49 169.8 193.67 184.81 184.	51.41 145.11	159.65	159.49	179.92	190.62	204.63	70.0	7(2
	79.8 79.8	79.8	79.8	86.03	87.69	88.31	79.8	ار 2)
ruel for water heating, kWh/month	70.0		70.0	00.00	07.00	00.01		,-
219)m = (64)m x 100 ÷ (217)m							Ī	
219)m= 237.8 210.22 222.03 201.83 203.47 1	89.73 181.85		199.87	209.13	217.39	231.73		٦,,
nnual totals	19a) ₁₁₂ =	Nh/voor		2505.1	(2			
pace heating fuel used, main system 1				N.	Wh/year		kWh/year 4505.91	٦
/ater heating fuel used							2505.1	╡
lectricity for pumps, fans and electric keep-hot								_
central heating pump:						30]	(2
boiler with a fan-assisted flue						45		(2
otal electricity for the above, kWh/year		sum o	f (230a)	(230g) =			75	(- 2)[2
		343	. (=000).	(2009)				╣
lectricity for lighting	(004) (000)	(0071)					412.99](2
otal delivered energy for all uses (211)(221) +	` , , , ,	` '					7499.01	(3
12a. CO2 emissions – Individual heating systems	s including mi	cro-CHP						
	Energy kWh/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/yea	
pace heating (main system 1)	(211) x			0.2	16	=	973.28	(2
pace heating (secondary)	(215) x			0.5	19	=	0	(2
Vater heating	(219) x			0.2	16	=	541.1	_ (2
pace and water heating	(261) + (262)	+ (263) + (26	64) =				1514.38	_ (2
	(231) x			0.5	19	=	38.93	_] ₍₂
lectricity for pumps, fans and electric keep-hot								
Electricity for pumps, fans and electric keep-hot	(232) x			0.5	19	=	214.34	7(2

TER =

(273)

17.03

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 11:03:01*

Project Information:

Assessed By: Neil Ingham (STRO010943) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 133.02m²

Site Reference: Highgate Road - GREEN

Plot Reference: 06 - B

Address:

Client Details:

Name: Address :

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 system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 17.24 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

15.11 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 61.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 50.3 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.18 (max. 0.30) 0.18 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK

Floor (no floor)

 Roof
 0.13 (max. 0.20)
 0.13 (max. 0.35)
 OK

 Openings
 1.40 (max. 2.00)
 1.40 (max. 3.30)
 OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ок
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	28.56m²	
Windows facing: South East	5.5m ²	
Windows facing: North West	5.47m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from boilers – mains gas		

		He	er Details:						
Access on Names	No: Usahan	USE		- M	L		CTDO	010010	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012	>	Stroma Softwa					010943 on: 1.0.5.50	
Contware reame.	01101110 1 07 11 2012		rty Address:		31011.		7 01010	710.0.00	
Address :		·	·						
1. Overall dwelling dime	ensions:								
Ground floor		<i>,</i>	Area(m²)	(10) ×		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (4n)		(1a) x		65	(2a) =	352.5	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	133.02	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	352.5	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
Number of allignments	heating he	eating		,			40 =		_
Number of chimneys] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				L	4		10 =	40	(7a)
Number of passive vents	;				0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)+(6b)+(7a)+(7	b)+(7c) =	Г	40		÷ (5) =	0.11	(8)
	peen carried out or is intended			continue fr			. (0) –	0.11	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber for resent, use the value corresp			•	ruction			0	(11)
deducting areas of openi		oriding to the g	jreater wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 (se	ealed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
· ·	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubi	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has				is haina u	sad		0.36	(18)
Number of sides sheltere		been done or e	a degree all per	пеаышу	is being u	seu		0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.36	(21)
Infiltration rate modified f	or monthly wind speed						!		
Jan Feb	Mar Apr May	Jun Ju	ıl Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	8 3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ∸ 4								
	1.23 1.1 1.08	0.95 0.9	95 0.92	1	1.08	1.12	1.18		
` '		1 3.0	1		L			J	

Adjusted infiltra	ation rate (allow	vina for st	nelter an	d wind s	:need) –	(21a) v	(22a)m					
0.46	0.45 0.45	0.4	0.39	0.35	0.35	0.34	0.36	0.39	0.41	0.43]	
	ctive air change	rate for t	he appli	cable ca	se	<u> </u>						
If mechanica											0	(23a)
	eat pump using App) = (23a)			0	(23b)
If balanced with	heat recovery: effi	ciency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mechanical v	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24a)
· -	d mechanical v	entilation	without	heat red	covery (N	ЛV) (24b	p)m = (22)	2b)m + (2	23b)	1	1	
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24b)
,	ouse extract ve		•	•				F (00h				
<u> </u>	$0 < 0.5 \times (23b),$	- `	c) = (230)	o); otner	wise (24)	c) = (220)	o) m + 0.	· ` `		Ι ,	1	(24c)
(24c)m= 0		0						0	0	0		(246)
,	ventilation or w n = 1, then (24d		•	•				0.5]				
(24d)m= 0.61	0.6 0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.58	0.59		(24d)
Effective air	change rate - e	nter (24a) or (24k	o) or (24	c) or (24	d) in box	x (25)	-	-	-		
(25)m= 0.61	0.6 0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.58	0.59		(25)
3 Heat losses	s and heat loss	naramet	er.									
ELEMENT	Gross	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	9	ΑΧk
LLLINLINI	area (m²)	m		A ,r		W/m2		(W/ł	<)	kJ/m²-		kJ/K
Windows Type	:1			24.03	x1,	/[1/(1.4)+	0.04] =	31.86				(27)
Windows Type	2			4.63	x1,	/[1/(1.4)+	0.04] =	6.14				(27)
Windows Type	3			4.6	x1,	/[1/(1.4)+	0.04] =	6.1				(27)
Walls Type1	95.16	33.2	6	61.9	Х	0.18	=	11.14				(29)
Walls Type2	41.02	0		41.02	<u>x</u>	0.18	<u> </u>	7.38				(29)
Roof	133.02	0		133.0	2 x	0.13		17.29	= [7 \sqsubset	(30)
Total area of e	lements, m ²			269.2	2							(31)
Party wall				12.16	3 x	0	=	0				(32)
Party floor				133.0	2							(32a)
Internal wall **				196.4	7				Ī			(32c)
	roof windows, use			alue calcul		ı formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	` ′
	is, $W/K = S(A)$		is and pan	uuons		(26)(30)) + (32) =				79.91	(33)
Heat capacity	•	()						(30) + (32	2) + (32a).	(32e) =	15008.6	
	parameter (TM	P = Cm -	- TFA) ir	n k.J/m²K			., ,	tive Value:	, , ,	(020)	250	(35)
For design assess	ments where the d	etails of the	,			ecisely the				able 1f	230	(00)
	ad of a detailed cal		uoina An	n an div l	,							(00)
_	es : S (L x Y) ca al bridging are not k		• .	•	`						11.16	(36)
Total fabric hea	al bridging are not k at loss	110WII (30) =	- v.vo x (3	1)			(33) +	(36) =			91.08	(37)
Ventilation hea		d monthl	y					$= 0.33 \times ($	25)m x (5))	31.00	`` ′
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		· ·					·				1	

(00)	05 70 47	1 00 00	1 07 40	07.04	05.4	05.4		05.05	07.04	07.00		1	(20)
Heat transfer coefficient, W/K (39)m= (61,73 161,25 160,77 158,54 158,12 156,18 156,18 156,82 156,93 158,87 158,87 159,85		(38)											
_		_	150.54	450.40	450.40	450.40	155.00		<u> </u>		450.05	1	
(39)m= 161	1.73 161.28	160.77	158.54	158.12	156.18	156.18	155.82					15054	(39)
Heat loss	oarameter	(HLP), W	/m²K	ī	•	•			•		12 / 1 Z =	136.34	(00)
(40)m= 1.	22 1.21	1.21	1.19	1.19	1.17	1.17	1.17		<u> </u>				-
Number of	dave in m	onth (Tah	(د1 ما					1	Average =	Sum(40) ₁	12 /12=	1.19	(40)
	- i			May	Jun	.lul	Aug	Sen	Oct	Nov	Dec]	
	_	+			-								(41)
. ,					<u> </u>								
1 Motor	hooting on	orav roau	iromont:								k/Mb/w	oor:	
4. Water	nealing en	ergy requ	irement.								KVVII/y	al.	
		,									2.9		(42)
			([1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)		•	
	,		ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		10:	3 13		(43)
Reduce the a	annual averaç	e hot water	usage by	5% if the c	lwelling is	designed			se target o		0.10	l	(- /
not more tha	t 125 litres pe	r person pe	r day (all w	ater use, i	hot and co	ld)			1	ı	1	1	
			<u> </u>	<u> </u>		<u> </u>		Sep	Oct	Nov	Dec		
Hot water us	age in litres p	er day for e	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)		•	,	•	•	
(44)m= 113	3.45 109.32	105.2	101.07	96.94	92.82	92.82	96.94	101.07	105.2	109.32	113.45		_
Energy conte	ent of hot wat	er used - ca	lculated mo	onthly = 4 .	190 x Vd,r	n x nm x [OTm / 3600			· /		1237.59	(44)
(45)m= 168	3.24 147.14	151.84	132.37	127.02	109.61	101.57	116.55	117.94	137.45	150.03	162.93		
									Total = Su	m(45) ₁₁₂ =		1622.67	(45)
If instantaned	ous water hea	ting at poin	t of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	_	_			
` '	I	22.78	19.86	19.05	16.44	15.23	17.48	17.69	20.62	22.51	24.44		(46)
	•	a) : al al:		-l \ \	/\/\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	_4	itle i		1			1	
J	`	,				J		ame ves	sei		150		(47)
				_			. ,	ore) onto	or 'O' in <i>(</i>	47 \			
		u not wate	51 (till5 li	iciuues i	iistaiitai	ieous cc	ווטט וטוווע	cis) cill	ווו ט ווו (41)			
	•	declared l	oss facto	or is kno	wn (kWł	n/day):				1.	.39		(48)
Temperatu	ire factor f	om Table	2b							0.	.54		(49)
•				ear			(48) x (49)) =					(50)
• • •		_	-		or is not	known:						_	` '
	_			e 2 (kW	h/litre/da	ıy)					0		(51)
			on 4.3									1	<i>,</i> ,
			2h										(52)
•							(47) (54)	· · · (EO) · · · (50)				(53)
•		_	e, Kvvn/ye	ear			(47) X (51)) X (52) X (53) =	-			(54)
, ,	` '	` '	for each	month			((56)m - (55) v (41):	m	0.	.10		(55)
					I	1		, , , ,	ı		T	Ī	(50)
` '												liv H	(56)
				1		1			1		r	1	
(57)m= 23	.33 21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

Primary circuit loss (annu	ual) from Table	e 3						0		(58)
Primary circuit loss calcu	•		$n = (58) \div 36$	65 × (41)	m				•	
(modified by factor from	m Table H5 if t	here is solar	water heati	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.01	23.26 22.51	23.26 22.	51 23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated fo	r each month	(61)m = (60)	÷ 365 × (41)m						
(61)m= 0 0	0 0	0 (<u> </u>	0	0	0	0	0		(61)
Total heat required for w	ater heating ca	alculated for	each month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
`	198.43 177.47	173.61 154		163.14	163.03	184.04	195.13	209.52		(62)
Solar DHW input calculated us	ing Appendix G o	r Appendix H (n	gative quantit	y) (enter '0	if no sola	r contributi	on to wate	r heating)	l	
(add additional lines if FC			-					3,		
(63)m= 0 0	0 0	0 0		0	0	0	0	0		(63)
Output from water heate	r	<u> </u>			Į.					
	198.43 177.47	173.61 154	1.7 148.16	163.14	163.03	184.04	195.13	209.52		
	!	ļ ļ		Outp	out from wa	ı ater heateı	r (annual)₁.	12	2171.29	(64)
Heat gains from water he	eating, kWh/m	onth 0.25 ´ [().85 × (45)m	ı + (61)m	nl + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1	_
	87.76 80.09	79.51 72.		76.03	75.29	82.98	85.96	91.45	,	(65)
include (57)m in calcul	lation of (65)m	only if cyling	ler is in the	l dwellina	or hot w	ater is fr	om com		l eating	
5. Internal gains (see T	, ,	• •		avvoiiing	01 1100 11	ator 10 11	0111 00111	indincy in	Journal	
)·								
Metabolic gains (Table 5 Jan Feb	Mar Apr	May J	ın Jul	Aug	Sep	Oct	Nov	Dec		
	145.12 145.12	145.12 145		145.12	145.12	145.12	145.12	145.12		(66)
` '					<u> </u>	140.12	140.12	140.12		()
Lighting gains (calculated (67)m= 26.86 23.86	19.4 14.69	10.98 9.2		13.02	17.48	22.19	25.9	27.61		(67)
` '	I	Ll		l	l		25.5	27.01		(07)
Appliances gains (calculation)	1		1	i	1	i	000.40	200.02	1	(69)
` '	296.57 279.8	258.62 238		222.3	230.18	246.95	268.13	288.03		(68)
Cooking gains (calculate				1					İ	(00)
` '	37.51 37.51	37.51 37.	51 37.51	37.51	37.51	37.51	37.51	37.51		(69)
Pumps and fans gains (1			-						I	
(70)m= 3 3	3 3	3 3	3	3	3	3	3	3		(70)
Losses e.g. evaporation	(negative valu	es) (Table 5)	i						•	
(71)m= -116.1 -116.1 -	-116.1 -116.1	-116.1 -11	6.1 -116.1	-116.1	-116.1	-116.1	-116.1	-116.1		(71)
Water heating gains (Tal	ble 5)									
(72)m= 125.29 122.91 1	117.96 111.23	106.87 100	.72 95.49	102.19	104.57	111.53	119.39	122.92		(72)
Total internal gains =			(66)m + (67)n	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m= 523.01 520.75 5	503.47 475.26	446.01 418	.25 400.47	407.05	421.76	450.21	482.95	508.09		(73)
6. Solar gains:										
Solar gains are calculated us	ing solar flux from	Table 6a and a	ssociated equa	ations to co	nvert to th	e applicab	le orientat	ion.		
Orientation: Access Fac			Flux	-	g_ 	_	FF		Gains	
Table 6d	m²		Table 6a	, <u> </u>	able 6b		able 6c		(W)	,
Northeast _{0.9x} 0.77	X 24.	03 ×	11.28	x	0.63	X	0.7	=	82.86	(75)
Northeast _{0.9x} 0.77	X 24.	03 ×	22.97	x	0.63	X	0.7	=	168.67	(75)

Jan		Mar	Apr Ma	Ť	Jun	Jul	Αι	ug :	Sep	Oct	Nov	Dec]	
Temperature Utilisation fac	•	•		•			oie 9,	ın1 (°	C)				21	(85)
7. Mean inter		`				o no. T - '	ole O	TL 4 /	001					(05)
(84)m= 673.8		36.86	ļ .		137.51	1358.76	1190).22 99	94.31	793.8	669.53	633.27		(84)
Total gains – ir				_			l	1	1		1		7	(0.1)
(83)m= 150.79		33.39	744.94 967.6			958.29	783	.17 57	2.55	343.59	186.58	125.18		(83)
Solar gains in	watts, calcu	ulated	for each mon	th			(83)m	= Sum(74)m	.(82)m	_		-	
Northwest _{0.9x}	0.77	X	4.6	X	9.	21	X	0.0	63	X	0.7	=	12.95	(81)
Northwest 0.9x	0.77	X	4.6	X		1.2	X	0.0		X	0.7	=	19.96	(81)
Northwest 0.9x	0.77	×	4.6	x	28	.07	X	0.0	63	X	0.7	=	39.46	(81)
Northwest _{0.9x}	0.77	X	4.6	x	50	.42	X	0.0	63	X	0.7	=	70.88	(81)
Northwest 0.9x	0.77	×	4.6	x	72	.63	x	0.0	63	X	0.7	=	102.1	(81)
Northwest _{0.9x}	0.77	X	4.6	x	91	.1	x	0.0	63	X	0.7	=	128.07	(81)
Northwest 0.9x	0.77	X	4.6	x	97	.38	x	0.0	63	X	0.7	=	136.9	(81)
Northwest _{0.9x}	0.77	×	4.6	x	91	.35	x	0.0	63	X	0.7		128.42	(81)
Northwest _{0.9x}	0.77	×	4.6	x	67	.96	x	0.0	63	X	0.7	=	95.53	(81)
Northwest _{0.9x}	0.77	×	4.6	×	41	.38	x	0.0	63	X	0.7	_ =	58.17	(81)
Northwest _{0.9x}	0.77	X	4.6	×		.97	X		63	X	0.7	=	32.29	(81)
Northwest _{0.9x}	0.77	×	4.6	x		.28	X		63		0.7	=	15.86	(81)
Southeast 0.9x	0.77	×	4.63	x		.49	X		63		0.7	=	44.55	(77)
Southeast 0.9x	0.77	×	4.63	x		.07	X		63	X	0.7	=	62.36	(77)
Southeast 0.9x	0.77	X	4.63)		.27	x		63		0.7	= =	98.01	(77)
Southeast 0.9x	0.77	-	4.63] ^] x		.85) ^ x		63	」^!] x !	0.7	$\dashv $	131.38	(77)
Southeast 0.9x	0.77	d ^ x	4.63] ^] x		1.39	^ x		63	」^! ⅂	0.7	= =	147.71	(77)
Southeast 0.9x	0.77		4.63			3.15			63 63	」	0.7	╡ -	161.18	(77)
Southeast 0.9x	0.77	x x	4.63	l x		9.01 3.15	x x		63 63	」 ^x │ ॊ x │	0.7	$\dashv $	168.4	(77)
Southeast 0.9x	0.77	」 ×	4.63	l X l v		6.25	X	0.0		」 [×]	0.7	=	150.34	= (77) (77)
Southeast 0.9x	0.77	_ X	4.63	X 1		.75	X 		63	X	0.7	=	121.34	(77)
Southeast o.e.	0.77	×	4.63	X		.67	X		63	X	0.7	ᆗ =	88.68	(77)
Southeast 0.9x	0.77	×	4.63	X	36	.79	X	0.0	63	X	0.7	=	52.06	(77)
Northeast 0.9x	0.77	X	24.03	X	9.	21	X	0.0	63	X	0.7	=	67.67	(75)
Northeast _{0.9x}	0.77	X	24.03	X	14	1.2	X	0.0	63	x	0.7	=	104.26	(75)
Northeast _{0.9x}	0.77	×	24.03	x	28	.07	X	0.0	63	X	0.7	=	206.12	(75)
Northeast 0.9x	0.77	X	24.03	x	50	.42	X	0.0	63	X	0.7	=	370.28	(75)
Northeast _{0.9x}	0.77	×	24.03	x	72	.63	X	0.0	63	x	0.7	=	533.36	(75)
Northeast _{0.9x}	0.77	X	24.03	x	91	.1	X	0.0	63	x	0.7	=	669.04	(75)
Northeast _{0.9x}	0.77	X	24.03	x	97	.38	X	0.0	63	x	0.7	=	715.18	(75)
Northeast _{0.9x}	0.77	x	24.03	x	91	.35	X	0.0	63	x	0.7	=	670.83	(75)
Northeast _{0.9x}	0.77	×	24.03	x	67	.96	x	0.0	63	x	0.7		499.06	(75)
Northeast _{0.9x}	0.77	X	24.03	X	41	.38	X	0.0	63	X	0.7	=	303.88	(75)

(86)m=	1	1	0.99	0.96	0.85	0.66	0.5	0.58	0.86	0.99	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fc	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.59	19.75	20.05	20.47	20.81	20.96	20.99	20.98	20.84	20.4	19.92	19.56		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)				l	
(88)m=	19.91	19.91	19.91	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.92	19.92		(88)
	tion for	tor for a	oina far	root of di	lina l	h2 m /oc	L Table	00)						
(89)m=	1	1 10 10 g	0.99	rest of d	0.79	0.56	0.38	9a) 0.46	0.8	0.98	1	1		(89)
									<u> </u>	l	<u>'</u>	,		()
		· ·				<u> </u>		ps 3 to 7	1		40.50	47.00		(90)
(90)m=	18.02	18.26	18.7	19.31	19.75	19.92	19.94	19.94	19.81	19.21	18.52 g area ÷ (4	17.99	0.54	¬`´
									'	ILA – LIVIII	y area + (-	+) -	0.51	(91)
Mean			ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2				l	
(92)m=	18.81	19.01	19.39	19.9	20.28	20.44	20.47	20.47	20.33	19.81	19.23	18.79		(92)
								4e, whe		r i			1	(00)
(93)m=	18.81	19.01	19.39	19.9	20.28	20.44	20.47	20.47	20.33	19.81	19.23	18.79		(93)
			uirement					-	-11	. —	- - > \			
				nperatur using Ta		ed at ste	ep 11 of	Table 9	o, so tha	it II,m=(/6)m an	d re-calc	ulate	
tilo di	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Odii	- Oui	, rug	ОСР	1 001	1101			
(94)m=	1	1	0.99	0.94	0.81	0.61	0.44	0.52	0.82	0.98	1	1		(94)
	ıl gains,	hmGm .	W = (94)	1)m x (84	4)m					l	l			
(95)m=	672.61	806.78	972.3	1147.2	1149.25	874.78	598.3	620.07	819.49	774.74	667	632.44		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8			<u> </u>					
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	2346.57	2275.95	2071.78	1743.7	1357.08	912.57	604.47	633.42	977.81	1456.21	1927.74	2331.73		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	1245.43	987.28	818.02	429.48	154.63	0	0	0	0	507.02	907.73	1264.27		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	6313.86	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								47.47	(99)
9a. En	ergy rec	uiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
	e heatir						<u> </u>		,					
Fracti	on of sp	ace hea	t from se	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.5	(206)
	•	-		ementar		a system	ղ. %						0	(208)
								Λ	0.1		N.L.	D		」
Snoo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	aľ
Space	1245.43		818.02	alculated	154.63	0	0	0	0	507.02	907.73	1264.27		
(044)							L	L	L	007.02	1 337.73	1207.21		(044)
(211) m)m x (20 1055.92	4)] } X 1 874.88	00 ÷ (20 459.34	165.38	0	0	0	0	542.26	970.83	1352.16		(211)
	1002.01	1000.92	014.00	408.04	100.36	U	U				970.83 211) _{15,1012}		6750.70	(211)
								1014	(,(2	- 15,1012	!	6752.79	

{[(98)m x (201)] } x 100 ÷ (208) 15)m= 0 0 0 0 0	0 0	0	0	0	0	0					
	.	Total	(kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(2			
ater heating						'		_			
utput from water heater (calculated above) 214.83 189.23 198.43 177.47 173.61 1	154.7 148.16	163.14	163.03	184.04	10F 12	209.52					
214.83 189.23 198.43 177.47 173.61 1 ficiency of water heater	154.7	103.14	103.03	164.04	195.13	209.52	79.8	7(2			
	79.8 79.8	79.8	79.8	87.38	88.4	88.81	7 0.0	⅃` (2			
uel for water heating, kWh/month	!			<u> </u>							
19)m = (64)m x 100 ÷ (217)m	20 20 1 405 20	T 004 44 T	2212	040.00	000 70	005.00					
9)m= 242.07 213.6 225 203.78 205.44 1	93.86 185.66	204.44 Total	204.3 = Sum(2)	210.62 19a) ₁₁₂ =	220.72	235.93	2545.43	7(2			
nnual totals		Nh/year	•	kWh/year							
pace heating fuel used, main system 1				22.	. ,		6752.79				
Water heating fuel used											
ectricity for pumps, fans and electric keep-hot						'					
entral heating pump:						30		(2			
oiler with a fan-assisted flue						45		(2			
otal electricity for the above, kWh/year		sum of (230a)(230g) =									
ectricity for lighting							474.41	」`			
otal delivered energy for all uses (211)(221) +	(231) + (232)	(237h) -	_				9847.63	」` <mark>]</mark> (3			
2a. CO2 emissions – Individual heating system	. , , , ,	· · ·					3047.00				
	Energy kWh/year			Emiss kg CO2	i <mark>on fac</mark> 2/kW/h	tor	Emissions kg CO2/yea				
pace heating (main system 1)	(211) x			0.2		=	1458.6	~'] ₍₂			
	(215) x					=		\\^ ☐(2			
				0.5			0	_			
pace heating (secondary)	1.71ar v			0.2	16	=	549.81	_](2 □ .			
ater heating	(219) x	. (262) . (2)C 4\ .					(2			
ater heating pace and water heating	(261) + (262)	+ (263) + (2	264) =			į	2008.41	_			
eace neating (secondary) ater heating bace and water heating ectricity for pumps, fans and electric keep-hot ectricity for lighting		+ (263) + (2	(64) =	0.5	19	=	38.93](2			

TER =

(273)

17.24