



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?			
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/m ²]	126.56	99.35
Primary energy* [kWh/m²]	70.37	82.26
Total emissions [kg/m²]	11.9	14.2

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

H	HVAC Systems Performance														
System 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		1.4	"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 10:50:17*

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 31.57 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.03 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

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 - Heat pump

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%	211
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	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	5.49m²	
Windows facing: South West	5.49m²	
Ventilation rate:	3.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		
i notovoltalo array		

		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	: 00 - A					
1. Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			63.84	(1a) x	2	2.65	(2a) =	169.18	(3a)
Total floor area TFA = (1	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	ins				0	x ′	10 =	0	(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 ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				0		÷ (5) =	0	(8)
Number of storeys in the	peen carried out or is intended, procee 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)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t	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	,	`	,,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic metro	•	•	•	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$ if a pressurisation test has been do				is haina u	sad		0.15	(18)
Number of sides sheltere		ne or a de	gree an pe	тпеаышу	is being u	seu		0	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	s) x (20) =				0.15	(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]	
<u> </u>		•	•	•		•	•	•	

Adjusted infiltration	rate (allow	ing for st	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.19 0.1	`	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
Calculate effective	_	rate for t	he appli	cable ca	se	!	!			•	,	_
If mechanical ve		andiv N. (O	12h) (22a	a) Franc (a	aguatian (I	VIEVV otho	muiaa (22h) (220)			0.5	(23a)
If exhaust air heat pu		•	, ,	,	. ,		,) = (23a)			0.5	(23b)
If balanced with heat	-	-	_					Ola) (001-) [4 (00)	75.65	(23c)
a) If balanced mo (24a)m= 0.31 0.3		entilation 0.29	0.28	at recove	0.26	7R) (248	a)m = (22) 0.27	2b)m + (0.28	23b) x [1 - (23c)) ÷ 100]]	(24a)
` '			<u> </u>							0.3		(Z+a)
b) If balanced me		entilation 0	without 0	neat red		0)m = (22 0	2b)m + (. 0	230)	0	1	(24b)
c) If whole house		ļ.	ļ	<u> </u>								(2.0)
if (22b)m < 0			•	•				.5 × (23b	o)			
(24c)m= 0 0		0	0	0	0	0	0	0	0	0]	(24c)
d) If natural vent	lation or wh	nole hous	e positiv	ve input	ventilatio	on from	loft	!	!	!	J	
if (22b)m = 1			•	•				0.5]			_	
(24d)m= 0 0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air char	nge rate - e	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)					
(25)m= 0.31 0.3	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)
3. Heat losses an	d heat loss	paramet	er:									
	Fross rea (m²)	Openin		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-		
Doors	` ,							•	,			
				2.55	X	1.4		3.57				(26)
Windows Type 1				2.55 5.49		1.4 /[1/(1.4)+	!	3.57 7.28				(26) (27)
Windows Type 1 Windows Type 2					x1		0.04] =					` '
				5.49	x1 x1	/[1/(1.4)+	0.04] =	7.28		110	7022.4	(27)
Windows Type 2	27.27	13.5	3	5.49	x1 x1 x	/[1/(1.4)+ /[1/(1.4)+	0.04] =	7.28 7.28 8.2992		110	7022.4	(27)
Windows Type 2 Floor Walls Type1			3	5.49 5.49 63.84	x1 x1 x x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.13	0.04] = [7.28 7.28 8.2992 2.47		60	824.4	(27) (27) (28) (29)
Windows Type 2 Floor Walls Type1 Walls Type2	56.63	0	3	5.49 5.49 63.84 13.74 56.63	x1 x1 x x1 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] = [7.28 7.28 8.2992 2.47 9.46		60	824.4 3397.8	(27) (27) (28) (29) (29)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof	3.74		3	5.49 5.49 63.84 13.74 56.63	x1 x1 x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.13	0.04] = [0.04] =	7.28 7.28 8.2992 2.47		60	824.4	(27) (27) (28) (29) (29) (29) (30)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements	3.74	0	3	5.49 5.49 63.84 13.74 56.63 3.74	x1 x1 x x1 x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+	0.04] = [0.04] =	7.28 7.28 8.2992 2.47 9.46 0.49		60	824.4 3397.8 33.66	(27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements	3.74	0	3	5.49 5.49 63.8 ² 13.7 ² 56.63 3.74 151.4	x1 x1 x x1 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] = [0.04] =	7.28 7.28 8.2992 2.47 9.46		60 60 9 45	824.4 3397.8 33.66	(27) (27) (28) (29) (29) (30) (31) (32)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements Party wall Party ceiling	3.74	0	3	5.49 5.49 63.84 13.74 56.63 3.74 151.4 21.76 60.09	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+	0.04] = [0.04] =	7.28 7.28 8.2992 2.47 9.46 0.49		60 60 9 45 30	824.4 3397.8 33.66 979.2 1802.7	(27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements Party wall Party ceiling Internal wall **	56.63 3.74 ents, m ²	0		5.49 5.49 63.8 ² 13.7 ² 56.63 3.74 151.4 21.76 60.09	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ / 0.13 0.18 0.17 0.13	0.04] = [0.04] = [= 0.04] = [= [= = [= = [7.28 7.28 8.2992 2.47 9.46 0.49		60 60 9 45 30 9	824.4 3397.8 33.66 979.2 1802.7 801.809	(27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements Party wall Party ceiling	56.63 3.74 ents, m²	0 0	indow U-va	5.49 5.49 63.8 ² 13.7 ² 56.63 3.74 151.4 21.76 60.09 89.09	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ / 0.13 0.18 0.17 0.13	0.04] = [0.04] = [= 0.04] = [= [= = [= = [7.28 7.28 8.2992 2.47 9.46 0.49		60 60 9 45 30 9	824.4 3397.8 33.66 979.2 1802.7 801.809	(27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements Party wall Party ceiling Internal wall ** * for windows and roof	56.63 3.74 ents, m² windows, use elboth sides of in	0 0	indow U-va	5.49 5.49 63.8 ² 13.7 ² 56.63 3.74 151.4 21.76 60.09 89.09	x1 x1 x x1 x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ / 0.13 0.18 0.17 0.13	- 0.04] = [- 0.04] = [- 0.04] = [- [- = [- = [- = [- = [- = [- = [- = [- = [- = [- = [- [- = [- = [- = [- = [- = [- = [- = [- = [- = [- = [- [- = [- = [- = [- = [- = [- = [- = [- = [- = [- = [- [- = [- = [- = [- = [- = [- = [- = [- = [- = [- = [-	7.28 7.28 8.2992 2.47 9.46 0.49		60 60 9 45 30 9	824.4 3397.8 33.66 979.2 1802.7 801.809	(27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of element Party wall Party ceiling Internal wall ** * for windows and roof ** ** include the areas on	56.63 3.74 ents, m² windows, use of the sides of it. I/K = S (A x	0 0	indow U-va	5.49 5.49 63.8 ² 13.7 ² 56.63 3.74 151.4 21.76 60.09 89.09	x1 x1 x x1 x x x x x x x x x x x x x x	0.13 0.18 0.17 0.13	- 0.04] = [- 0.04	7.28 7.28 8.2992 2.47 9.46 0.49	as given in	60 60 9 45 30 9	824.4 3397.8 33.66 979.2 1802.7 801.8099	(27) (27) (28) (29) (29) (30) (31) (32) (32b) 9 (32c)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of element Party wall Party ceiling Internal wall ** * for windows and roof the include the areas on Fabric heat loss, Wall	56.63 3.74 ents, m² windows, use of the sides of it. I/K = S (A x k)	effective winternal wal	indow U-va	5.49 5.49 63.8 ² 13.7 ² 56.63 3.74 151.4 21.76 60.09 89.09 alue calcultitions	x1 x1 x1 x1 x2 x1 x2 x2 x3 x4 x5 x6	0.13 0.18 0.17 0.13	= [- 0.04] = [-	7.28 7.28 8.2992 2.47 9.46 0.49 0	as given in	60 60 9 45 30 9	824.4 3397.8 33.66 979.2 1802.7 801.8099	(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements Party wall Party ceiling Internal wall ** * for windows and roof to the areas on the property include the areas on the property includes	56.63 3.74 ents, m² windows, use of the sides of it. I/K = S (A x k) ameter (TMI) is where the de-	effective winternal walk U) P = Cm - etails of the	indow U-ve ls and pan	5.49 5.49 63.84 13.74 56.63 3.74 151.4 21.76 60.09 89.09 alue calculatitions	x1 x1 x1 x1 x1 x2 x1 x2 x2 x2 x3 x2 x3 x2 x3 x4	0.13 0.18 0.17 0.13 0.18 0.17 0.13	= [- 0.04] = [-	7.28 7.28 8.2992 2.47 9.46 0.49 0 ue)+0.04] a(30) + (3: ÷ (4) =	as given in [2] + (32a).	60 60 9 45 30 9 paragraph (32e) =	824.4 3397.8 33.66 979.2 1802.7 801.8099 38.85 14861.97	(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c) (33) (34)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements Party wall Party ceiling Internal wall ** * for windows and roof ** include the areas on Fabric heat loss, Wheat capacity Cm : Thermal mass para For design assessments	swhere the de a detailed calculation	effective winternal walk (U) P = Cm - etails of the culation.	indow U-vals and pan	5.49 5.49 63.8 ² 13.7 ² 56.63 3.74 151.4 21.76 60.09 89.09 alue calculatitions	x1 x1 x1 x1 x1 x2 x1 x2 x2 x3 x4 x5 x5 x6 x6 x7 x6 x6 x7 x7 x1	0.13 0.18 0.17 0.13 0.18 0.17 0.13	= [- 0.04] = [-	7.28 7.28 8.2992 2.47 9.46 0.49 0 ue)+0.04] a(30) + (3: ÷ (4) =	as given in [2] + (32a).	60 60 9 45 30 9 paragraph (32e) =	824.4 3397.8 33.66 979.2 1802.7 801.8099 38.85 14861.97	(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c) (33) (34)
Windows Type 2 Floor Walls Type1 Walls Type2 Roof Total area of elements Party wall Party ceiling Internal wall ** * for windows and roof ** ** include the areas on Fabric heat loss, Wheat capacity Cm : Thermal mass para For design assessments can be used instead of	swhere the dea detailed calco	effective winternal walk (U) P = Cm - etails of the culation.	TFA) ir construct	5.49 5.49 63.84 13.74 56.63 3.74 151.4 21.76 60.09 89.09 alue calculatitions n kJ/m²K ppendix l	x1 x1 x1 x1 x1 x2 x1 x2 x2 x3 x4 x5 x5 x6 x6 x7 x6 x6 x7 x7 x1	0.13 0.18 0.17 0.13 0.18 0.17 0.13	= [- 0.04] = [-	7.28 7.28 8.2992 2.47 9.46 0.49 0 ue)+0.04] a(30) + (3: ÷ (4) =	as given in [2] + (32a).	60 60 9 45 30 9 paragraph (32e) =	824.4 3397.8 33.66 979.2 1802.7 801.8099 7 3.2 38.85 14861.97 232.8	(27) (27) (28) (29) (29) (30) (31) (32) (32b) (32c) (33) (34) (35)

√entila	ation hea	nt 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=	17.47	17.26	17.06	16.01	15.8	14.75	14.75	14.54	15.17	15.8	16.22	16.64		(38)
Heat tr	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
39)m=	67.46	67.25	67.04	65.99	65.79	64.74	64.74	64.53	65.16	65.79	66.2	66.62		
Heat Id	oss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	65.94	(39)
40)m=	1.06	1.05	1.05	1.03	1.03	1.01	1.01	1.01	1.02	1.03	1.04	1.04		
Numbe	er of day	s in mor	nth (Tab	le 1a)				•	,	Average =	Sum(40) ₁ .	12 /12=	1.03	(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
	ater heat			irement:								kWh/ye	ear:	
if TF	ned occu FA > 13.9 FA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		09		(42
Reduce	I averag the annua e that 125	ıl average	hot water	usage by	5% if the α	lwelling is	designed i	` ,		se target o		.79		(43
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)						
44)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		
Energy (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1005.44	(44
45)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		
f instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	· [1318.29	(45
46)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		(40
	storage					/\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		20.2		!				
Ŭ	je volum	` ,					•		ame ves	sel		0		(47
Otherv	munity h vise if no storage	stored			_			. ,	ers) ente	er '0' in (47)			
	nanufact		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(4
empe	erature fa	actor fro	m Table	2b								0		(4
	y lost fro		_	-				(48) x (49)) =		1	10		(50
ot wa	nanufact ater stora	age loss	factor fr	om Tabl							0.	02		(5
	munity h e factor	_		on 4.3							1	02		(5
	e lactor erature fa			2b								.6		(5:
	y lost fro				ear			(47) x (51)	x (52) x (53) =		03		(5
		54) in (5	_	,y				, , , , , (01)	\/ ^ (-,	-	03		(5
٠.	(00) 01 (., ,	,											
Enter	storage		•	for each	month			((56)m = (55) × (41):	m				

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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circui	t loss (ar	nual) fro	m Table	• 3	!	!	!	!	!	<u>'</u>	0		(58)
Primary circui	`	,			59)m = ((58) ÷ 36	65 × (41)	m				•	
(modified by	y factor f	rom Tab	le H5 if t	here is	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 he	eating ca	alculated	for eacl	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 191.96	169.47	178.63	161.04	158.47	142.54	137.79	149.96	149.31	166.94	175.39	187.64		(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	al 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= 191.96	169.47	178.63	161.04	158.47	142.54	137.79	149.96	149.31	166.94	175.39	187.64		
							Outp	out from w	ater heate	r (annual)	112	1969.13	(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= 89.67	79.69	85.24	78.55	78.53	72.4	71.66	75.7	74.65	81.35	83.32	88.23		(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 g	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	pendix	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 in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	•	•		
(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	ppendix	L. egua	tion L15	or L15a), also se	ee Table	· 5	!	1		
(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	 5а)	l	l	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>!</u>	<u> </u>	l	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)	ı	ı			1			
(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 (٦	rable 5)		!	!	!	!	!	!		•	•	
(72)m= 120.52	118.58	114.57	109.1	105.55	100.56	96.31	101.75	103.69	109.34	115.73	118.59		(72)
Total internal	gains =	:		!	(66)	m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	(1)m + (72))m		
(73)m= 374.1	372.19	360.62	342.06	323.37	305.25	293.42	298.84	308.32	327.08	348.6	364.59		(73)
6. Solar gain	s:			l.						•			
6. Solar gain Solar gains are		using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	ne applicat	ole orienta	tion.		

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

Northeast _{0.9x}				_ 1				1		_						7(75)
<u>L</u>	0.77	×	5.4		X		1.28	X	0.63	=	X [0.7	_	=	18.93	(75)
Northeast _{0.9x}	0.77	X	5.4	9	X	2:	2.97	X	0.63	 '	x [0.7	_	=	38.53	(75)
Northeast _{0.9x}	0.77	X	5.4	9	X	4	1.38	X	0.63	;	×	0.7	_	=	69.43	(75)
Northeast _{0.9x}	0.77	X	5.4	9	X	6	7.96	X	0.63	;	× [0.7		=	114.02	(75)
Northeast _{0.9x}	0.77	Х	5.4	9	X	9	1.35	X	0.63	;	x [0.7		=	153.26	(75)
Northeast _{0.9x}	0.77	X	5.4	9	X	9	7.38	X	0.63	:	x	0.7		=	163.39	(75)
Northeast _{0.9x}	0.77	X	5.4	9	X	9	91.1	X	0.63		x [0.7		=	152.85	(75)
Northeast _{0.9x}	0.77	X	5.4	9	x	7:	2.63	X	0.63		x [0.7		=	121.85	(75)
Northeast _{0.9x}	0.77	X	5.4	9	x	50	0.42	x	0.63		x [0.7		=	84.6	(75)
Northeast 0.9x	0.77	X	5.4	9	x	2	8.07	x	0.63		x [0.7		=	47.09	(75)
Northeast _{0.9x}	0.77	Х	5.4	9	x	1	4.2	x	0.63		x [0.7		=	23.82	(75)
Northeast _{0.9x}	0.77	Х	5.4	9	x	9	9.21	х	0.63		x [0.7		=	15.46	(75)
Southwest _{0.9x}	0.77	x	5.4	9	x	3(6.79	ĺ	0.63		x [0.7		=	61.73	(79)
Southwest _{0.9x}	0.77	x	5.4	9	x	6:	2.67	Ī	0.63	<u> </u>	x [0.7		=	105.15	(79)
Southwest _{0.9x}	0.77	х	5.4	9	x	8	5.75	ĺ	0.63		x [0.7		=	143.88	(79)
Southwest _{0.9x}	0.77	x	5.4	9	x	10	06.25	ĺ	0.63	<u> </u>	× [0.7	司	=	178.27	(79)
Southwest _{0.9x}	0.77	х	5.4	9	x	11	19.01	ĺ	0.63		x [0.7	司	=	199.68	(79)
Southwest _{0.9x}	0.77	x	5.4	9	x	11	18.15	ĺ	0.63		x [0.7		=	198.23	(79)
Southwest _{0.9x}	0.77	x	5.4	9	x	11	13.91	j	0.63		x [0.7		=	191.12	(79)
Southwest _{0.9x}	0.77	x	5.4	9	x	10	04.39	İ	0.63		x [0.7	冒	=	175.15	(79)
Southwest _{0.9x}	0.77	x	5.4	9	x	9:	2.85	i	0.63		x [0.7	Ħ	=	155.79	(79)
Southwest _{0.9x}	0.77	x	5.4	9	x	6:	9.27	i	0.63	$\overline{}$	x [0.7	Ħ	=	116.22	(79)
Southwest _{0.9x}	0.77	x	5.4	9	x	4	4.07	i	0.63		x [0.7	司	=	73.94	(79)
Southwest _{0.9x}	0.77	x	5.4		x	3	1.49	<u>.</u>	0.63	= ,	x [0.7	=	_	52.83	(79)
L								ı			_					
Solar gains in	watts, cal	culated	for each	n mont	h			(83)m	ı = Sum(74)m	ı(82 [°])m					
7	143.69	Y	Y			61.63			7 240.38			97.76	68.2	29		(83)
Total gains – i	nternal an	nd solar	(84)m =	(73)m	1 + (33)m ,	watts	!	!	'					l	
(84)m= 454.77	515.88	573.92	634.34	676.31	6	66.88	637.39	595	.84 548.71	490).39	446.36	432.	88		(84)
7. Mean inter	rnal tempe	erature i	(heating	seaso	n)					-						
Temperature						area f	rom Tah	ole 9	Th1 (°C)						21	(85)
Utilisation fac	•	• .			_			010 0	(0)						21	(00)
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Δ	ug Sep)ct	Nov	De	20		
(86)m= 0.99	0.99	0.97	0.92	0.79	+	0.6	0.44	0.4		+	94	0.99	1	,,,		(86)
` '	ļ!	!	!							1 -		1 5.55				` '
Mean interna	, , ,				$\overline{}$	i				1 00	0.5	1 00 04	40.6	\ <u></u>	1	(07)
(87)m= 19.93	20.09	20.34	20.66	20.88		0.98	21	20.	99 20.94	20.	.65	20.24	19.9	91		(87)
Temperature		eating p	eriods in	rest o	$\overline{}$	Ť	from Ta	able 9	9, Th2 (°C)	,					•	
(88)m= 20.04	20.04	20.04	20.06	20.06	2	0.07	20.07	20.	07 20.07	20.	.06	20.05	20.0)5		(88)
Utilisation fac	ctor for gai	ins for r	est of dv	<u>we</u> lling	, h2	m (se	e Table	9a)								
(89)m= 0.99	0.98	0.96	0.89	0.74		0.52	0.35	0.4	4 0.67	0.9	92	0.98	0.9	9		(89)
Mean interna	al tempera	ture in t	the rest of	of dwe	llina	T2 (fc	ollow ste	eps 3	to 7 in Tal	ole 9d	:)				-	
	,			_	9	, -	- /-				,					

		1 1 .		1	(00)
(90)m= 18.62 18.85 19.22 19.66 19.94 20.06 20.07	20.07 20.02	19.66 1 fLA = Living ar	9.08 18.59		(90)
		TLA = Living at	ea + (4) =	0.58	(91)
Mean internal temperature (for the whole dwelling) = fLA × T1 +	· · · · · · · · · · · · · · · · · · ·	 		1	(00)
(92)m= 19.38 19.57 19.87 20.24 20.49 20.59 20.61	20.61 20.55		9.75 19.35]	(92)
Apply adjustment to the mean internal temperature from Table 4 (93)m= 19.38 19.57 19.87 20.24 20.49 20.59 20.61	e, wnere appr 20.61 20.55	 	9.75 19.35	1	(93)
8. Space heating requirement	20.00	20.20	0.70		(00)
Set Ti to the mean internal temperature obtained at step 11 of T	able 9b, so tha	at Ti,m=(76)	m and re-cald	culate	
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:		1 1 .		1	(0.4)
(94)m= 0.99 0.98 0.96 0.9 0.77 0.57 0.4	0.45 0.71	0.92	0.99]	(94)
Useful gains, hmGm , W = (94) m x (84) m (95) m= 450.52 506.64 551.22 569.98 518.11 378.07 257.99	269.01 390.04	453.43 43	38.07 429.65	1	(95)
Monthly average external temperature from Table 8	209.01 390.04	400.40	38.07 429.03	J	(55)
(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				J	
	271.38 420.18	 	37.42 1009.54]	(97)
Space heating requirement for each month, kWh/month = 0.024	x [(97)m – (95	5)m] x (41)m	<u> </u>	1	
(98)m= 421.65 322.54 256.66 128.28 44.56 0 0	0 0	134.01 28	37.53 431.44		
	Total per year	(kWh/year) =	Sum(98) _{15,912} =	2026.67	(98)
Space heating requirement in kWh/m²/year				31.75	(99)
9b. Energy requirements – Community heating scheme					
This part is used for space heating, space cooling or water heating	•		ty scheme.		_
Fraction of space heat from secondary/supplementary heating (T	able 11) '0' if r	none		0	(301)
Fraction of space heat from community system $1 - (301) =$				1	(302)
The community scheme may obtain heat from several sources. The procedure a		up to four othe	er heat sources; t	he latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. S Fraction of heat from Community heat pump	ee Appendix C.				
					(3032)
		(0.00)	(000.)	1	(303a)
Fraction of total space heat from Community heat pump			x (303a) =		(304a)
Factor for control and charging method (Table 4c(3)) for commun	nity heating sys		x (303a) =	1	=
			x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for commun			x (303a) =	1 1	(304a) (305) (306)
Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system			x (303a) =	1 1 1 1.05	(304a) (305) (306)
Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system. Space heating	1			1 1 1 1.05 kWh/yea	(304a) (305) (306)
Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement	(98) × (3	stem 904a) x (305) x	(306) =	1 1 1 1.05 kWh/yea 2026.67	(304a) (305) (306)
Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement Space heat from Community heat pump	(98) x (3 n Table 4a or A	stem 904a) x (305) x	(306) =	1 1 1.05 kWh/yea 2026.67 2128.01	(304a) (305) (306) r (307a)
Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement Space heat from Community heat pump Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system water heating	(98) x (3 n Table 4a or A	stem 304a) x (305) x Appendix E)	(306) =	1 1 1 1.05 kWh/yea 2026.67 2128.01 0	(304a) (305) (306) r (307a) (308
Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement Space heat from Community heat pump Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system water heating Annual water heating requirement	(98) x (3 n Table 4a or A	stem 304a) x (305) x Appendix E)	(306) =	1 1 1.05 kWh/yea 2026.67 2128.01 0	(304a) (305) (306) r (307a) (308
Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement Space heat from Community heat pump Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system water heating Annual water heating requirement If DHW from community scheme:	(98) x (3 n Table 4a or <i>A</i> em (98) x (3	stem 304a) x (305) x Appendix E)	(306) = 08) =	1 1 1 1.05 kWh/yea 2026.67 2128.01 0	(304a) (305) (306) r (307a) (308
Factor for control and charging method (Table 4c(3)) for community Distribution loss factor (Table 12c) for community heating system Space heating Annual space heating requirement Space heat from Community heat pump Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system water heating Annual water heating requirement	(98) x (3 n Table 4a or A em (98) x (3 (64) x (3	stem 304a) × (305) × Appendix E) 301) × 100 ÷ (30 303a) × (305) ×	(306) = 08) =	1 1 1 1.05 kWh/yea 2026.67 2128.01 0 0 1969.13	(304a) (305) (306) r (307a) (308 (309)

Cooling System Energy Efficiency Rat	io				0	(314)
Space cooling (if there is a fixed cooling	ng system, if not enter 0)	$= (107) \div (314)$	=		0	(315)
Electricity for pumps and fans within d mechanical ventilation - balanced, extra		outside		Г	121.26	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330	b) + (330g) =		121.26	(331)
Energy for lighting (calculated in Appe	ndix L)				295.76	(332)
Electricity generated by PVs (Appendi	x M) (negative quantity)				-108.82	(333)
Total delivered energy for all uses (30)	7) + (309) + (310) + (312)	+ (315) + (331) + (33	32)(237b) =		4503.79	(338)
12b. CO2 Emissions – Community hea	ating scheme					
		Energy kWh/year	Emission fac kg CO2/kWh		nissions ı CO2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)	• · · · · · · · · · · · · · · · · · · ·	g two fuels repeat (363) to	(366) for the secon	d fuel	280	(367a)
•	If there is CHP usin	g two fuels repeat (363) to -(310b)] x 100 ÷ (367b) x	(366) for the secon	d fuel =	280 777.68	(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP usin			. !		_
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP usin	-(310b)] x 100 ÷ (367b) x	0.52	=	777.68	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	If there is CHP usin [(307b)+	-(310b)] x 100 ÷ (367b) x [(313) x	0.52	=	777.68 21.78	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community	If there is CHP usin [(307b)+ systems econdary)	-(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x	0.52	=	777.68 21.78 799.46	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (s	If there is CHP usin [(307b)+ systems econdary) rsion heater or instantane	-(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x	0.52 0.52	=	777.68 21.78 799.46	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (see the community) CO2 associated with water from immediately from immediately associated with water from immediately from immedia	If there is CHP usin [(307b)+ systems econdary) rsion heater or instantane water heating	-(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) =	0.52 0.52	=	777.68 21.78 799.46 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (s CO2 associated with water from immediately contained to the conta	systems econdary) rsion heater or instantane water heating nps and fans within dwelli	-(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) =	0.52 0.52 2) 0 0.52	= = = = = = = = = = = = = = = = = = = =	777.68 21.78 799.46 0 0 799.46	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (see CO2 associated with water from immediate Total CO2 associated with space and CO2 associated with electricity for pure	systems econdary) rsion heater or instantane water heating nps and fans within dwelli	-(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) = ing (331)) x (332))) x	0.52 0.52 0 0 0.52	= = = = = = = = = = = = = = = = = = = =	777.68 21.78 799.46 0 799.46 62.93	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community CO2 associated with space heating (see CO2 associated with water from immediate Total CO2 associated with space and CO2 associated with electricity for pure CO2 associated with electricity for light Energy saving/generation technologies	systems econdary) rsion heater or instantane water heating nps and fans within dwelli	-(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) = ing (331)) x (332))) x	0.52 0.52 0 0 0.52 0.52 0.52	= = = = = = = = = = = = = = = = = = = =	777.68 21.78 799.46 0 799.46 62.93 153.5	(367) (372) (373) (374) (375) (376) (378) (379)

El rating (section 14)

(385)

88.19

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:49:51

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 60.42m² **Plot Reference:** Site Reference : Highgate Road - GREEN 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 32.94 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.79 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 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 **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	6.56m²	
Ventilation rate:	3.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		

Photovoltaic array

		Heor	Details:						
A No	Nail leaban	Osei		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Contware Hame.	Oli Oli II I I I I I I I I I I I I I I I I I		y Address:		31011.		7 01010	71. 110.0.00	
Address :		·							
1. Overall dwelling dime	ensions:								
Ground floor		Ar	ea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	-\.(41-\.(4-\.(4-1\.(4-1\)	. (4.5)		(1a) x	2	65	(2a) =	160.11	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(1n)	60.42	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	160.11	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
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				Ĺ	0		10 =	0	(7a)
Number of passive vents	3			L	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)+(7b)	+(7c) =	Г	0		÷ (5) =	0	(8)
•	peen carried out or is intended			ontinue fr			- (3) =	0	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber fra resent, use the value correspo			•	ruction			0	(11)
deducting areas of openii		oriding to the gre	ater wall are	a (anter					
If suspended wooden f	floor, enter 0.2 (unseale	d) or 0.1 (sea	iled), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
ŭ	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2	, ,	_	. (45)		0	(15)
Infiltration rate	aro avaraged is subject		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic	•	•	•	etre or e	envelope	area	3	$= \begin{pmatrix} (17) \\ (49) \end{pmatrix}$
•	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere			,,,	,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(21)
Infiltration rate modified f	for 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]	
					<u> </u>			J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
Calculate effe		•	rate for t	пе арріі	cable ca	ise						0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				75.65	(23
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	_
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(24
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24b	o)m = (2	2b)m + (23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r				•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losse	s and he	eat loss p	paramet	er:									
ELEMENT	Gros area		Openin m	=	Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²-		X k /K
Doors					3.49	X	1.4	=	4.886				(26
Vindows					6.56	x1.	/[1/(1.4)+	0.04] =	8.7				(27
Floor					60.42	2 x	0.13	=	7.85459	9	110	6646.2	(28
Walls Type1	19.8	35	10.0	5	9.8	X	0.18	=	1.76		60	588	(29
Walls Type2	51.	2	0		51.2	X	0.17	=	8.55		60	3072	(29
Roof	5.6	8	0		5.68	X	0.13	=	0.74		9	51.12	(30
Total area of e	elements	s, m²			137.1	5							(31
Party wall					21.92	2 x	0	=	0		45	986.4	(32
Party ceiling					54.74	1					30	1642.2	2 (32
nternal wall **	•				85.22	2				Ī	9	766.98	3 (32
* for windows and ** include the area						lated using	ı formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragrapl	1 3.2	_
abric heat los	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				32.49	(33
Heat capacity	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	13752.9	(34
Thermal mass	parame	eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			= (34)) ÷ (4) =			227.62	(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	,	•		• .	•	K						10.25	(36
f details of therma		are not kn	own (36) =	= 0.05 x (3	31)			(22)	(26)				¬,,,
Fotal fabric he		olouloto -	l manth!	,					- (36) = - 0.33 × ((25)m + (F)	١	42.75	(37
entilation hea	l	1	·		lun	1,.1	۸	``	$1 = 0.33 \times 0$	1		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

			i		i								4
(38)m= 16.54		16.14	15.15	14.95	13.96	13.96	13.76	14.36	14.95	15.35	15.75		(38)
Heat transfe		 		T		T	l		= (37) + (
(39)m= 59.28	59.09	58.89	57.9	57.7	56.71	56.71	56.51	57.1	57.7	58.09	58.49		7(30)
Heat loss pa	rameter (I	HLP), W	m²K						= (39)m ÷	Sum(39) _{1.} · (4)	12 /12=	57.85	(39)
(40)m= 0.98	0.98	0.97	0.96	0.95	0.94	0.94	0.94	0.95	0.95	0.96	0.97		_
Number of d	avs in mo	nth (Tab	le 1a)					/	Average =	Sum(40) ₁ .	12 /12=	0.96	(40)
Jan	i	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	eating ene	rgy requi	irement:								kWh/ye	ar:	
A sourced so	oun on ou	N I											(40)
Assumed oc if TFA > 13 if TFA £ 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		99		(42)
Annual avera	•	ater usad	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		81	.55		(43)
Reduce the ann	nual average	hot water	usage by	5% if the a	lwelling is	designed			se target o		.00		(- /
not more that 12		· ·	r day (all w	ater use, i I	not and co	<u> </u>	1			1			
Jan Hot water usage		Mar	Apr	May	Jun	Jul Table 10 Y	Aug	Sep	Oct	Nov	Dec		
	<u> </u>	· ·	1	1	1	1							
(44)m= 89.7	86.44	83.18	79.91	76.65	73.39	73.39	76.65	79.91	83.18	86.44	89.7		7,40
Energy content	of hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	L	978.54	(44)
(45)m= 133.0	2 116.34	120.05	104.67	100.43	86.66	80.31	92.15	93.25	108.68	118.63	128.82		
If instantaneous	s water heati	ina at point	of use (no	n hot water	r storage)	enter () in	hoxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1283.02	(45)
		18.01	15.7	15.06	13	12.05	13.82	13.99	16.3	17.79	19.32		(46)
(46)m= 19.95 Water storage		10.01	13.7	15.00	13	12.05	13.02	13.99	10.3	17.79	19.32		(40)
Storage volu	ıme (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	/elling, e	nter 110	litres in	(47)						
Otherwise if		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storag	-	oclarod I	oss fact	or ie kna	wn (k\//k	2/d2v/).							(40)
Temperature				JI IS KIIO	wii (Kvvi	i/uay).					0		(48) (49)
Energy lost f				aar			(48) x (49)	١ _			0		
b) If manufa		_	-		or is not		(40) X (40)	_		1	10		(50)
Hot water sto			-							0.	.02		(51)
If community	•		on 4.3										
Volume factor Temperature			2h							—	.03		(52)
·							(47) (54)	· · · (50) · · · (1	50)		.6		(53)
Energy lost f Enter (50) o		_	, KVVII/ye	ear			(47) x (51)) X (52) X (53) =		.03		(54) (55)
Water storage			for each	month			((56)m = (55) × (41)r	m	1.	.03		(55)
(56)m= 32.01		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder conta												κH	(00)
(57)m= 32.01		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3					()		(58)
Primary circuit loss calcula	ted for each month	(59) m = $(58) \div 3$	365 × (41)	m	,				
(modified by factor from	Table H5 if there is	solar water hea	iting and a	cylinder	thermos	stat)		ı	
(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 e	ach month (61)m =	(60) ÷ 365 × (4	1)m						
(61)m= 0 0	0 0	0 0	0	0	0	0	0		(61)
Total heat required for water	er heating calculate	d for each mon	th (62)m =	0.85 × (4	45)m + (46)m +	(57)m +	(59)m + (61)m	
(62)m= 188.3 166.27 175	.33 158.16 155.71	140.16 135.58	8 147.43	146.75	163.95	172.12	184.1		(62)
Solar DHW input calculated using	Appendix G or Append	ix H (negative quan	tity) (enter '0'	if no solar	contribution	on to wate	r heating)		
(add additional lines if FGH	IRS and/or WWHR	S applies, see A	Appendix G	6)					
(63)m = 0 0 0	0 0	0 0	0	0	0	0	0		(63)
Output from water heater									
(64)m= 188.3 166.27 175	.33 158.16 155.71	140.16 135.58	8 147.43	146.75	163.95	172.12	184.1		
			Outp	ut from wa	iter heater	(annual) _{1.}	12	1933.86	(64)
Heat gains from water heat	ing, kWh/month 0.2	25 ´ [0.85 × (45)	m + (61)m] + 0.8 x	[(46)m -	+ (57)m	+ (59)m]	
(65)m= 88.45 78.63 84.	14 77.6 77.61	71.61 70.92	74.86	73.8	80.36	82.24	87.06		(65)
include (57)m in calculati	on of (65)m only if	cylinder is in the	e dwelling	or hot wa	ater is fro	om comi	munity h	eating	
5. Internal gains (see Tab	ole 5 and 5a):								
Metabolic gains (Table 5),	Watts								
Jan Feb M	lar 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	n Appendix L, equa	tion 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 (calculate	ed in Appendix L, e	quation L13 or L	_13a), also	see Tab	ole 5				
(68)m= 174 175.81 171	.26 161.57 149.35	137.85 130.1	8 128.37	132.92	142.61	154.84	166.33		(68)
Cooking gains (calculated i	n Appendix L, equa	ation L15 or L15	a), also se	e Table	5				
(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		(69)
Pumps and fans gains (Tab	ole 5a)								
(70)m= 0 0 0	0 0	0 0	0	0	0	0	0		(70)
Losses e.g. evaporation (ne	egative values) (Ta	ble 5)							
(71)m= -79.74 -79.74 -79	.74 -79.74 -79.74	-79.74 -79.74	4 -79.74	-79.74	-79.74	-79.74	-79.74		(71)
Water heating gains (Table	5)								
(72)m= 118.89 117 113	.09 107.77 104.32	99.46 95.33	100.62	102.5	108.01	114.22	117.01		(72)
Total internal gains =		(66)m + (67)m + (68)m +	(69)m + (7	70)m + (71)m + (72)	m		
(73)m= 363.39 361.35 349	.97 331.87 313.76	296.29 284.9	7 290.43	299.78	318.06	338.93	354.33		(73)
6. Solar gains:									
Solar gains are calculated using		·	uations to co	nvert to the	e applicabl		on.		
Orientation: Access Facto Table 6d	r Area m²	Flux Table 6a	т	g_ able 6b	Та	FF ble 6c		Gains (W)	
N. d								, ,	1,
Northeast 0.9x 0.77	X 6.56	X 11.28	_ X	0.63	_ X	0.7	=	22.62	[(75)
Northeast _{0.9x} 0.77	x 6.56	x 22.97	x	0.63	x	0.7	=	46.04	(75)

Northeast _{0.9x}	0.77	X	6.5	56	x	4	1.38	x		0.63	x	0.7	=	82.96	(75)
Northeast _{0.9x}	0.77	X	6.5	56	x	6	7.96	X		0.63	x	0.7	=	136.24	(75)
Northeast _{0.9x}	0.77	X	6.5	56	x	9	1.35	X		0.63	x	0.7	=	183.13	(75)
Northeast _{0.9x}	0.77	X	6.5	56	x	9	7.38	X		0.63	x	0.7	=	195.24	(75)
Northeast _{0.9x}	0.77	Х	6.5	56	x	9	91.1	X		0.63	х	0.7	=	182.64	(75)
Northeast _{0.9x}	0.77	х	6.5	56	x	7	2.63	X		0.63	x	0.7	=	145.6	(75)
Northeast 0.9x	0.77	x	6.5	56	x	5	0.42	X		0.63	x	0.7	=	101.08	(75)
Northeast _{0.9x}	0.77	X	6.5	56	x	2	8.07	x		0.63	x	0.7	=	56.27	(75)
Northeast _{0.9x}	0.77	X	6.5	56	x	1	14.2	X		0.63	x	0.7	=	28.46	(75)
Northeast 0.9x	0.77	x	6.5	56	x	9	9.21	х		0.63	x	0.7		18.47	(75)
_					•										
Solar gains in	watts. ca	alculated	d for eac	h month	1			(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		101.08	56.27	28.46	18.47		(83)
Total gains – i	nternal a	ınd sola	r (84)m =	- (73)m	+ (8	33)m	, watts		!			_!	!		
(84)m= 386.01	407.39	432.92	468.11	496.9	·	91.53	467.61	436.	.03	400.86	374.32	367.39	372.8		(84)
7 Moon inter	nal tamp	oroturo	(hooting		. \			<u> </u>				1	ı		
7. Mean inter	•		,		<u> </u>	oroo f	rom Tok	olo O	Th	1 (00)					7(05)
Temperature	•	٠.			-			ые 9,	In	I (°C)				21	(85)
Utilisation fac		l e			Ť						0 1	 		1	
Jan	Feb	Mar	Apr	May	_	Jun	Jul	Αι	-	Sep	Oct	Nov	Dec		(00)
(86)m= 1	0.99	0.99	0.96	0.87		0.7	0.53	0.5	8	0.84	0.97	0.99	1		(86)
Mean interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)				_	
(87)m= 19.95	20.05	20.26	20.56	20.82	2	0.96	20.99	20.9	99	20.9	20.59	20.23	19.94		(87)
Temperature	durina h	eating r	eriods i	n rest of	dw	ellina	from Ta	able 9). Th	n2 (°C)					
(88)m= 20.1	20.1	20.1	20.12	20.12	Т	0.13	20.13	20.1	-	20.13	20.12	20.12	20.11		(88)
Utilisation fac	tor for a	aine for	rest of d	welling	h2	 m (sa	a Tahla	02)					!		
(89)m= 0.99		0.98	0.95	0.83	_).62	0.43	0.4	8	0.77	0.96	0.99	1		(89)
				!	_							1 0.00	<u> </u>		, ,
Mean interna	· ·	1	1	T .	ΤŤ	<u> </u>		ri –				T	T	1	(00)
(90)m= 18.7	18.85	19.15	19.59	19.94	2	0.11	20.13	20.1	13	20.04	19.63	19.12	18.69		(90)
										Ť	LA = Liv	ing area ÷ (4) =	0.6	(91)
Mean interna	l temper	ature (fo	or the wh	ole dwe	lling	g) = fl	_A × T1	+ (1 -	– fL	A) × T2					
(92)m= 19.45	19.57	19.82	20.18	20.47	2	0.62	20.65	20.6	65	20.56	20.21	19.79	19.44		(92)
Apply adjustr	nent to tl	he mear	n interna	l temper	atu	re fro	m Table	4e, v	whe	re appro	priate	•	•	•	
(93)m= 19.45	19.57	19.82	20.18	20.47	2	0.62	20.65	20.6	65	20.56	20.21	19.79	19.44		(93)
8. Space hea	ting requ	uiremen	t												
Set Ti to the	mean int	ernal te	mperatu	re obtair	ned	at ste	ep 11 of	Table	e 9b	, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the utilisation	factor fo	or gains	using Ta	able 9a										•	
Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	n:		_							_		•	
(94)m= 0.99	0.99	0.98	0.95	0.85		0.66	0.49	0.5	54	0.81	0.96	0.99	0.99		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	_									•	
(95)m= 383.49	403.45	424.54	443.16	423.22	32	25.98	227.32	235.	.95	323.86	358.55	363	370.76		(95)
Monthly aver	age exte	rnal tem	perature	from T	abl	e 8								•	
(96)m= 4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16.	.4	14.1	10.6	7.1	4.2		(96)

	00) (00)					
Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(97)$ m = 898.35 867.05 784.33 652.87 506.09 341.58 229.71 24	93)m- (96)m _{10.06} 368.79	554.36	737.07	891.52		(97)
Space heating requirement for each month, kWh/month = 0.024 x				031.32		(0.)
	0 0	145.68	269.33	387.45		
	Total per year	(kWh/year) = Sum(9	8) _{15,912} =	1977.39	(98)
Space heating requirement in kWh/m²/year					32.73	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab			unity sch	neme.	0	(301)
Fraction of space heat from community system $1 - (301) =$				Ī	1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See		ıp to four d	other heat	sources; th	e latter	_
Fraction of heat from Community heat pump				L	1	(303a)
Fraction of total space heat from Community heat pump		(30	02) x (303	a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	y heating syst	em		[1	(305)
Distribution loss factor (Table 12c) for community heating system					1.05	(306)
Space heating				-	kWh/year	_
Annual space heating requirement				Į	1977.39	_
Space heat from Community heat pump	(98) x (30)4a) x (305	5) x (306) =	<u> </u>	2076.26	(307a)
Efficiency of secondary/supplementary heating system in % (from 7	Table 4a or A	ppendix	E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (30)1) x 100 ÷	- (308) =		0	(309)
Water heating Annual water heating requirement				Γ	1933.86	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (30)3a) x (305	5) x (306) =	- [2030.56] (310a)
Electricity used for heat distribution	0.01 × [(307a).	(307e) +	(310a)(1 310e)] = [41.07	(313)
Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷	(314) =		Ī	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out	tside			[128.53	(330a)
warm air heating system fans				Ī	0	(330b)
pump for solar water heating				Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) +	- (330b) +	(330g) =		128.53	 ☐(331)
Energy for lighting (calculated in Appendix L)				[310.83] (332)
Electricity generated by PVs (Appendix M) (negative quantity)					-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + ((315) + (331)	+ (332)	(237b)	= [4437.36	(338)

12b. CO2 Emissions – Community heating scheme

Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year

CO2 from other sources of space and water Efficiency of heat source 1 (%)	er heating (not CHP) If there is CHP using two fuels repeat (363)	to (366) for the second fu	el 28	30 (36	7a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	76	.23 (36)	7)
Electrical energy for heat distribution	[(313) x	0.52	= 21	.31 (37)	2)
Total CO2 associated with community syst	tems (363)(366) + (368)(3	372)	= 782	2.54 (37)	3)
CO2 associated with space heating (secon	ndary) (309) x	0	=	(37-	4)
CO2 associated with water from immersion	n heater or instantaneous heater (312) x	0.22	=	(37	5)
Total CO2 associated with space and water	er heating (373) + (374) + (375) =		782	2.54 (37)	6)
CO2 associated with electricity for pumps	and fans within dwelling (331)) x	0.52	= 66	.71 (37	(8)
CO2 associated with electricity for lighting	(332))) x	0.52	= 16	.32 (37	9)
Energy saving/generation technologies (33 Item 1	33) to (334) as applicable	0.52 x 0.01 =	-56	.48 (38)	0)
Total CO2, kg/year	ım of (376)(382) =		95	4.1 (38	3)
Dwelling CO2 Emission Rate (3	83) ÷ (4) =		15	.79 (38	4)
El rating (section 14)			87	.87 (38:	5)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:49:25

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 32.02 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

15.35 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 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 - Heat pump

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	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	9.01m²	
Ventilation rate:	2.00	
10 Key features		
To Noy Toutures		
Air permeablility	3.0 m³/m²h	
·	3.0 m³/m²h 0 W/m²K	

Photovoltaic array

		Lleor	Details:						
Access on Names	No:I leabore	USEI		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa			0010943 on: 1.0.5.50			
Contware reame.	Ottoma 1		y Address:		31011.		7 01010	71. 110.0.00	
Address :		·	·						
1. Overall dwelling dime	ensions:								
Ground floor		Aı	rea(m²)	(1a) x		ight(m)	(2a) =	Volume(m³	(3a)
	a) · (4b) · (4 a) · (4 d) · (4 a)	. (4=)			2	.65	(2a) =	156.93	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	+(1n)	59.22	(4)	\	N (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	156.93	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of allipsychia	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				Ĺ	0		10 =	0	(7a)
Number of passive vents	i			L	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	ovs flues and fans = (6a)	+(6b)+(7a)+(7b))+(7c) =	Г	0		÷ (5) =	0	(8)
'	peen carried out or is intended,			ontinue fr			- (3) =	0	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber fra present, use the value correspo			•	ruction			0	(11)
deducting areas of openii		oriding 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								0	(13)
ŭ	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2	, ,	_	. (45)		0	(15)
Infiltration rate	aro avaraged in subject		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic	-	•	•	etre or e	envelope	area	3	$= \begin{pmatrix} (17) \\ (49) \end{pmatrix}$
	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere			,	,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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]	
		<u>l</u>			<u> </u>			J	

Adjusted infiltr	ation rat	e (allow	ina for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		•	rate for t	he appli	cable ca	se	!		!	!			(00=)
If exhaust air h			endix N (2	23h) <i>- (23</i> :	a) × Fmv (4	equation (I	NS)) othe	rwise (23h) = (23a)			0.5	(23a)
If balanced with) = (20a)			0.5	(23b)
a) If balance		-	-	_					2h)m + (23h) 🗴 [1 – (23c)	75.65 ÷ 1001	(23c)
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(24a)
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	л ЛV) (24b	p)m = (2i)	2b)m + (23b)	<u> </u>	l	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	ouse ex	tract ver	ntilation o	or positiv	e input	ventilatio	n from o	outside	!	!			
if (22b)r	n < 0.5 >	(23b), t	then (24	c) = (23k	o); other	wise (24	c) = (22l	o) m + 0	.5 × (23b)		•	
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r	ventilation $n = 1$, th								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openir		Net Ar A ,r		U-val W/m2		A X U (W/l		k-value kJ/m²-l		X k I/K
Doors		()			2.94		1.4	=	4.116	$\stackrel{\prime}{\Box}$			(26)
Windows					9.01	x1,	/[1/(1.4)+	0.04] =	11.95	一			(27)
Floor					59.22	2 x	0.13		7.6986		110	6514.	2 (28)
Walls Type1	23.4	17	11.9	5	11.52	2 x	0.18	<u> </u>	2.07		60	691.2	(29)
Walls Type2	35.2	26	0		35.26	3 X	0.17	-	5.89	F i	60	2115.	6 (29)
Roof	6.9	1	0		6.91	X	0.13	<u> </u>	0.9		9	62.19	(30)
Total area of e	elements	s, m²			124.8	6							(31)
Party wall					26	X	0	=	0	\neg [45	1170	(32)
Party ceiling					52.3						30	1569	(32b)
Internal wall **	*				101.8	1				Ī	9	916.2	9 (32c)
* for windows and ** include the area						lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	_
Fabric heat los	ss, W/K	= S (A x	U)				(26)(30) + (32) =				32.62	(33)
Heat capacity	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	13038.48	(34)
Thermal mass	parame	eter (TMI	⊃ = Cm -	: TFA) ir	n kJ/m²K	•		= (34)	÷ (4) =			220.17	(35)
For design assess 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	K						10.34	(36)
if details of therma		are not kr	nown (36) :	= 0.05 x (3	31)			(22)	(0.0)				_
Total fabric he		ما مرباء (-	d ma = = 41-1						(36) =	(DE) (E)		42.96	(37)
Ventilation hea	1		<u> </u>	<u> </u>	lı	1,.1	۸~	``	= 0.33 × (<u> </u>]	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	I	

(20) 40.24	1,000	45.00	44.05	44.00	42.00	42.00	42.40	44.07	44.00	45.04	45.40		(38)
(38)m= 16.21	16.02	15.82	14.85	14.66	13.68	13.68	13.49	14.07	14.66	15.04	15.43		(30)
Heat transfer (39)m= 59.17	58.98	58.78	57.81	57.62	56.65	56.65	56.45	57.04	= (37) + (37) 57.62	58.01	58.4		
(66)	1 00.00	1 000	01.01	01.102	00.00	00.00	00.10			Sum(39) ₁ .		57.77	(39)
Heat loss par	ameter (I	HLP), W	m²K			•		(40)m	= (39)m ÷	(4)	_		_
(40)m= 1	1	0.99	0.98	0.97	0.96	0.96	0.95	0.96	0.97	0.98	0.99		7(40)
Number of da	ıvs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	0.98	(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	ating ene	rgy requi	rement:								kWh/yea	ar:	
Assumed occ	upancy	N								1	96		(42)
if TFA > 13	.9, N = 1		[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.		90		(42)
if TFA £ 13 Annual avera	•	atar usar	na in litra	s nar da	v Vd av	erane –	(25 v NI)	+ 36		00	74		(43)
Reduce the annu	ial average	hot water	usage by	5% if the d	welling is	designed t			se target o		.74		(43)
not more that 12:	5 litres per	person pei	day (all w	ater use, h	not and co	ld)				_			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	able 1c x	(43) I						
(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		٦,,,,
Energy content of	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		968.86	(44)
(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		
	1		<u> </u>			<u> </u>	<u>I</u>		Γotal = Su	m(45) ₁₁₂ =	=	1270.32	(45)
If instantaneous	water heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)					_
(46)m= 19.76	17.28	17.83	15.54	14.92	12.87	11.93	13.69	13.85	16.14	17.62	19.13		(46)
Water storage Storage volur) includir	ng any so	olar or W	/WHRS	storage	within sa	me ves	sel		0		(47)
If community	` '	•	0 ,			Ü			301		0		(47)
Otherwise if n	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufac				or is kno	wn (kWh	n/day):					0		(48)
Temperature											0		(49)
Energy lost from b) If manufact		_	-		or io not		(48) x (49)	=		1	10		(50)
Hot water sto			-							0.	02		(51)
If community	_			`		,				<u> </u>	<u></u>		()
Volume factor										1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fr		_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		03		(54)
Enter (50) or							//EC\ /	EE) (44)	_	1.	03		(55)
Water storage							((56)m = (, , ,		1			(50)
(56)m= 32.01 If cylinder contain	28.92	d solar sto	30.98	32.01 m = (56)m	30.98 x [(50) – (32.01 H11)] <i>÷ (</i> 5	32.01 0) else (5	30.98	32.01 m where (30.98 H11) is fro	32.01 m Appendix	сH	(56)
												. 1 1	(E7\
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(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 +	- (46)m + (57)m +	(59)m + (61)m
(62)m= 186.98 165.12 174.14 157.12 154.71 139.3 134.79 146.52 145.82 162.88	````	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	I l	
(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	(63)
Output from water heater		1
(64)m= 186.98 165.12 174.14 157.12 154.71 139.3 134.79 146.52 145.82 162.88	170.95 182.83	
Output from water heat	<u> </u>	1921.16 (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= 88.01 78.24 83.74 77.25 77.28 71.33 70.66 74.56 73.49 80	81.85 86.63	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is		
. , . , . , . ,	irom community n	eating
5. Internal gains (see Table 5 and 5a):		
Metabolic gains (Table 5), Watts	1	1
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec	(00)
(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 97.97	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(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		•
(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)		
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)		
(71)m= -78.38 -78.38 -78.38 -78.38 -78.38 -78.38 -78.38 -78.38 -78.38 -78.38	-78.38 -78.38	(71)
Water heating gains (Table 5)		
(72)m= 118.3 116.43 112.56 107.29 103.88 99.06 94.97 100.21 102.08 107.53	113.68 116.44	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m	71)m + (72)m	
(73)m= 357.73 355.84 344.84 327.23 309.58 292.45 281.26 286.53 295.53 313.31	333.7 348.78	(73)
6. Solar gains:		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux from Table 6a and associated equations to convert to the applications are calculated using solar flux flux flux flux flux flux flux flux	able orientation.	
Orientation: Access Factor Area Flux g_	FF	Gains
	Γable 6c	(W)
Northeast 0.9x 0.77 x 9.01 x 11.28 x 0.63 x	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	×	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	X		0.63	x	0.7	=	138.84	(75)
Northeast _{0.9x}	0.77	x	9.0)1	x [2	8.07	x		0.63	×	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)
_													<u></u>		_
Solar gains in	watts, ca	alculated	d for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m= 31.07	63.24	113.94	187.12	251.53		8.16	250.85	199.		138.84	77.29	39.09	25.37		(83)
Total gains – i	nternal a	and sola	r (84)m =	- (73)m	+ (8	3)m	, watts		!						
(84)m= 388.8	419.08	458.77	514.35	561.11	56	0.61	532.12	486.	.51	434.36	390.6	372.79	374.15		(84)
7. Mean inter	rnal temr	oratura	(heating	easean	1										
Temperature			`		<i>'</i>	rea f	rom Tak	مام ۵	Th	1 (°C)				21	(85)
•	•	٠.			•			Jie J,		1 (0)				21	(00)
Utilisation fac					Ė	. 1		١ ٨.	ا ما	Con	Oct	Nov	Dec		
(86)m= Jan 0.99	0.99	Mar 0.98	Apr 0.94	May 0.82	_	Jun .62	Jul 0.46	0.5	-	Sep 0.8	Oct 0.96	0.99	1		(86)
(80)111= 0.99	0.99	0.90	0.94	0.02		.02	0.40	0.5	,2	0.0	0.90	0.99			(00)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)															
(87)m= 19.91	20.03	20.27	20.6	20.86	20).97	21	20.9	99	20.91	20.59	20.21	19.9		(87)
Temperature	during h	neating p	eriods i	n rest of	dwe	elling	from Ta	able 9), Th	n2 (°C)					
(88)m= 20.08	20.09	20.09	20.1	20.11	20).12	20.12	20.1	12	20.11	20.11	20.1	20.09		(88)
Utilisation fac	ctor for a	ains for	rest of d	wellina.	h2.r	n (se	e Table	9a)	-					•	
(89)m= 0.99		0.97		0.77	_	.55	0.37	0.4	3	0.73	0.94	0.99	0.99		(89)
Mean interna	l temper	atura in	the rect	of dwall	ina .	T2 (f	allow etc	ne 3	to 7	in Tahl	0.00)				
(90)m= 18.64	18.81	19.16	19.64	19.97	-	0.1	20.12	20.		20.04	19.63	19.07	18.62		(90)
(66)	1 .0.0	1	10.0	10.01								ng area ÷ (0.45	(91)
												·9 ··· · · (-,	0.43	(0.)
Mean interna		· `	1	1	Ť			- `-				1	i	1	(22)
(92)m= 19.21	19.36	19.66	20.07	20.37).49	20.51	20.5		20.43	20.06	19.58	19.2		(92)
Apply adjustr	1				_			·			•	T	T	1	(00)
(93)m= 19.21	19.36	19.66	20.07	20.37	20).49	20.51	20.5	51	20.43	20.06	19.58	19.2		(93)
8. Space hea	·											 >			
Set Ti to the the utilisation					ned	at ste	ep 11 of	Table	e 9b	o, so tha	t Ti,m=	(76)m an	d re-cald	culate	
Jan	Feb	Mar	Apr	May		Jun	Jul	Ι ,,		Sep	Oct	Nov	Dec		
Utilisation fac	l		<u> </u>	Iviay		Juli	Jui	Αι	ug	Sep	Oct	INOV	Dec		
(94)m= 0.99	0.99	0.97	0.92	0.79	Ιο	.58	0.41	0.4	7	0.75	0.94	0.98	0.99]	(94)
Useful gains,	<u> </u>		<u> </u>	l		.50	0.71			0.70	0.04	1 0.00	1 0.00		(- ')
(95)m= 385.39	413.3	445.27	471.67	441.11	32	4.74	220.37	229.	66	327.32	368.13	366.82	371.41		(95)
Monthly aver								L		027.02	550.15	1 000.02	1 57 1.71		(/
(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)
` ,		<u> </u>	<u> </u>	<u> </u>								<u> </u>	<u> </u>	1	

Heat lose rate for many internal temperature. I.m., W. [(20)m.y.[(02)m.y.(06)m.]										
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 882.32 853.01 773.55 645.92 499.58 333.94 221.66 232.12 361.26 545.24 724.19 875.67		(97)								
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m		` '								
(98)m= 369.71 295.49 244.24 125.45 43.5 0 0 0 0 131.77 257.3 375.17										
Total per year (kWh/year) = Sum(98) _{15,912} =	1842.63	(98)								
Space heating requirement in kWh/m²/year	31.12	(99)								
9b. Energy requirements – Community heating scheme										
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)								
Fraction of space heat from community system 1 – (301) =	1	(302)								
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.										
Fraction of heat from Community heat pump	1	(303a)								
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)								
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)								
Distribution loss factor (Table 12c) for community heating system	1.05	(306)								
Space heating	kWh/year	¬								
Annual space heating requirement	1842.63	╛								
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1934.76	(307a)								
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308								
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0	(309)								
Water heating Annual water heating requirement	1921.16	٦								
If DHW from community scheme: Water heat from Community heat pump (64) x (303a) x (305) x (306) =	2017.22	」 (310a)								
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] =	39.52	(313)								
Cooling System Energy Efficiency Ratio	0	(314)								
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	0	(315)								
Electricity for pumps and fans within dwelling (Table 4f):		⊣ −								
mechanical ventilation - balanced, extract or positive input from outside	125.98	(330a)								
warm air heating system fans	0	(330b)								
pump for solar water heating	0	(330g)								
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) =	125.98	(331)								
Energy for lighting (calculated in Appendix L)	283.72	(332)								
Electricity generated by PVs (Appendix M) (negative quantity)	-108.82	(333)								
Total delivered energy for all uses $(307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =$	4252.87	(338)								

Energy

kWh/year

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12b. CO2 Emissions – Community heating scheme

kg CO2/year

Emission factor Emissions

kg CO2/kWh

CO2 from other sources of space and water Efficiency of heat source 1 (%)	O \ ,	CHP) P using two fuels repeat (363) to (366) for the second fuel							
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (36	(7b) x 0.52	=	732.53	(367)				
Electrical energy for heat distribution	[(313) x	0.52	=	20.51	(372)				
Total CO2 associated with community syst	tems (363)(366) + (368	8)(372)	=	753.04	(373)				
CO2 associated with space heating (secon	ndary) (309) x	0	=	0	(374)				
CO2 associated with water from immersion	=	0	(375)						
Total CO2 associated with space and water	er heating (373) + (374) + (37	(373) + (374) + (375) =							
CO2 associated with electricity for pumps	and fans within dwelling (331)) x	0.52	=	65.38	(378)				
CO2 associated with electricity for lighting	(332))) x	0.52	=	147.25	(379)				
Energy saving/generation technologies (33 Item 1	33) to (334) as applicable	0.52 x 0.01 =		-56.48	(380)				
Total CO2, kg/year	um of (376)(382) =			909.2	(383)				
Dwelling CO2 Emission Rate (3	883) ÷ (4) =			15.35	(384)				
El rating (section 14)				88.31	(385)				

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Project 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)

29.79 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

14.27 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 Highest Average 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 - Heat pump

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	5.09m²	
Windows facing: South East	6.72m²	
Ventilation rate:	3.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

		l Isar I	Details:							
Assessor Name: Software Name:	sor Name: Neil Ingham Stroma Number: STRO ure Name: Stroma FSAP 2012 Software Version: Version									
Property Address: 00 - D Address:										
Overall dwelling dime	ensions:									
		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 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				0	x ′	10 =	0	(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 ho	our	
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$			[0		÷ (5) =	0	(8)	
Number of storeys in the	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otnerwise (continue tr	om (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 fo	r masoni	y constr	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	,	•	,,					0	(13)	
Percentage of window	s 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	3	(17)	
•	lity value, then $(18) = [(17) \div 20] + (18)$ if a pressurisation test has been do				is haina u	sad		0.15	(18)	
Number of sides sheltere		ne or a de	gree an pe	THEADIIITY	is being u	seu		0	(19)	
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			1	(20)	
Infiltration rate incorporate	ting shelter factor		(21) = (18) x (20) =				0.15	(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]		
		•	•		•	•	•	•		

Adjusted infiltr	ation rate	e (allowi	ng for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effec		•	rate for t	he appli	cable ca	se							_
If mechanica				(. (22)	\			0.5	(23a)
If exhaust air h) = (23a)			0.5	(23b)
If balanced with		-	-	_								75.65	(23c)
a) If balance								^ `	<u> </u>		1 ` ´	÷ 100]	(5.4.)
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24a)
b) If balance			i	ı	1	covery (N	ЛV) (24b	í `	r Ó			I	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)n	nouse extin < 0.5 ×			•	•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n	ventilatio n = 1, the			•					0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change r	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)	-	-			
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)
3. Heat losse	s and he	at loss p	paramet	er:									
ELEMENT	Gross area (_	Openin m	=	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-l		
Doors					2.61	X	1.4	= [3.654				(26)
Windows Type) 1				5.09	x1.	/[1/(1.4)+	0.04] =	6.75				(27)
Windows Type	€ 2				6.72	x1		0.041	0.04				(27)
Floor					0.72		/[1/(1.4)+	0.04] =	8.91				(27)
					64.41	=	0.13	0.04] =	8.37330	1	110	7085.10	_ ` ′
Walls Type1	45.34	4	14.4	2		x		—,		 1 	110	7085.10	1 (28)
Walls Type1 Walls Type2	45.34	_	14.4	2	64.41	x	0.13	=	8.37330	1 1		- -	1 (28)
• •		9		2	30.92	x	0.13	=	8.37330 5.57	1	60	1855.2	(28)
Walls Type2	4.69)	0	2	64.41 30.92 4.69 6.8	x x x x x	0.13 0.18 0.18	= = =	8.37330 5.57 0.84		60	1855.2	1 (28) (29) (29)
Walls Type2 Roof Total area of e	4.69)	0	2	64.41 30.92 4.69 6.8	x 2 x x x x 4	0.13 0.18 0.18 0.13	= = =	8.37330 5.57 0.84 0.88		60 60 9	1855.2 281.4 61.2	1 (28) (29) (29) (30) (31)
Walls Type2 Roof Total area of e	4.69)	0	2	64.41 30.92 4.69 6.8 121.2 47.16	x x x x 4 x	0.13 0.18 0.18	= = = = = = = = = = = = = = = = = = = =	8.37330 5.57 0.84		60 60 9 45	1855.2 281.4 61.2	1 (28) (29) (29) (30) (31) (32)
Walls Type2 Roof Total area of e Party wall Party ceiling	4.69 6.8 elements,)	0	2	64.41 30.92 4.69 6.8 121.2 47.16	x x x x 4 x	0.13 0.18 0.18 0.13	= = = = = = = = = = = = = = = = = = = =	8.37330 5.57 0.84 0.88		60 60 9 45 30	1855.2 281.4 61.2 2122.2 1728.3	1 (28) (29) (29) (30) (31) (32) (32b)
Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and	4.69 6.8 elements,	, m²	0 0	indow U-va	64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05	x x x x 4 x x 5 x	0.13 0.18 0.18 0.13		8.37330 5.57 0.84 0.88		60 60 9 45 30 9	1855.2 281.4 61.2 2122.2 1728.3 819.45	(29) (29) (30) (31) (32) (32b)
Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area	4.69 6.8 elements,	, m²	0 0	indow U-va	64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05	x x x x 4 x x ingle dated using	0.13 0.18 0.18 0.13	= = = =	8.37330 5.57 0.84 0.88		60 60 9 45 30 9	1855.2 281.4 61.2 2122.2 1728.3 819.45	(29) (29) (30) (31) (32) (32b) (32c)
Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and	4.69 6.8 elements, d roof windo as on both s sss, W/K =	ows, use e sides of in	0 0	indow U-va	64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calcul	x x x x 4 x x ingle dated using	0.13 0.18 0.18 0.13 0.13	= = = = /[(1/U-value) + (32) =	8.37330 5.57 0.84 0.88	ns given ir	60 60 9 45 30 9	1855.2 281.4 61.2 2122.2 1728.3 819.45 9 3.2	(29) (29) (29) (30) (31) (32) (32b) (32c)
Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area Fabric heat los Heat capacity	4.69 6.8 elements, d roof windo as on both s ss, W/K = Cm = S(A	ows, use e sides of in = S (A x A x k)	0 0 offective winternal wall	indow U-va	64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calculatitions	x x x x x x x x x x x x x x x x x x x	0.13 0.18 0.18 0.13 0.13	= = = = 	8.37330 5.57 0.84 0.88	ns given ir	60 60 9 45 30 9	1855.2 281.4 61.2 2122.2 1728.3 819.45 3.2 34.98 13952.85	(32b) (32c) (33) (33) (34)
Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area Fabric heat los	4.69 6.8 elements, froof windo as on both s ss, W/K = Cm = S(A	ows, use e sides of in = S (A x A x k) ter (TMF	o o o effective winternal walk U) of tails of the	indow U-va ls and par	64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calculatitions	x x x x x x x x x x x x x x x x x x x	0.13 0.18 0.18 0.13 0.19 0.10 0.10 0.10 0.10 0.10 0.10 0.10	= = = = = /[(1/U-value) + (32) = ((28). = (34)	8.37330 5.57 0.84 0.88 0 0 (30) + (32 ÷ (4) =	as given ir 2) + (32a)	60 9 45 30 9 n paragraph	1855.2 281.4 61.2 2122.2 1728.3 819.45 9 3.2	(29) (29) (29) (30) (31) (32) (32b) (32c)
Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	4.69 6.8 elements, froof windo as on both s ss, W/K = Cm = S(A s paramet sments whe had of a deta	ows, use e sides of in = S (A x A x k) ter (TMF ere the de vailed calcu	o o o o o o o o o o o o o o o o o o o	indow U-vals and par TFA) ir	64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calcul titions	x x x x x x x x x x x x x x x x x x x	0.13 0.18 0.18 0.13 0.19 0.10 0.10 0.10 0.10 0.10 0.10 0.10	= = = = = /[(1/U-value) + (32) = ((28). = (34)	8.37330 5.57 0.84 0.88 0 0 (30) + (32 ÷ (4) =	as given ir 2) + (32a)	60 9 45 30 9 n paragraph	1855.2 281.4 61.2 2122.2 1728.3 819.45 3.2 34.98 13952.85	(32b) (32c) (33) (33) (34)
Walls Type2 Roof Total area of e Party wall Party ceiling Internal wall ** * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste	4.69 6.8 elements, froof windo as on both s sss, W/K = Cm = S(A sparamet sments whe ad of a deta es : S (L)	ows, use esides of intermediate (TMF) ere the detailed calcuracy (XY) calcuracy (XYY) calcuracy (XYY) calcuracy (XYYY) calcuracy (XYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYYY	o o o o o o o o o o o o o o o o o o o	TFA) ir construct	64.41 30.92 4.69 6.8 121.2 47.16 57.61 91.05 alue calculatitions	x x x x x x x x x x x x x x x x x x x	0.13 0.18 0.18 0.13 0.19 0.10 0.10 0.10 0.10 0.10 0.10 0.10	= = = = = /[(1/U-value) + (32) = ((28). = (34)	8.37330 5.57 0.84 0.88 0 0 (30) + (32 ÷ (4) =	as given ir 2) + (32a)	60 9 45 30 9 n paragraph	1855.2 281.4 61.2 2122.2 1728.3 819.45 3.2 34.98 13952.85 216.63	(29) (29) (30) (31) (32) (32b) (32c) (33) (34) (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=	17.63	17.42	17.21	16.15	15.94	14.88	14.88	14.67	15.31	15.94	16.36	16.79		(38)
Heat tr	ansfer c	coefficier	nt, W/K	-	-	-	-	-	(39)m	= (37) + (3	38)m	-		
(39)m=	64.29	64.08	63.87	62.82	62.6	61.55	61.55	61.34	61.97	62.6	63.03	63.45		
Heat Id	oss para	meter (H	HLP), W/	m²K				-		Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	62.76	(39)
(40)m=	1	0.99	0.99	0.98	0.97	0.96	0.96	0.95	0.96	0.97	0.98	0.99		
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	0.97	(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)
Assum if TF if TF Annua	ned occu A > 13.9 A £ 13.9 I averag	ipancy, I 9, N = 1 9, N = 1 e hot wa	rgy requi N + 1.76 x ater usag hot water	[1 - exp	s per da	ay Vd,av	erage =	(25 x N)	+ 36		.9)	.1 15	ear:	(42)
not more	Jan	litres per p	person per Mar	day (all w	May	hot and co	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(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		
Energy (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1009.81	(44)
(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	rater heatii	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = 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		مالد ما دماله		-1 \	/\// IDC								\
If comr Otherw Water	munity h vise if no storage	eating a stored loss:	includin	ink in dw er (this ir	velling, e ncludes i	nter 110 nstantar	litres in	(47)			47)	0		(47)
•			eclared l		JI 15 KI10	wii (Kvvi	i/uay).					0		(48)
•			m Table		201			(48) x (49)	\ _			0		(49)
b) If m	nanufact	urer's de	storage eclared of factor fr	cylinder l	oss fact		known:	(40) X (49 ₁) =			10		(50)
		_	ee secti		~ (NVV	, C/UO	· <i>y </i>				<u> </u>	02		(51)
	e factor	_		-							1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b								.6		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	03		(55)
	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				

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= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(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 thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 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 \times (45)m + (46)m + (57)m + (59)m + (60)m	1)m
(62)m= 192.55 169.99 179.17 161.5 158.92 142.93 138.15 150.37 149.73 167.43 175.91 188.22	(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= 192.55 169.99 179.17 161.5 158.92 142.93 138.15 150.37 149.73 167.43 175.91 188.22	
Output from water heater (annual) ₁₁₂ 1974.86	(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= 89.86 79.86 85.42 78.71 78.68 72.53 71.78 75.84 74.79 81.51 83.5 88.42	(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= 105.16 105.16 105.16 105.16 105.16 105.16 105.16 105.16 105.16 105.16 105.16 105.16 105.16	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(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 (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 183.92 185.83 181.02 170.78 157.85 145.71 137.59 135.68 140.49 150.73 163.65 175.8	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 33.52 33.52 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 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -84.13 -84.13 -84.13 -84.13 -84.13 -84.13 -84.13 -84.13 -84.13 -84.13 -84.13 -84.13 -84.13 -84.13	(71)
Water heating gains (Table 5)	
(72)m= 120.79 118.84 114.81 109.32 105.75 100.74 96.47 101.94 103.88 109.56 115.97 118.85	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 375.95 374.05 362.43 343.77 324.98 306.75 294.84 300.26 309.78 328.63 350.27 366.36	(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 Gains Table 6d m² Table 6a Table 6b Table 6c (W)	

Northeast _{0.9x}	0.77	×	5.09		хГ	11.28] _x	0.63	×	0.7		17.55	(75)
Northeast 0.9x	0.77	d ×	5.09		^ L	22.97]	0.63	^ x	0.7	_	35.73	(75)
Northeast _{0.9x}	0.77	^ x	5.09		^ L	41.38]	0.63	= x	0.7	_	64.37	(75)
Northeast _{0.9x}	0.77	d ×	5.09		~ L х [67.96]	0.63	= x	0.7	= =	105.71	(75)
Northeast _{0.9x}	0.77	= x	5.09		x [91.35] x	0.63	×	0.7	= =	142.1	(75)
Northeast _{0.9x}	0.77	×	5.09		x [97.38] x	0.63	×	0.7	= =	151.49	(75)
Northeast 0.9x	0.77	ا ×	5.09		x [91.1]]	0.63	×	0.7	= =	141.71	(75)
Northeast _{0.9x}	0.77	ا ×	5.09		x [72.63]]	0.63	x	0.7	= =	112.98	(75)
Northeast _{0.9x}	0.77	≓ ×	5.09		x	50.42] X	0.63	×	0.7	= =	78.43	(75)
Northeast 0.9x	0.77	×	5.09		x [28.07] x	0.63	X	0.7		43.66	(75)
Northeast _{0.9x}	0.77	×	5.09		x [14.2] x	0.63	x	0.7	=	22.08	(75)
Northeast _{0.9x}	0.77	×	5.09		x	9.21	X	0.63	×	0.7	= =	14.33	(75)
Southeast _{0.9x}	0.77	×	6.72		x	36.79	X	0.63	×	0.7	-	75.56	(77)
Southeast 0.9x	0.77	×	6.72		x [62.67	j×	0.63	x	0.7		128.71	(77)
Southeast 0.9x	0.77	×	6.72		x	85.75	X	0.63	x	0.7	=	176.11	(77)
Southeast 0.9x	0.77	×	6.72		x	106.25	x	0.63	x	0.7		218.21	(77)
Southeast 0.9x	0.77	x	6.72		x	119.01	X	0.63	X	0.7	=	244.41	(77)
Southeast 0.9x	0.77	X	6.72		x	118.15	X	0.63	X	0.7	=	242.65	(77)
Southeast 0.9x	0.77	X	6.72		x	113.91	X	0.63	x	0.7	=	233.94	(77)
Southeast 0.9x	0.77	X	6.72		x	104.39	X	0.63	X	0.7	=	214.39	(77)
Southeast 0.9x	0.77	X	6.72		x	92.85	X	0.63	X	0.7	=	190.69	(77)
Southeast 0.9x	0.77	X	6.72		x	69.27	X	0.63	X	0.7	=	142.26	(77)
Southeast 0.9x	0.77	X	6.72		x	44.07	X	0.63	X	0.7	=	90.51	(77)
Southeast 0.9x	0.77	X	6.72		x	31.49	X	0.63	X	0.7	=	64.67	(77)
Solar gains in w							ì -	n = Sum(74)m	T ·		T	1	(02)
(83)m= 93.12 Total gains – in		40.48 solar		386.51		4.14 375.65	327	269.12	185.9	2 112.59	79]	(83)
		02.91	` 	711.49	·	0.89 670.49	627	.63 578.91	514.5	5 462.87	445.36	1	(84)
` '					_	0.03 070.43	021	.00 070.01	014.0	9 402.07	140.00	J	(0.)
7. Mean intern						una fuana Tal	hia O	Th4 (9C)					7(05)
Temperature of Utilisation factors	ŭ	٠.			•		bie 9	, IIII (C)				21	(85)
Jan	<u>_</u>	Mar	Apr	May	r	lun Jul	ΤΔ	ug Sep	Oct	Nov	Dec	1	
(86)m= 0.99		0.96	0.89	0.74	├	.55 0.4	0.4		0.92		0.99	1	(86)
			ļ.					İ	ļ			J	, ,
Mean internal (87)m= 19.98		0.41	20.71	20.91		0.98 21	/ IN 1 2		20.7	20.29	19.95	1	(87)
			ļ					!		20.20	10.00	J	(- /
Temperature of (88)m= 20.08		ting pe	20.1	20.11		0.12 20.12	20.		20.11	20.1	20.1	1	(88)
			ļ					12 20.12	20.1	20.1	20.1	J	(00)
Utilisation fact							–	00 000	0.00	0.00	0.00	1	(00)
(89)m= 0.99		0.95	0.86	0.69		.48 0.32	0.3		0.89	0.98	0.99	J	(89)
Mean internal	temperatu	re in t	he rest of	f dwelli	ing ⁻	T2 (follow ste	eps 3	to 7 in Tab	le 9c)				

(90)m= 18.73 18.98 19.35 19.78 20.02 20.11 20.12	20.12 20.08	19.77	19.19	18.69		(90)
(90)1112 10.73 10.90 19.33 19.70 20.02 20.11 20.12	ļ	fLA = Living			0.63	(91)
Managintage of tages and the Managing (fact the sub-plants about the colling). (I.A. T.A.			·	<i>'</i>	0.00	(0.7)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (92)m = 19.52 19.72 20.02 20.37 20.58 20.66 20.67$	$\frac{(1 - 1LA) \times 12}{20.67}$ 20.63	20.35	19.88	19.49		(92)
Apply adjustment to the mean internal temperature from Table 4		1	.0.00			(-)
	20.67 20.63	20.35	19.88	19.49		(93)
8. Space heating requirement	•					
Set Ti to the mean internal temperature obtained at step 11 of T	able 9b, so tha	at Ti,m=(7	76)m and	d re-calc	ulate	
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:	Aug Ocp	1 001	1407	DCC		
(94)m= 0.99 0.97 0.94 0.87 0.72 0.52 0.37	0.42 0.66	0.9	0.97	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m					1	
(95)m= 462.89 524.62 569.41 578.57 511.99 366.41 249.79	260.5 383.22	462.76	450.79	440.67		(95)
Monthly average external temperature from Table 8	40.4	100	7.4	4.0	1	(96)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 Heat loss rate for mean internal temperature, Lm , W =[(39)m x	16.4 14.1 [(93)m_ (96)m	10.6	7.1	4.2		(90)
	262.12 404.72	610.7	805.69	969.88		(97)
Space heating requirement for each month, kWh/month = 0.024	x [(97)m – (95	5)m] x (41)m			
(98)m= 383.44 285.75 218.94 102.18 32.77 0 0	0 0	110.07	255.53	393.73		
	Total per year	(kWh/year)	= Sum(98	8) _{15,912} =	1782.41	(98)
Space heating requirement in kWh/m²/year					27.67	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating. Fraction of space heat from secondary/supplementary heating (T			unity sch	neme.	0	(301)
	able 11) o 1111	10110				
Fraction of space heat from community system 1 – (301) =						= ' '
Fraction of space heat from community system 1 – (301) = The community scheme may obtain heat from several sources. The procedure all	lows for CHP and	un to four o	other heat	sources: ti	1	(302)
Fraction of space heat from community system 1 – (301) = The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. Se		up to four o	other heat	sources; ti	1	= ' '
The community scheme may obtain heat from several sources. The procedure al.		up to four o	other heat	sources; ti	1	= ' '
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See			02) x (303		1 he latter	(302)
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. Se Fraction of heat from Community heat pump	ee Appendix C.	(30			1 he latter	(302) (303a)
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. Se Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump	ee Appendix C. ity heating sys	(30			1 he latter 1	(302) (303a) (304a)
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. So Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community	ee Appendix C. ity heating sys	(30			1 he latter 1 1	(302) (303a) (304a) (305) (306)
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community heating systems	ee Appendix C. ity heating sys	(30			1	(302) (303a) (304a) (305) (306)
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system Space heating	ee Appendix C. ity heating sys	(30	02) x (303;	a) =	1 1 1 1 1.05 kWh/yea	(302) (303a) (304a) (305) (306)
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system space heating Annual space heating requirement	ee Appendix C. ity heating sys	(30 stem 04a) x (305	02) x (303a	a) =	1 1 1 1 1.05 kWh/yea 1782.41	(302) (303a) (304a) (305) (306)
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community bistribution loss factor (Table 12c) for community heating system space heating Annual space heating requirement Space heat from Community heat pump	ee Appendix C. ity heating sys (98) x (3	(30 stem 04a) x (305	02) x (303a 0) x (306) = E)	a) =	1 1 1 1 1.05 kWh/yea 1782.41 1871.53	(302) (303a) (304a) (305) (306) (307a)
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community heating systems Distribution loss factor (Table 12c) for community heating systems Space heating Annual space heating requirement Space heat from Community heat pump Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary systems) Water heating	ee Appendix C. ity heating sys (98) x (3	(30 stem 04a) x (305 Appendix	02) x (303a 0) x (306) = E)	a) =	1 1 1 1 1.05 kWh/yea 1782.41 1871.53 0	(302) (303a) (304a) (305) (306) (307a) (308
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community heating system. Distribution loss factor (Table 12c) for community heating system. Space heating Annual space heating requirement Space heat from Community heat pump Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system. Water heating Annual water heating requirement	ee Appendix C. ity heating sys (98) x (3	(30 stem 04a) x (305 Appendix	02) x (303a 0) x (306) = E)	a) =	1 1 1 1 1.05 kWh/yea 1782.41 1871.53	(302) (303a) (304a) (305) (306) (307a) (308
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community heating systems Distribution loss factor (Table 12c) for community heating systems Space heating Annual space heating requirement Space heat from Community heat pump Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary systems) Water heating	ee Appendix C. (98) x (3) Table 4a or A m (98) x (3)	(30 stem 04a) x (305 Appendix	02) x (303; 0) x (306) = E) (308) =	a) =	1 1 1 1 1.05 kWh/yea 1782.41 1871.53 0	(302) (303a) (304a) (305) (306) (307a) (308
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community heating system. Distribution loss factor (Table 12c) for community heating system. Space heating Annual space heating requirement. Space heat from Community heat pump Efficiency of secondary/supplementary heating system in % (from Space heating requirement from secondary/supplementary system. Water heating Annual water heating requirement. If DHW from community scheme:	ee Appendix C. (98) x (3) Table 4a or A m (98) x (3)	(30 stem 04a) x (305 Appendix 01) x 100 ÷	(308) = (308) = (308) =	a) =	1 1 1 1 1 1.05 kWh/yea 1782.41 1871.53 0 0	(302) (303a) (304a) (305) (306) (307a) (308 (309)

Cooling System Energy Efficiency Ratio)				0	(314)
Space cooling (if there is a fixed cooling	g system, if not enter 0)	$=(107) \div (314)$	=		0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra		n outside		Г	137.02	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/yea	r	=(330a) + (330	b) + (330g) =		137.02	(331)
Energy for lighting (calculated in Appen	dix L)				294.9	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)				-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (33	32)(237b) =		4268.24	(338)
12b. CO2 Emissions - Community hea	ting scheme					
		Energy kWh/year	Emission fac kg CO2/kWh		nissions CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)	O (,	ng two fuels repeat (363) to	(366) for the secon	d fuel	280	(367a)
•	If there is CHP usin	ng two fuels repeat (363) to +(310b)] x 100 ÷ (367b) x	(366) for the secon	d fuel =	280 731.26	(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP usin					_
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP usir	+(310b)] x 100 ÷ (367b) x	0.52	=	731.26	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	If there is CHP usin [(307b)-	+(310b)] x 100 ÷ (367b) x [(313) x	0.52	=	731.26	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	If there is CHP usin [(307b)- systems condary)	+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x	0.52	=	731.26 20.48 751.73	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so	If there is CHP usin [(307b)- systems condary) sion heater or instantant	+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x	0.52 0.52	=	731.26 20.48 751.73	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (see	If there is CHP usin [(307b)- systems condary) sion heater or instantant vater heating	+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) =	0.52 0.52	=	731.26 20.48 751.73 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (see CO2 associated with water from immer	If there is CHP usin [(307b)- systems condary) sion heater or instantant vater heating ps and fans within dwell	+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) =	0.52 0.52 2) 0 0.22	= = = = = = = = = = = = = = = = = = = =	731.26 20.48 751.73 0 0 751.73	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and we CO2 associated with electricity for pum	If there is CHP usin [(307b)- systems condary) sion heater or instantant vater heating ps and fans within dwelling	+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) = ling (331)) x (332))) x	0.52 0.52 0 0 0.22	= = = = = = = = = = = = = = = = = = = =	731.26 20.48 751.73 0 0 751.73 71.11	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and work CO2 associated with electricity for pum CO2 associated with electricity for light Energy saving/generation technologies	If there is CHP usin [(307b)- systems condary) sion heater or instantant vater heating ps and fans within dwelling	+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 (309) x eous heater (312) x (373) + (374) + (375) = ling (331)) x (332))) x	0.52 0.52 0 0 0.22 0.52 0.52	= = = = = = = = = = = = = = = = = = = =	731.26 20.48 751.73 0 0 751.73 71.11 153.05	(367) (372) (373) (374) (375) (376) (378) (379)

El rating (section 14)

(385)

88.74

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:48:35*

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)

29.98 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

14.24 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 - Heat pump

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:		
Based on: Overshading:	Average or unknown	
	Average or unknown 9.14m ²	
Overshading:	<u> </u>	
Overshading: Windows facing: South East	9.14m²	
Overshading: Windows facing: South East	9.14m²	
Overshading: Windows facing: South East Ventilation rate:	9.14m²	
Overshading: Windows facing: South East Ventilation rate: 10 Key features	9.14m ² 3.00	

Photovoltaic array

		Heor	Details:						
A No	Not be also as	USEI		. NI	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Contware Hame.	01101110110111 2012	Property	Address:		31011.		7 01010	7.0.0.00	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		Are	ea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 la) . (4 a) . (4 a) . (4 a) .	(4.5)		(1a) x	2	65	(2a) =	163.98	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	·(1n)	61.88	(4)) (O.) (O.)	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	163.98	(5)
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	r
Number of altimospess	heating hea	ating		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				L	0		10 =	0	(7a)
Number of passive vents				L	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	0		÷ (5) =	0	(8)
•	peen carried out or is intended,			ontinue fr			. (0) –	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		'	*	uction			0	(11)
deducting areas of openii		riding to the grea	ater wan area	i (aitei					
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								0	(13)
ŭ	s and doors draught strip	ped						0	(14)
Window infiltration			0.25 - [0.2	. ,	_	. (45)		0	(15)
Infiltration rate	250		(8) + (10) -		, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)
•	es if a pressurisation test has be				is beina u	sed		0.15	(18)
Number of sides sheltere			. g	,				0	(19)
Shelter factor			(20) = 1 - [0.075 x (1	9)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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		ı	J	

Adjusted infiltr	ation rat	te (allowi	ing for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19 Calculate effe	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanic		•	ial e ioi l	пе аррп	cable ca	3E						0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	h heat reco	overy: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				75.65	(23
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24
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		(24
c) If whole h if (22b)r		tract ver × (23b), t		•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)				·	
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)
3. Heat losse	s and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²-l		
Doors					2.61	x	1.4	=	3.654				(26
Vindows					9.14	x1	/[1/(1.4)+	0.04] =	12.12				(27
Floor					61.88	3 x	0.13	= i	8.0444		110	6806.8	(28
Walls Type1	21.9	92	11.7	5	10.17	7 X	0.18	=	1.83		60	610.2	(29
Walls Type2	27.9	99	0		27.99) x	0.15	=	4.34		60	1679.4	(29
Roof	24.9	98	0		24.98	3 x	0.13	=	3.25		9	224.82	(30
Total area of e	elements	s, m²			136.7	7							— (31
Party wall					42.78	3 x	0	=	0	\neg [45	1925.1	(32
Party ceiling					36.89	9					30	1106.7	(32
Internal wall **	:				120.6	8				Ī	9	1086.12	2 (32
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	1 3.2	_
abric heat los	ss, W/K	= S (A x	U)				(26)(30) + (32) =				33.23	(33
Heat capacity	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	13439.14	(34
Thermal mass	parame	eter (TMF	= Cm =	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			217.18	(35
For design asses can be used inste				construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	,	,		• .	•	<						11.41	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	31)			(22) -	(26)				-
Total fabric he		oloulete -	l manthi	,					(36) =	(2E) (E)	\	44.64	(37
entilation hea		i e	·		1,	11	^	- ` 	= 0.33 × (1	<u> </u>	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	i	

			1	ı	1								(0.0)
(38)m= 16.94		16.53	15.52	15.31	14.3	14.3	14.1	14.71	15.31	15.72	16.13		(38)
Heat transfer		 						· · · ·	= (37) + (37)				
(39)m= 61.58	61.37	61.17	60.16	59.95	58.94	58.94	58.74	59.35	59.95	60.36	60.77	CO 44	(39)
Heat loss pa	rameter (I	HLP), W	m²K						= (39)m ÷	Sum(39) ₁ .	12 /12=	60.11	(39)
(40)m= 1	0.99	0.99	0.97	0.97	0.95	0.95	0.95	0.96	0.97	0.98	0.98		_
Number of da	avs in mo	nth (Tab	le 1a)					/	Average =	Sum(40) ₁	12 /12=	0.97	(40)
Jan	<u> </u>	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 oc	cupancy	NI									20		(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	•	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		82	2.51		(43)
Reduce the ann	ual average	hot water	usage by	5% if the a	lwelling is	designed			se target o				` ,
not more that 12	· ·	· ·				<u> </u>							
Jan Hot water usage		Mar r day for ea	Apr	May $\sqrt{dm-fa}$	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	<u> </u>	· ·	1		1	1		00.00	04.40	07.40	00.77		
(44)m= 90.77	87.46	84.16	80.86	77.56	74.26	74.26	77.56	80.86	84.16	87.46	90.77	000.46	(44)
Energy content	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	<u> </u>	990.16	(44)
(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 heati	ina at point	of use (no	o hot water	r storage).	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1298.26	(45)
(46)m= 20.19		18.22	15.89	15.24	13.15	12.19	13.99	14.15	16.5	18.01	19.55		(46)
Water storag	1	10.22	13.03	13.24	13.13	12.19	13.99	14.10	10.5	10.01	19.55		(10)
Storage volu	me (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	/elling, e	nter 110	litres in	(47)				_		
Otherwise if		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storag a) If manufa		oclarod I	oss fact	or ie kna	wn (k\//k	2/d2v/).							(40)
Temperature				JI IS KIIO	wii (Kvvi	i/uay).					0		(48) (49)
Energy lost f				aar			(48) x (49)	١ _			0		
b) If manufa		_	-		or is not		(40) X (40)	_		1	10		(50)
Hot water sto			-							0.	02		(51)
If community	•		on 4.3										
Volume factor Temperature			2h							-	.03		(52)
•							(47) (54)	· · · (50) · · · (1	50)		.6		(53)
Energy lost f Enter (50) o		_	, KVVII/ye	ear			(47) x (51)) X (52) X (53) =		03		(54) (55)
Water storag			for each	month			((56)m = (55) × (41)r	m	'	.03		(00)
(56)m= 32.01		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder conta												кH	(00)
(57)m= 32.01		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m	
(modified by factor from Table H5 if there is solar water heating and a cylinder the	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 × (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 = $0.85 \times (45)$	5)m + (46)m + (57)m + (59)m + (61)m
	165.25 173.53 185.63 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar or	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	g/
(63)m= 0 0 0 0 0 0 0 0 0	0 0 0 (63)
Output from water heater	
	165.25 173.53 185.63
	er heater (annual) ₁₁₂ 1949.1 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 × (45)m + (61)m] + 0.8 x [(, , ,
	80.79 82.71 87.56 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water	
	er is nom community nearing
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	Orl No Book
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct Nov Dec
	101.71 101.71 101.71 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
	13.88 16.19 17.26 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table	
(68)m= 177.66 179.51 174.86 164.97 152.49 140.75 132.91 131.07 135.71	145.6 158.09 169.82 (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 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0	0 0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -81.37 -8	-81.37 -81.37 (71)
Water heating gains (Table 5)	
(72)m= 119.59 117.69 113.73 108.35 104.85 99.93 95.75 101.11 103.01 1	108.58 114.87 117.69 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m	D)m + (71)m + (72)m
(73)m= 367.57 365.63 354.24 336.02 317.72 300 288.44 293.83 303.17 3	321.58 342.67 358.3 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the a	applicable orientation.
Orientation: Access Factor Area Flux g_	FF Gains
Table 6d m ² Table 6a Table 6b	Table 6c (W)
Southeast 0.9x 0.77 x 9.14 x 36.79 x 0.63	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.	14	x	8	5.75	X		0.63	x	0.7	=	239.53	(77)
Southeast _{0.9x}	0.77	X	9.	14	x	10	06.25	X		0.63	x	0.7	=	296.79	(77)
Southeast _{0.9x}	0.77	X	9.	14	x	11	19.01	X		0.63	x	0.7	=	332.43	(77)
Southeast _{0.9x}	0.77	X	9.	14	x	11	18.15	X		0.63	x	0.7	=	330.03	(77)
Southeast _{0.9x}	0.77	X	9.	14	x	11	13.91	X		0.63	x	0.7	=	318.18	(77)
Southeast _{0.9x}	0.77	X	9.	14	x	10	04.39	X		0.63	x	0.7	=	291.59	(77)
Southeast 0.9x	0.77	X	9.	14	x	9:	2.85	X		0.63	x	0.7	=	259.36	(77)
Southeast _{0.9x}	0.77	X	9.	14	x	6	9.27	X		0.63	x	0.7	=	193.49	(77)
Southeast _{0.9x}	0.77	X	9.	14	x	4	4.07	X		0.63	x	0.7	=	123.1	(77)
Southeast 0.9x	0.77	X	9.	14	x	3	1.49	X		0.63	x	0.7	=	87.96	(77)
Solar gains in	watts, ca	alculated	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	1	0.03	318.18	291.	.59	259.36	193.4	9 123.1	87.96		(83)
Total gains – i	nternal a	and sola	r (84)m =	= (73)m ·	+ (8	3)m ,	watts	•	-			<u>. </u>		•	
(84)m= 470.34	540.69	593.77	632.81	650.15	630	0.03	606.63	585.	.43	562.53	515.0	6 465.77	446.25	1	(84)
7. Mean inter	nal temr	perature	(heating	season)				•					•	
Temperature			`		<i>'</i>	rea f	rom Tal	ole 9.	. Th′	1 (°C)				21	(85)
Utilisation fac	_				•			,	,	. (•)					(22)
Jan	Feb	Mar	Apr	May	<u> </u>	un	Jul	I Ai	ug	Sep	Oc	Nov	Dec	1	
(86)m= 0.99	0.98	0.95	0.89	0.77	 	58	0.42	0.4	-	0.68	0.91	0.98	0.99	1	(86)
` '				L T4 /5	مالمنا				ا ا	. 0.0\				J	
Mean interna (87)m= 20.02	20.2	20.44	20.71	20.9		.98	21	21 21	Т	20.96	20.72	20.33	19.99	1	(87)
(87)m= 20.02	20.2	20.44	20.71	20.9	20	.90	Z1		<u>' </u>	20.90	20.77	20.33	19.99]	(07)
Temperature			I		Т	Ť							1	1	(00)
(88)m= 20.09	20.09	20.09	20.11	20.11	20	.12	20.12	20.	13	20.12	20.1	20.1	20.1]	(88)
Utilisation fac		ains for	rest of d	welling,	h2,n	n (se	e Table	9a)					_	-	
(89)m= 0.99	0.97	0.94	0.86	0.72	0.	51	0.34	0.3	37	0.61	0.88	0.97	0.99		(89)
Mean interna	l temper	ature in	the rest	of dwelli	ing 1	Γ2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c)				
(90)m= 18.79	19.05	19.39	19.78	20.01	20	.11	20.12	20.	12	20.08	19.8	19.25	18.75]	(90)
			l							f	LA = Li	∕ing area ÷ ((4) =	0.56	(91)
Mean interna	Ltompor	oturo (fo	r tho wh	olo dwo	lling	\ _ fl	Λ ν Τ1	. /1	fl	۸) ی T2					
(92)m= 19.47	19.69	19.98	20.3	20.51		0.6	20.61	20.6		20.57	20.3	19.85	19.44	1	(92)
Apply adjustr			l					<u> </u>					10.11	j	(- /
(93)m= 19.47	19.69	19.98	20.3	20.51	1	0.6	20.61	20.6		20.57	20.3		19.44	1	(93)
8. Space hea			L									10100			
Set Ti to the				re obtair	ned a	at ste	ep 11 of	Table	e 9b	o, so tha	t Ti.m	=(76)m ar	nd re-cal	culate	
the utilisation							γ · · · σ·		0.0.0	, 00	,	(1 0) a.		74	
Jan	Feb	Mar	Apr	May	J	un	Jul	Αι	ug	Sep	Ос	Nov	Dec]	
Utilisation fac	tor for g	ains, hm	1:											_	
(94)m= 0.98	0.97	0.94	0.87	0.74	0.	55	0.39	0.4	12	0.65	0.88	0.97	0.99		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m										-	
(95)m= 462.89	524.04	557.31	549.73	480.93	345	5.68	235.37	245.	.79	365.54	455.5	2 451.06	440.59		(95)
Monthly aver	age exte	rnal tem	perature	from T	able	8								-	
(96)m= 4.3	4.9	6.5	8.9	11.7	14	1.6	16.6	16.	.4	14.1	10.6	7.1	4.2]	(96)

	(00)					
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(97)m= $934.38 \ 907.76 \ 824.41 \ 685.71 \ 527.95 \ 353.47 \ 236.43 \ 24$	93)m- (96)m 17.37 384.07	582.69	769.67	926.2		(97)
Space heating requirement for each month, kWh/month = 0.024 x				320.2		(0.)
(98)m= 350.79 257.86 198.72 97.9 34.98 0 0	0 0	94.61	229.4	361.29		
	Total per year	(kWh/year) = Sum(9	8) _{15,912} =	1625.56	(98)
Space heating requirement in kWh/m²/year					26.27	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab			unity sch	neme.	0	(301)
Fraction of space heat from community system $1 - (301) =$				Ī	1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See	e latter	_				
Fraction of heat from Community heat pump					1	(303a)
Fraction of total space heat from Community heat pump		(30	02) x (303	a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	y heating sys	tem			1	(305)
Distribution loss factor (Table 12c) for community heating system					1.05	(306)
Space heating				-	kWh/year	_
Annual space heating requirement					1625.56	╛
Space heat from Community heat pump	(98) x (30	04a) x (305	5) x (306) :	= [1706.84	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or A	ppendix	E)		0	(308
Space heating requirement from secondary/supplementary system	(98) x (30	01) x 100 ÷	÷ (308) =		0	(309)
Water heating Annual water heating requirement				Г	1949.1	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (30)3a) x (305	5) x (306) :	_ _ [2046.56	(310a)
Electricity used for heat distribution	0.01 × [(307a).	(307e) +	(310a)([310e)] =	37.53	
Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷	(314) =		Ī	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out	tside			[131.64	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating				Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) -	+ (330b) +	(330g) =	Ī	131.64	(331)
Energy for lighting (calculated in Appendix L)				Ī	296.65	(332)
Electricity generated by PVs (Appendix M) (negative quantity)				ļ	-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + ((315) + (331)	+ (332)	(237b)	= [4072.87	(338)

12b. CO2 Emissions – Community heating scheme

Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year

CO2 from other sources of space and wat Efficiency of heat source 1 (%)	er heating (not CHP) If there is CHP using two fuels rep	peat (363) to (366) for the se	cond fuel	280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100	÷ (367b) x 0.52		695.72	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	19.48	(372)
Total CO2 associated with community sys	tems (363)(366)	+ (368)(372)	=	715.2	(373)
CO2 associated with space heating (seco	ndary) (309) x	0	=	0	(374)
CO2 associated with water from immersion	n heater or instantaneous heater	(312) x 0.22	=	0	(375)
Total CO2 associated with space and wat	er heating (373) + (374)	+ (375) =		715.2	(376)
CO2 associated with electricity for pumps	and fans within dwelling (331)) x	0.52	=	68.32	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	153.96	(379)
Energy saving/generation technologies (3 Item 1	33) to (334) as applicable	0.52 x	0.01 =	-56.48	(380)
Total CO2, kg/year	um of (376)(382) =			881	(383)
Dwelling CO2 Emission Rate	383) ÷ (4) =			14.24	(384)
El rating (section 14)				88.95	(385)

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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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 31.68 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.83 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) 0.13 (max. 0.70)

Roof (no roof)

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

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

2a Thermal bridging

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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

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	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	5.45m²	
Windows facing: South East	6.09m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

		l Jser J	Details:									
Assessor Name: Software Name:	•											
Address :	F	Property	Address	01 - A								
Overall dwelling dime	nsions:											
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)			
Ground floor			48.96	(1a) x	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	0	x 1	10 =	0	(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 ho	our			
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				0		÷ (5) =	0	(8)			
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	ed to (17),	otherwise (ontinue tr	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 fc	r masoni	y constr	uction			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 ().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 $(18) = [(17) \div 20] +$	-	•	•	etre of e	envelope	area	3	(17)			
•	s if a pressurisation test has been do				is being u	sed		0.15	(18)			
Number of sides sheltere			,	,	J			0	(19)			
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)			
Infiltration rate incorporat	_		(21) = (18	x (20) =				0.15	(21)			
Infiltration rate modified for		1	T .	_	T _	T	_	1				
L 1	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind sp		1 00	1 0.7	4	T 40	1 45	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					
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 infiltration rate	(allowing	for shelter a	nd wind s	speed) =	(21a) x	(22a)m					
0.19 0.19 Calculate effective air ch	I	0.16 0.16 e for the app	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanical ventilation	•	o ror are app								0.5	(23
If exhaust air heat pump usi	ng Append	ix N, (23b) = (23b)	Ba) × Fmv (equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with heat recove	ery: efficiend	cy in % allowing	for in-use f	actor (fron	n Table 4h) =				75.65	(23
a) If balanced mechan	ical venti	ilation with he	eat recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.31 0.31	0.31	0.29 0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24
b) If balanced mechan	ical venti	ilation withou	t heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		1	
(24b)m= 0 0	0	0 0	0	0	0	0	0	0	0		(24
c) If whole house extra if (22b)m < 0.5 x (•	-				5 × (23b	o)	_	_	
(24c)m= 0 0	0	0 0	0	0	0	0	0	0	0		(24
d) If natural ventilation if (22b)m = 1, then							0.5]				
(24d)m= 0 0	0	0 0	0	0	0	0	0	0	0		(24
Effective air change ra	ite - entei	r (24a) or (24	b) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.31 0.31	0.31	0.29 0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losses and hea	t loss par	ameter:									
ELEMENT Gross area (r		penings m²	Net Ar A ,r		U-val W/m2		A X U (W/l		k-value kJ/m²-l		
Windows Type 1			5.45	_x 1	/[1/(1.4)+	0.04] =	7.23	,			(27
Windows Type 2			6.09	x1	/[1/(1.4)+	0.04] =	8.07	Ħ			(27
Floor			48.96	3 X	0.13	─	6.36479	9 [75	3672	(28
Walls Type1 35.3		11.54	23.76	6 X	0.18	-	4.28	T i	60	1425.6	(29)
Walls Type2 35.99	Ħ F	0	35.99) x	0.17	ffi -i	6.04	Ħ i	60	2159.4	(29
Total area of elements, r	 n²	<u>_</u>	120.2	:5							— (31
Party wall			14.89) x	0		0	\neg [45	670.05	(32)
Party ceiling			48.96	5					30	1468.8	(32
Internal wall **			96.46	5				Ī	9	868.14	(32
* for windows and roof window ** include the areas on both sid				lated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	_
Fabric heat loss, W/K = \$	S (A x U)				(26)(30)	+ (32) =				31.98	(33
Heat capacity Cm = S(A	xk)					((28).	(30) + (32	2) + (32a).	(32e) =	10263.99	(34)
Thermal mass paramete	r (TMP =	Cm ÷ TFA)	in kJ/m²K			= (34)	÷ (4) =			209.64	(35
For design assessments where can be used instead of a detail			ction are no	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridges : S (L x	Y) calcul	lated using A	ppendix l	K						9.02	(36
if details of thermal bridging an Total fabric heat loss	e not knowi	n(36) = 0.05 x ((31)			(33) +	(36) =			41	(37
Ventilation heat loss cald	culated m	onthly		•	•	(38)m	= 0.33 × (25)m x (5))		
Jan Feb	Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 13.4 13.24	13.08 1	2.28 12.12	11.31	11.31	11.15	11.64	12.12	12.44	12.76		(38
Heat transfer coefficient,	W/K					(39)m	= (37) + (38)m		.	
(39)m= 54.4 54.24	54.08 5	53.28 53.12	52.32	52.32	52.16	52.64	53.12	53.44	53.76		_
Stroma FSAP 2012 Version: 1.	.0.5.50 (SA	P 9.92) - http://v	vww.stroma	a.com			Average =	Sum(39) ₁	12 /12=	53.2 ∮ age 2	J/39

Heat loss parameter (HLP), W/m*K
Number of days in month (Table 1a)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4. Water heating energy requirement: Assumed occupancy, N
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 ### 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) ### Jun
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 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)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), v = 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 th, c, td) (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 0 (47) Ufterwise 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): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 110 (50) If community heating see section 4.3 Volume factor from Table 2 (kWh/litre/day) (52)
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 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)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), v = 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, c, d) (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 0 (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): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 110 (50) If community heating see section 4.3 Volume factor from Table 2a (52)
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
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)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)1v = 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 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)
(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 =
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 Total = Sum(45) ₁₋₁₂ = 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 0 (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): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)
(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
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 0 (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): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)
(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 0 (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): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)
Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 110 (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 1.03 (52)
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 1.03 (52)
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 1.03 (48) (48) (49) (49) (48) (49) (50) (51)
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 1.03 (48) × (49) = 0 (49) 0 (50) 1.03
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 1.03 (48) (48) × (49) = 0 0 (49) 0.00 (50) 1.00 (51)
Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)
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 1.03 (52)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)
If community heating see section 4.3 Volume factor from Table 2a 1.03 (52)
Volume factor from Table 2a 1.03 (52)
1 0.0
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 1.03$ (54)
Enter (50) or (54) in (55) 1.03 (54)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (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
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (57)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59) m = $(58) \div 365 \times (41)$ m (58)
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)
(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)

Combi loss calc	sulated f	for each	month ((61)m =	(60) ·	365 × (41	/m							
(61)m= 0	0	0	0	0	00) -	0) 0		0	0	T 0	0	1	(61)
Total heat requi													[(50)m + (61)m	(- /
	154.95	163.65	147.98	145.94	131.7		138.	_	137.68	153.38	` 	171.57	(59)III + (61)IIII]	(62)
Solar DHW input ca	Į												I	(- /
(add additional											mon to wat	or modung)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0]	(63)
Output from wat	ter heat	:er				I					-1			
· -	154.95	163.65	147.98	145.94	131.7	3 127.77	138.	.47	137.68	153.38	160.59	171.57]	
	'						. (Outp	out from wa	ater heat	er (annual)₁	12	1809.07	(64)
Heat gains from	n water l	heating,	kWh/m	onth 0.2	5 ´[0.	85 × (45)m	ı + (6	1)m	n] + 0.8 x	c [(46)m	n + (57)m	+ (59)m]	_
(65)m= 84.15	74.86	80.26	74.21	74.37	68.8	1 68.33	71.8	88	70.79	76.84	78.4	82.89]	(65)
include (57)m	in calc	ulation	of (65)m	only if c	ylinde	r is in the	dwelli	ing (or hot w	ater is	from com	munity h	neating	
5. Internal gai				•	-							•		
Metabolic gains	(Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Ju	n Jul	Αι	ug	Sep	Oct	Nov	Dec		
(66)m= 82.98	82.98	82.98	82.98	82.98	82.9	82.98	82.9	98	82.98	82.98	82.98	82.98		(66)
Lighting gains (calculat	ed in Ap	pendix	L, equati	ion L9	or L9a), a	lso s	ee 7	Table 5					
(67)m= 12.89	11.44	9.31	7.05	5.27	4.45	4.8	6.2	:5	8.38	10.64	12.42	13.24		(67)
Appliances gain	ns (calcu	ulated in	Append	dix L, eq	uatior	L13 or L1	3a), a	also	see Tal	ble 5	-	-		
(68)m= 144.53	146.03	142.25	134.21	124.05	114.5	108.13	106.	.63	110.41	118.45	128.61	138.16		(68)
Cooking gains (calculat	ted in Ap	pendix	L, equat	ion L	15 or L15a), also	o se	e 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	s gains	(Table 5	ia)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g. eva	poratio	n (negat	ive valu	es) (Tab	le 5)							-		
(71)m= -66.38	-66.38	-66.38	-66.38	-66.38	-66.3	8 -66.38	-66.	38	-66.38	-66.38	-66.38	-66.38		(71)
Water heating g	gains (T	able 5)									-	-		
(72)m= 113.1	111.4	107.87	103.07	99.95	95.5	7 91.84	96.6	62	98.31	103.28	108.89	111.41		(72)
Total internal g	gains =					66)m + (67)n	า + (68	3)m +	+ (69)m + ((70)m + (71)m + (72))m		
(73)m= 318.42	316.77	307.33	292.22	277.17	262.4	1 252.66	257.	.38	265	280.27	297.82	310.7		(73)
6. Solar gains:														
Solar gains are ca		ŭ	r flux from	Table 6a		•	tions t	to co	nvert to th	e applica		tion.		
Orientation: Ad	ccess Fa able 6d	actor	Area m²			Flux Fable 6a		т	g_ able 6b	_	FF Fable 6c		Gains	
	able ou				_	able ba	, ,	- 1	able ob	_ ,	able oc		(W)	7
Southeast 0.9x	0.77	X	6.0	9	×	36.79	X		0.63	x [0.7	=	68.48	(77)
Southeast 0.9x	0.77	X	6.0	9	x	62.67	X		0.63	x [0.7	=	116.65	(77)
Southeast 0.9x	0.77	X	6.0	9	X _	85.75	X		0.63	×	0.7	=	159.6	(77)
Southeast 0.9x	0.77	×	6.0	9	X _	106.25	X		0.63	x [0.7	=	197.75	(77)
Southeast 0.9x	0.77	X	6.0	9	x	119.01	X		0.63	X	0.7	=	221.5	(77)

Southeast 0.9x	0.77	X	6.0	9	X	1	18.15	X	0.63	3	X	0.7		=	219.9	(77)
Southeast 0.9x	0.77	X	6.0	9	X	1	13.91	X	0.63	3	x	0.7		=	212.01	(77)
Southeast 0.9x	0.77	X	6.0	9	X	10	04.39	x	0.63	3	x	0.7		=	194.29	(77)
Southeast 0.9x	0.77	X	6.0	9	X	9	2.85	x	0.63	3	x	0.7		=	172.81	(77)
Southeast 0.9x	0.77	х	6.0	9	x	6	9.27	x	0.63	3	x	0.7		=	128.92	(77)
Southeast 0.9x	0.77	Х	6.0	9	x	4	4.07	x	0.63	3	x	0.7		=	82.02	(77)
Southeast 0.9x	0.77	X	6.0	9	x	3	1.49	x	0.63	3	x	0.7		=	58.6	(77)
Southwest _{0.9x}	0.77	х	5.4	15	x	3	6.79]	0.63	3	x	0.7		=	61.28	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	6	2.67		0.63	3	x	0.7		=	104.39	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	8	5.75]	0.63	3	x	0.7		=	142.83	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	10	06.25	ĺ	0.63	3	x	0.7		=	176.97	(79)
Southwest _{0.9x}	0.77	X	5.4	ļ5	x	1	19.01	ĺ	0.63	3	х	0.7		=	198.22	(79)
Southwest _{0.9x}	0.77	X	5.4	ļ5	x	1	18.15	j	0.63	3	j ×	0.7		=	196.79	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	1	13.91	j	0.63	3	x	0.7		=	189.73	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	1(04.39	j	0.63	3	x	0.7		=	173.87	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	9	2.85	j	0.63	3	i x	0.7		=	154.65	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	6	9.27	j	0.63	3	x	0.7		=	115.37	(79)
Southwest _{0.9x}	0.77	X	5.4	15	x	4	4.07	ĺ	0.63	3	x	0.7		=	73.4	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x	3	1.49	j	0.63	3	j ×	0.7		=	52.45	(79)
_								•								_
Solar gains in	watts. ca	lculated	for eacl	h month	,			(00)	0 (7	4)	(0.0)					
								(83)m	n = Sum(74	4)m	(82)m					
(83)m= 129.76	221.04	302.43	374.73	419.72	$\overline{}$	16.69	401.73	368			(82)m 244.29	155.43	111.0	05	I	(83)
Ť	221.04	302.43	374.73	419.72	41		401.73	<u> </u>			· ·	155.43	111.0	05		(83)
(83)m= 129.76	221.04	302.43	374.73	419.72	+ (8		401.73	<u> </u>	.16 327	7.47	· ·		421.7			(83)
(83)m= 129.76 Total gains – ii	221.04 nternal ar 537.81	302.43 nd solar 609.76	374.73 (84)m = 666.94	419.72 = (73)m 696.89	41 + (8	33)m	401.73 , watts	368	.16 327	7.47	244.29		ļ			
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter	221.04 Internal are 537.81 Inal temporal	302.43 nd solar 609.76 erature	374.73 (84)m = 666.94 (heating	419.72 = (73)m 696.89 seasor	41 + (8 6	33)m 79.1	401.73 , watts 654.39	368 625	.16 327	2.46	244.29		ļ		21	
(83)m= 129.76 Total gains – ii (84)m= 448.18	221.04 nternal ar 537.81 nal tempo	302.43 and solar 609.76 erature (eating possible)	374.73 (84)m = 666.94 (heating	419.72 = (73)m 696.89 seasor	41 + (8 6 n)	33)m 79.1 area 1	401.73 , watts 654.39 from Tak	368 625	.16 327	2.46	244.29		ļ		21	(84)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature	221.04 nternal ar 537.81 nal tempo	302.43 and solar 609.76 erature (eating possible)	374.73 (84)m = 666.94 (heating	419.72 = (73)m 696.89 seasor	41 + (8 6 n) ing a	33)m 79.1 area 1	401.73 , watts 654.39 from Tak	368 625 ole 9	.16 327 .54 592 , Th1 (°C	2.46	244.29	3 453.25	ļ	75	21	(84)
(83)m= 129.76 Total gains – in (84)m= 448.18 7. Mean inter Temperature Utilisation fac	221.04 Internal are 537.81 Internal temperaturing heater for garage.	302.43 and solar 609.76 erature (eating points for limits)	374.73 (84)m = 666.94 (heating eriods in	419.72 = (73)m 696.89 seasor the livings, h1,n	41 + (8 6 n) ing a	33)m 79.1 area f	401.73 , watts 654.39 from Tab ble 9a)	368 625 ole 9	.16 327 .54 592 , Th1 (°C	2.47 2.46 C)	244.29 524.56	3 453.25	421.7	75 ec	21	(84)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.98	221.04 Internal are 537.81 Inal temporal during heater for gas Feb 0.95	302.43 and solar 609.76 erature (eating points for limits of limits) Mar 0.9	374.73 (84)m = 666.94 (heating eriods in iving are Apr 0.81	419.72 = (73)m 696.89 seasor the livings, h1,n May 0.66	41 + (8 n) ing a	33)m 79.1 area f ee Ta Jun	401.73 , watts 654.39 from Tab ble 9a) Jul 0.35	368 625 ole 9 A	.16 327 .54 592 , Th1 (°C ug S	2.47 2.46 2.46 2.59 ep	244.29 524.56 Oct	453.25 Nov	421.7	75 ec	21	(84)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fac	221.04 Internal are 537.81 Inal temporal during heater for gas Feb 0.95	302.43 and solar 609.76 erature (eating points for limits of limits) Mar 0.9	374.73 (84)m = 666.94 (heating eriods in iving are Apr 0.81	419.72 = (73)m 696.89 seasor the livings, h1,n May 0.66	41 + (8 6 6) 1) (see 6)	33)m 79.1 area f ee Ta Jun	401.73 , watts 654.39 from Tab ble 9a) Jul 0.35	368 625 ole 9 A	.16 327 .54 592 , Th1 (°C ug S 38 0.5	2.47 2.46 C) ep 59	244.29 524.56 Oct	Nov 0.96	421.7	75 PC	21	(84)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.98 Mean interna (87)m= 19.96	221.04 Internal are 537.81 Internal temporal during heater for gas Feb 0.95 Internal temporal 20.2	and solar 609.76 erature eating pains for li Mar 0.9 eture in l 20.48	374.73 (84)m = 666.94 (heating eriods in iving are Apr 0.81 iving are 20.76	419.72 = (73)m 696.89 seasor in the livities, h1,n May 0.66 ea T1 (f	41 + (8 6 6 n)	33)m 79.1 area f ee Ta Jun 0.48 w ste 0.99	401.73 , watts 654.39 from Tak ble 9a) Jul 0.35 ps 3 to 7	368 625 ole 9 A 0.3 7 in T	.16 327 .54 592 , Th1 (°C ug S 38 0.9 Table 9c) 1 20.	2.47 2.46 2.46 2.59 2.59 2.69 2.69 2.69 2.69 2.69 2.69 2.69 2.6	244.29 524.56 Oct 0.84	Nov 0.96	421.7 De 0.98	75 PC	21	(84)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.98 Mean interna (87)m= 19.96 Temperature	221.04 Internal are 537.81 Inal temporal during heater for gas Feb 0.95 I tempera 20.2 I during heater for gas feb 0.95	and solar 609.76 erature (eating points for limits for limits) Mar 0.9 eture in limits and limits for limits f	374.73 (84)m = 666.94 (heating eriods in iving are Apr 0.81 iving are 20.76 eriods in iving are 20.76	419.72 = (73)m 696.89 seasor the livities, h1,n May 0.66 ea T1 (f 20.92	41 + (8 6 6 1) ing a control of the	area face Ta Jun 0.48 w ste 0.99	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Ta	368 625 ble 9 A 0.3	.16 327 .54 592 .54 592 .Th1 (°C) .58 0.5 .59, Th2 (°C)	ep 59 96 C)	244.29 524.56 Oct 0.84	Nov 0.96	De 0.98	75 PC 3	21	(84) (85) (86) (87)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.98 Mean interna (87)m= 19.96 Temperature (88)m= 19.99	221.04 Internal are 537.81 Inal temporal during heater for gas Feb 0.95 I tempera 20.2 I tempera 20.2 I tempera 20.2	and solar 609.76 erature (eating points for limits and	374.73 (84)m = 666.94 (heating eriods in iving are 20.76 eriods in 20.01	419.72 = (73)m 696.89 seasor in the living ea, h1,n May 0.66 ea T1 (f 20.92 in rest of	41 + (8 6 6 7) ing a collor of dw 2	area face Ta Jun 0.48 w ste 0.99 elling 0.03	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Table 9a	368 625 ble 9 A 0.3 7 in T 2 able 9	.16 327 .54 592 .54 592 .Th1 (°C) .58 0.5 .59, Th2 (°C)	ep 59 96 C)	244.29 524.56 Oct 0.84	Nov 0.96	421.7 De 0.98	75 PC 3	21	(84)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact (86)m= 0.98 Mean interna (87)m= 19.96 Temperature (88)m= 19.99 Utilisation fact	221.04 Internal ar 537.81 Inal temporal during heater for gar Feb 0.95 I temperal 20.2 during heater for gar 19.99 Etor for gar and temperal control temperal c	and solar 609.76 erature eating periods for limits for limits 0.9 eature in limits 20.48 eating periods for real limits eating periods for real limits 20.48	374.73 (84)m = 666.94 (heating eriods ir iving are 20.76 eriods ir 20.01 est of dv	419.72 = (73)m 696.89 seasor the living a, h1,n May 0.66 ea T1 (ff 20.92 n rest of 20.01 welling,	41 + (8 6 6 n) c c c c c c c c c c c c c c c c c c	area free Ta Jun 0.48 w ste 0.99 elling 0.03	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Table 20.03	368 625 ble 9 A 0.3 7 in T 2 2 able 9 20.	.16 327 .54 592 , Th1 (°C ug S 38 0.5 able 9c) 1 20. 9, Th2 (° 03 20.	ep 59 96 CC)	244.29 524.56 Oct 0.84 20.75	Nov 0.96 20.31 20.01	De 0.98	75 eC 3	21	(84) (85) (86) (87) (88)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact (86)m= 0.98 Mean internat (87)m= 19.96 Temperature (88)m= 19.99 Utilisation fact (89)m= 0.97	221.04 Internal ar 537.81 Inal temporal during heater for gar Teb 0.95 I temperate 20.2 during heater 19.99 eternal are temperate 20.2 during heater 19.99 eternal are temperate 20.2 during heater 19.99	and solar 609.76 erature (eating points for limited points) ature in limited points for record points	374.73 (84)m = 666.94 (heating eriods in iving are 20.76 eriods in 20.01 est of do 0.77	419.72 = (73)m 696.89 seasor the livities, h1,n May 0.66 ea T1 (f 20.92 n rest of 20.01 welling, 0.6	41 + (8 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	area free Ta Jun 0.48 w ste 0.99 elling 0.03 m (se	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Ta 20.03 ee Table 0.27	368 625 625 625 A 0.3 7 in T 2 20. 9a) 0.	.16 327 .54 592 .54 592 .54 592 .54 0.5 .54 0.	ep 59 96 C) 02	Oct 0.84 20.75	Nov 0.96	De 0.98	75 eC 3	21	(84) (85) (86) (87)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.98 Mean interna (87)m= 19.96 Temperature (88)m= 19.99 Utilisation fact (89)m= 0.97 Mean interna	221.04 Internal ar 537.81 Inal temporal during heater for gar 20.2 Itemperal during heater for gar 20.2 Itemperal during heater for gar 19.99 Itemperal during heater for gar 19.99 Itemperal during heater for gar 19.99 Itemperal during heater for gar 19.99	and solar 609.76 erature (eating points for limits for rough) ature in limits for rough) ature in rough) ature in rough) ature in rough) ature in the rough)	374.73 (84)m = 666.94 (heating eriods in iving are 20.76 eriods in 20.01 est of do 0.77 the rest	419.72 = (73)m 696.89 seasor the livities, h1,n May 0.66 ea T1 (f 20.92 n rest of 20.01 welling, 0.6	41 + (8 6 6 1) ing a few few few few few few few few few few	33)m 79.1 area f ee Ta Jun 0.48 w ste 0.99 elling 0.03 m (se 0.41 T2 (fe	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Ta 20.03 ee Table 0.27 pollow ste	368 625 625 A 0.3 7 in T 2 able 9 20. 9a) 0.	.16 327 .54 592 .54 592 .Th1 (°C) .58 0.5 .59 Th2 (°C) .59 Th2 (°C) .50 7 in	ep	244.29 524.56 Oct 0.84 20.75 20.01 0.8 9c)	Nov 0.96 20.31 20.01	De 0.98	75 PC 33	21	(84) (85) (86) (87) (88) (89)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact (86)m= 0.98 Mean internat (87)m= 19.96 Temperature (88)m= 19.99 Utilisation fact (89)m= 0.97	221.04 Internal ar 537.81 Inal temporal during heater for gar Teb 0.95 I temperate 20.2 during heater 19.99 eternal are temperate 20.2 during heater 19.99 eternal are temperate 20.2 during heater 19.99	and solar 609.76 erature (eating points for limited points) ature in limited points for record points	374.73 (84)m = 666.94 (heating eriods in iving are 20.76 eriods in 20.01 est of do 0.77	419.72 = (73)m 696.89 seasor the livities, h1,n May 0.66 ea T1 (f 20.92 n rest of 20.01 welling, 0.6	41 + (8 6 6 1) ing a few few few few few few few few few few	area free Ta Jun 0.48 w ste 0.99 elling 0.03 m (se	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Ta 20.03 ee Table 0.27	368 625 625 625 A 0.3 7 in T 2 20. 9a) 0.	.16 327 .54 592 .54 592 .Th1 (°C) .58 0.5 .59 Th2 (°C) .59 Th2 (°C) .50 7 in	ep 59 50 51 Table 0	244.29 524.56 Oct 0.84 20.75 20.01 0.8 9c) 19.75	Nov 0.96 20.31 20.01 0.94	De 0.98 19.9 20 0.98	75 PC 33		(84) (85) (86) (87) (88) (89)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.98 Mean interna (87)m= 19.96 Temperature (88)m= 19.99 Utilisation fact (89)m= 0.97 Mean interna	221.04 Internal ar 537.81 Inal temporal during heater for gar 20.2 Itemperal during heater for gar 20.2 Itemperal during heater for gar 19.99 Itemperal during heater for gar 19.99 Itemperal during heater for gar 19.99 Itemperal during heater for gar 19.99	and solar 609.76 erature (eating points for limits for rough) ature in limits for rough) ature in rough) ature in rough) ature in rough) ature in the rough)	374.73 (84)m = 666.94 (heating eriods in iving are 20.76 eriods in 20.01 est of do 0.77 the rest	419.72 = (73)m 696.89 seasor the livities, h1,n May 0.66 ea T1 (f 20.92 n rest of 20.01 welling, 0.6	41 + (8 6 6 1) ing a few few few few few few few few few few	33)m 79.1 area f ee Ta Jun 0.48 w ste 0.99 elling 0.03 m (se 0.41 T2 (fe	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Ta 20.03 ee Table 0.27 pollow ste	368 625 625 A 0.3 7 in T 2 able 9 20. 9a) 0.	.16 327 .54 592 .54 592 .Th1 (°C) .58 0.5 .59 Th2 (°C) .59 Th2 (°C) .50 7 in	ep 59 50 51 Table 0	244.29 524.56 Oct 0.84 20.75 20.01 0.8 9c) 19.75	Nov 0.96 20.31 20.01	De 0.98 19.9 20 0.98	75 PC 33	0.5	(84) (85) (86) (87) (88) (89)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.98 Mean interna (87)m= 19.96 Temperature (88)m= 19.99 Utilisation fact (89)m= 0.97 Mean interna	221.04 Internal ar 537.81 Inal temporal during heater for gar 20.2 Internal area temporal during heater for gar 20.2 Internal area temporal during heater for gar 20.94 Internal area temporal 19.99 Internal area temporal	and solar 609.76 erature eating periods for limits for	374.73 (84)m = 666.94 (heating eriods ir iving are 20.76 eriods ir 20.01 est of do 0.77 the rest 19.75	419.72 = (73)m 696.89 seasor the living a, h1,n May 0.66 ea T1 (ff 20.92 n rest of 20.01 welling, 0.6 of dwell	41 + (8 6 6 1) ing a continuous following a continuous following a continuous following a continuous following follo	33)m 79.1 area f ee Ta Jun 0.48 w ste 0.99 elling 0.03 m (se 0.41 T2 (fe 0.02	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Table 20.03 ee Table 0.27 collow stee	368 625 625 A 0.3 7 in T 2 20. 9a) 0.	.16 327 .54 592 .54 592 .Th1 (°C .58 0.5 .59, Th2 (° .59, Th2 (° .59, Th2 (° .503 20510 7 in 1503 2	ep 59 59 50 51 Table 50 fL	244.29 524.56 Oct 0.84 20.75 20.01 0.8 9c) 19.75	Nov 0.96 20.31 20.01 0.94	De 0.98 19.9 20 0.98	75 PC 33		(84) (85) (86) (87) (88) (89)
(83)m= 129.76 Total gains – ii (84)m= 448.18 7. Mean inter Temperature Utilisation fact (86)m= 0.98 Mean interna (87)m= 19.96 Temperature (88)m= 19.99 Utilisation fact (89)m= 0.97 Mean interna (90)m= 18.64	221.04 Internal ar 537.81 Inal temporal during heater for gar 20.2 Itemperal 20.2 Itemperal 19.99 Itemperal 18.98 Itemperal 19.59 Itemperal 19.59	and solar 609.76 erature eating period of the solar 0.9 enture in 1 20.48 eating period of the solar 19.38 eature in term of the solar	374.73 (84)m = 666.94 (heating eriods in iving are 20.76 eriods in 20.01 est of do 0.77 the rest 19.75 r the wh 20.25	419.72 = (73)m 696.89 seasor the livities, h1,n May 0.66 ea T1 (f 20.92 n rest of 20.01 welling, 0.6 of dwell 19.94	41 + (8 6 6 1) ing a control of the	33)m 79.1 area f ee Ta Jun 0.48 w ste 0.99 elling 0.03 m (se 0.41 T2 (fe 0.02	401.73 , watts 654.39 from Table 9a) Jul 0.35 ps 3 to 7 21 from Ta 20.03 ee Table 0.27 ollow ste 20.03 A × T1 20.51	368 625 A 0.3 7 in T 2 20. 9a) 0. + (1 20.	.16 327 .54 592 .54 592 .54 592 .54 0.5 .58 0.5 .50 0.5 .50 7 in	ep	244.29 524.56 Oct 0.84 20.75 20.01 0.8 9c) 19.75 A = Liv	Nov 0.96 20.31 20.01 0.94 19.15 ing area ÷ (De 0.98 19.9 20 0.98	75 PC 33		(84) (85) (86) (87) (88) (89)

(93)m= 19.29	19.59	19.93	20.25	20.43	20.5	20.51	20.51	20.48	20.25	19.73	19.24		(93)
8. Space hea													
Set Ti to the the utilisation			•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	L		<u> </u>				_ 3						
(94)m= 0.97	0.94	0.88	0.78	0.63	0.45	0.31	0.34	0.55	0.81	0.94	0.97		(94)
Useful gains,	hmGm	, W = (94	4)m x (8	4)m		•	•						
(95)m= 433.95	504.17	537.92	518.98	436.88	304.14	203.81	213.3	324.61	425.46	426	410.92		(95)
Monthly aver		1	-	from T	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 loss rate	1	i	· ·		ì	-``	- ` 	<u> </u>					(07)
(97)m= 815.63	796.64	726.12	604.87	463.67	308.55	204.45	214.28	335.66	512.52	674.87	808.69		(97)
Space heatin (98)m= 283.97	196.55	140.02	61.84	19.93	vvn/mon	$\ln = 0.02$	24 X [(97])m – (95 0)m] X (4 ⁻ 64.77	1) m 179.18	295.94		
(96)11= 263.97	190.55	140.02	01.04	19.93							Ь——	1242.21	(98)
			1.14/1./	.,			TUId	l per year	(KVVII/yeai) = Sum(9	O)15,912 =		╡``
Space heatin	ig require	ement in	kvvh/m²	/year							l	25.37	(99)
9b. Energy red			· ·	Ĭ									
This part is us Fraction of spa										unity sch	neme.	0	(301)
·			•		•	•	(Table T	1) 0 11 11	JIIC		[[= ' '
Fraction of space heat from community system 1 – (301) =									1	(302)			
The community so includes boilers, I									ıp to four (other heat	sources; th	ne latter	
Fraction of he		-			ioni powe	stations.	оес Арреі	iuix C.			[1	(303a)
Fraction of total					eat pum	0			(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	em		Ī	1	(305)
Distribution los	ss factor	(Table 1	12c) for d	commun	ity heati	ng syste	m				ĺ	1.05	(306)
Space heatin	q										L	kWh/yea	 r
Annual space	_	requiren	nent									1242.21	\neg
Space heat fro	om Comi	munity h	eat pum	р				(98) x (30)4a) x (30	5) x (306)	= [1304.32	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	9												
Annual water		equirem	ent									1809.07	
If DHW from co Water heat from)				(64) x (30)3a) x (30 <u></u>	5) x (306) :	<u> </u>	1899.52	(310a)
Electricity use		-					0.01	× [(307a).			L	32.04	(313)
Cooling Syste				0							[0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		[0	(315)
Electricity for p	•			•		,					L		
							outeida				ſ		(330a)
mechanical ve	entiliation	- Dalanc	eu, exii	act of pe	John VC III	put iroiii	outside				l	104.15	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		104.15	(331)
Energy for lighting (calculated in Appendix L)				227.56	(332)
Electricity generated by PVs (Appendix M) (negative quantity	<i>'</i>)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =	Ī	3426.74	(338)
12b. CO2 Emissions – Community heating scheme					_
	Energy kWh/year	Emission factor kg CO2/kWh		nissions ı CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second	fuel	280	(367a)
CO2 associated with heat source 1 [(307	7b)+(310b)] x 100 ÷ (367b) x	0.52	=	593.85	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.63	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	610.48	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			610.48	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	=	54.06	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	118.1	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	olicable	0.52 × 0.01	= [-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				726.17	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				14.83	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:47:53*

Proiect Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 53.46m²

Site Reference: Highgate Road - GREEN

Plot Reference: 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 29.68 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

14.04 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

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

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 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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:	0.47	
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	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 electric heat pump		
Photovoltaic array		

Stroma Number			User D	Details:						
Address		•								
Area(m²)			Property	Address	01 - B					
A		ancione:								
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)	1. Overall dwelling diffle	511310113.	Are	a(m²)		Av. He	iaht(m)		Volume(m ³	3)
Dwelling volume	Ground floor				(1a) x			_		<u>^</u>
Dwelling volume	Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	53.46	(4)			_		
Number of chimneys	Dwelling volume		´ <u> </u>)+(3c)+(3c	d)+(3e)+	(3n) =	141 67	1 (5)
Number of chimneys									111.07	
Number of chimneys	Z. Verillation rate.		ıry	other		total			m³ per hou	ır
Number of intermittent fans 0	Number of chimneys		+ [0] = [0	x	40 =	0	(6a)
Number of intermittent fans 0	Number of open flues	0 + 0	╡ + ト	0]	0	×	20 =	0	(6b)
Number of passive vents	Number of intermittent fa	ins			'	0	x	10 =	0	(7a)
Number of flueless gas fires	Number of passive vents	;			F		×	10 =	0	=
Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	·				L		x	40 =		Ⅎ`ໍ
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	guo				L					(, 5)
Structural infiltration								Air ch	nanges per ho	our
Number of storeys in the dwelling (ns) Additional infiltration (19)-1)x0.1 = 0 (10) (10)		•				-		÷ (5) =	0	(8)
Additional infiltration			ed to (17),	otherwise (continue fr	om (9) to ((16)			— (0)
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 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration 0.25 · [0.2 x (14) ÷ 100] = Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 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)] = 1 (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 ÷ 4	•	ne aweiling (na)					[(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 of	or 0.35 fo	r masoni	y constr	ruction		-		= ' '
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			to the great	ter wall are	a (after					
If no draught lobby, enter 0.05, else enter 0).1 (seale	ed), else	enter 0				0	(12)
Window infiltration $0.25 - [0.2 \times (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 If based on air permeability value, then $ (18) = [(17) \div 20] + (8), \text{ otherwise } (18) = (16) $ [18] Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Shelter factor $ (20) = 1 - [0.075 \times (19)] = 0 $ [19] Infiltration rate incorporating shelter factor $ (21) = (18) \times (20) = 0 $ [19] Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Infiltration rate modified for 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 $	If no draught lobby, en	ter 0.05, else enter 0	•	,					0	=
Infiltration rate 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 $(21) = (18) \times (20) =$ 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 $(22a)m = (22)m \div 4$	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	(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 $(21) = (18) \times (20) =$ $(21) = (18) \times (20) =$ O (19) Shelter factor $(21) = (18) \times (20) =$ 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 $(22a)m = (22)m \div 4$, , , ,	` , , `	, , ,	. ,		0	= ' '
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 $(21) = (18) \times (20) = 1 \cdot (20) = 1 \cdot (20) = 1 \cdot (20) = 1 \cdot (20)$ 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	e area		=
Number of sides sheltered $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	·	•				is beina u	sed		0.15	(18)
Infiltration rate incorporating shelter factor $ (21) = (18) \times (20) = $				g p -		is a said			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 -	[0.0 75 x (1	19)] =			1	(20)
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 incorporate	ting shelter factor		(21) = (18) x (20) =				0.15	(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		or monthly wind speed						-	1	
(22)m =	Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind Factor (22a)m = (22)m ÷ 4	 	- 1 1 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1		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 = (2	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	(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 s	need) –	(21a) v	(22a)m							
0.19 0.19 0.18 0.16 0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]			
Calculate effective air change rate for the app	1 - 1	_				• • • • • • • • • • • • • • • • • • • •	1				
If mechanical ventilation:								0.5	(23a)		
If exhaust air heat pump using Appendix N, (23b) = (23	Ba) × Fmv (e	quation (N	N5)) , other	wise (23b) = (23a)			0.5	(23b)		
If balanced with heat recovery: efficiency in % allowing	for in-use fa	actor (from	n Table 4h) =				75.65	(23c)		
a) If balanced mechanical ventilation with he		<u> </u>		<u> </u>	`		- ` ´	÷ 100]			
(24a)m= 0.31 0.31 0.29 0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24a)		
b) If balanced mechanical ventilation withou		- `	- ^ ` 	<u> </u>	r Ó T	- 		1			
(24b)m= 0 0 0 0 0	0	0	0	0	0	0	0		(24b)		
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)											
(24c)m= 0 0 0 0 0	0	0	0	0	0	0	0		(24c)		
d) If natural ventilation or whole house posit if (22b)m = 1, then (24d)m = (22b)m oth					0.5]						
(24d)m= 0 0 0 0 0	0	0	0	0	0	0	0		(24d)		
Effective air change rate - enter (24a) or (24	b) or (24d	c) or (24	d) in box	(25)	-	-					
(25)m= 0.31 0.31 0.31 0.29 0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)		
3. Heat losses and heat loss parameter:											
ELEMENT Gross Openings area (m²) m²	Net Are A ,n		U-valı W/m2		A X U (W/l		k-value kJ/m²-				
Windows Type 1	9.56		/[1/(1.4)+	0.04] =	12.67	,			(27)		
Windows Type 2	3.98	x1,	/[1/(1.4)+	0.04] =	5.28	一			(27)		
Floor	53.46	x	0.13		6.9498		75	4009.5	(28)		
Walls Type1 40.04 13.54	26.5	×	0.18	=	4.77	F i	60	1590	(29)		
Walls Type2 12.16 0	12.16	X	0.17	=	2.04	F i	60	729.6	(29)		
Total area of elements, m ²	105.66	5							– (31)		
Party wall	27.88	=	0		0	¬	45	1254.6	(32)		
Party ceiling	53.46						30	1603.8	(32b)		
Internal wall **	102.03	=				[9	918.27	(32c)		
* for windows and roof windows, use effective window U-v			ı formula 1.	/[(1/U-valu	ıe)+0.04] a	ו as given in			」 ` ′		
** include the areas on both sides of internal walls and pa	rtitions								_		
Fabric heat loss, W/K = S (A x U)			(26)(30)	, ,				31.71	(33)		
Heat capacity Cm = S(A x k)				* * *	(30) + (32	2) + (32a).	(32e) =	10105.77	(34)		
Thermal mass parameter (TMP = Cm ÷ TFA)				` '	÷ (4) =	T. 45 . T		189.03	(35)		
For design assessments where the details of the construction can be used instead of a detailed calculation.	tion are not	known pr	ecisely the	indicative	values of	TMP In T	able 1f				
Thermal bridges : S (L x Y) calculated using A	ppendix k	(8.81	(36)		
if details of thermal bridging are not known (36) = $0.05 x$ (31)			(22)	(20)				7		
Total fabric heat loss					(36) =	(E)		40.52	(37)		
Ventilation heat loss calculated monthly	l lum	led	۸۰۰۵	<u> </u>	= 0.33 × (]			
(38)m=	Jun 12.35	Jul 12.35	Aug 12.18	Sep 12.7	Oct 13.23	Nov 13.58	13.93		(38)		
	12.00	12.00	12.10		<u> </u>	<u> </u>	10.90	J	(00)		
Heat transfer coefficient, W/K (39)m= 55.16 54.98 54.8 53.93 53.75	52.90	52.00	52.7		= (37) + (37)		51.15]			
	52.88	52.88	52.7	53.23	53.75	54.1 Sum(39) ₁	54.45	53.8 β age 2	7(20)		
Stroma FSAP 2012 Version: 1.0.5.50 (SAP 9.92) - http://v	MANAL OFFO	com			Averace =	Juliu 1912	12 / 1 / =	1 33.000) \[\frac{1}{20} \]		

Heat loss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.03	1.03	1.03	1.01	1.01	0.99	0.99	0.99	1	1.01	1.01	1.02		
							ı		Average =	Sum(40) ₁	12 /12=	1.01	(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	iting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occi 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		79		(42)
Annual average Reduce the annu not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed t	` ,		se target c		.76		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(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		
_						_				m(44) ₁₁₂ =	L	921.15	(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= 125.22	109.52	113.01	98.53	94.54	81.58	75.6	86.75	87.78	102.3	111.67	121.27		_
If instantaneous v	water heati	na at noint	of use (no	hot water	r storaga)	enter∩in	hoves (46		Total = Su	m(45) ₁₁₂ =	= [1207.78	(45)
	1		·	1	· · ·	·	· · ·	, , , I	45.05	10.75	40.40		(46)
(46)m= 18.78 Water storage	16.43 e loss:	16.95	14.78	14.18	12.24	11.34	13.01	13.17	15.35	16.75	18.19		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage					4.144	/ I \							
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature t											0		(49)
Energy lost from b) If manufact		•			or io not		(48) x (49)) =		1	10		(50)
Hot water stor			-								02		(51)
If community I	_			- (77					02		(- /
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature t	factor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	m Table								0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41))m					
(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 calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0	0	0	0	0	0) 0	0	0	То	0	1	(61)
	 auired for	water h	eating ca	Lulated	L I for eac	.h month	(62)n	n = 0.85 x	 (45)m +	(46)m +	(57)m +	ו - (59)m + (61)m	
(62)m= 180.5	-	168.29	152.02	149.82	135.07		142.0		157.58	165.17	176.55]	(62)
Solar DHW inpu	it calculated	using App	endix G oı	· Appendix	H (nega	tive quantity	y) (ente	r '0' if no sola	ar contribu	tion to wate	r heating)) T	
(add addition											•		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ter				•	•	•	•	•	•	•	
(64)m= 180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.0	2 141.28	157.58	165.17	176.55]	
	•			•	•	•		Output from w	ater heate	er (annual)	112	1858.62	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	n + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	ı]	
(65)m= 85.86	76.36	81.8	75.56	75.66	69.92	69.36	73.0	7 71.98	78.24	79.93	84.54]	(65)
include (57	7)m in calc	culation	of (65)m	only if c	ylinder	is in the	dwelli	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):									
Metabolic ga	ins (Table	5), Wat	ts										
Jan		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.6	1 89.61	89.61	89.61	89.61]	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m= 13.93	12.37	10.06	7.62	5.69	4.81	5.19	6.75	9.06	11.5	13.43	14.31]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	lso see Ta	ble 5		-	-	
(68)m= 156.2°	1 157.83	153.74	145.05	134.07	123.75	116.86	115.2	24 119.33	128.02	139	149.32]	(68)
Cooking gain	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	e 5		-	_	
(69)m= 31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.9	6 31.96	31.96	31.96	31.96]	(69)
Pumps and fa	ans gains	(Table 5	āa)										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. e	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -71.68	3 -71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.6	8 -71.68	-71.68	-71.68	-71.68]	(71)
Water heatin	g gains (T	able 5)										_	
(72)m= 115.4	113.63	109.94	104.94	101.69	97.11	93.22	98.2	1 99.98	105.16	111.01	113.63]	(72)
Total interna	al gains =				(66	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 335.42	2 333.71	323.63	307.48	291.33	275.55	265.16	270.0	08 278.24	294.57	313.32	327.14]	(73)
6. Solar gai													
Solar gains are		ŭ					ations to		ne applica		tion.		
Orientation:	Access F Table 6d	actor	Area m²			ux able 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Couthwoots							1 -						7,
Southweston		X	9.5		-	36.79] <u> </u>	0.63	×	0.7	=	107.5	(79)
Southwesters	<u> </u>	X	9.5			62.67	ļ ļ	0.63	×	0.7	=	183.11	<u></u> (79)
Southwesto o	<u> </u>	X	9.5			85.75] 	0.63	×	0.7	=	250.54	_ (79) _ (70)
Southweston		X	9.5	_		106.25	ļ ļ	0.63	×	0.7	=	310.43	」 (79)
Southwest _{0.9x}	0.77	X	9.5	56	X	119.01	J L	0.63	Х	0.7	=	347.71	(79)

			_		_		_		_				_
Southwest _{0.9x}	0.77	X	9.5	56	x	118.15	╛	0.63	X	0.7	=	345.19	(79)
Southwest _{0.9x}	0.77	X	9.5	56	x	113.91		0.63	X	0.7	=	332.8	(79)
Southwest _{0.9x}	0.77	X	9.5	56	x	104.39		0.63	X	0.7	=	304.99	(79)
Southwest _{0.9x}	0.77	X	9.5	56	x	92.85		0.63	X	0.7	=	271.28	(79)
Southwest _{0.9x}	0.77	X	9.5	56	x	69.27		0.63	X	0.7	=	202.38	(79)
Southwest _{0.9x}	0.77	X	9.5	56	x	44.07		0.63	X	0.7		128.76	(79)
Southwest _{0.9x}	0.77	x	9.5	56	x	31.49		0.63	x	0.7	=	92	(79)
Northwest 0.9x	0.77	х	3.9	98	x	11.28	x	0.63	х	0.7	=	13.72	(81)
Northwest _{0.9x}	0.77	х	3.9	98	x	22.97	x	0.63	х	0.7	=	27.94	(81)
Northwest 0.9x	0.77	х	3.9	98	x	41.38	x	0.63	х	0.7	=	50.33	(81)
Northwest _{0.9x}	0.77	x	3.9	98	x	67.96	x	0.63	x	0.7	_	82.66	(81)
Northwest _{0.9x}	0.77	x	3.9	98	x	91.35	X	0.63	x	0.7	_	111.11	(81)
Northwest _{0.9x}	0.77	x	3.9	98	x	97.38	X	0.63	x	0.7	=	118.45	(81)
Northwest _{0.9x}	0.77	x	3.9	98	x	91.1	X	0.63	x	0.7		110.81	(81)
Northwest _{0.9x}	0.77	x	3.9	98	x	72.63	×	0.63	x	0.7		88.34	(81)
Northwest 0.9x	0.77	x	3.9	98	x	50.42	T x	0.63	x	0.7	=	61.33	(81)
Northwest 0.9x	0.77	x	3.9	98	x	28.07	T x	0.63	x	0.7	=	34.14	(81)
Northwest _{0.9x}	0.77	х	3.9	98	x	14.2	X	0.63	х	0.7	=	17.27	(81)
Northwest 0.9x	0.77	x	3.9	98	x	9.21	T x	0.63	x	0.7	=	11.21	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 121.22 211.05 300.87 393.09 458.82 463.65 443.61 393.33 332.61 236.52 146.03 103.2 (83) Total gains – internal and solar (84)m = (73) m + (83) m , watts (84)m = (456.64) 544.75 624.5 700.57 750.15 739.2 708.77 663.41 610.85 531.08 459.34 430.35 (84)													
7. Mean inter	nal temper	rature	(heating	season)								
Temperature	•		`		<i>'</i>	ea from Ta	ble 9	. Th1 (°C)				21	(85)
Utilisation fac	J	٠.			•			, , ,					`
Jan	Feb	Mar	Apr	May	Ju		Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.98	0.95	0.9	0.79	0.63	0.4	0.33	0.3	36 0.58	0.84	0.95	0.98		(86)
Mean interna	l temperati	ure in I	iving ar	ea T1 (fo	ollow	steps 3 to	7 in T	able 9c)	•	•	•	•	
(87)m= 19.94	 	20.48	20.77	20.93	20.9	i	2		20.74	20.29	19.9		(87)
Temperature	during hos										<u> </u>		
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)													
(88)m= 20.06	,			i	1	<u> </u>	1		20.08	20.07	20.07		(88)
(88)m= 20.06	20.06	20.06	20.08	20.08	20.0	9 20.09	20		20.08	20.07	20.07		(88)
Utilisation fac	20.06 2	20.06 ns for r	20.08 est of d	20.08 welling,	20.0 h2,m	9 20.09 (see Table	20 9a)	.1 20.09	!]	, ,
Utilisation faction (89)m= 0.97	20.06 2 ctor for gair 0.94	20.06 ns for r	20.08 est of d	20.08 welling, 0.57	20.0 h2,m 0.39	9 20.09 (see Table 9 0.26	20 e 9a)	.1 20.09	0.8	0.94	0.98		(88)
Utilisation faction (89)m= 0.97 Mean internal	20.06 2 etor for gair 0.94	20.06 ns for r 0.88 ure in t	20.08 rest of d 0.75 the rest	20.08 welling, 0.57 of dwell	20.0 h2,m 0.39 ing T2	9 20.09 (see Table 0 0.26 2 (follow st	20 e 9a) 0.2 eps 3	.1 20.09 29 0.51 to 7 in Tab	0.8 le 9c)	0.94	0.98		(89)
Utilisation faction (89)m= 0.97	20.06 2 etor for gair 0.94	20.06 ns for r	20.08 est of d	20.08 welling, 0.57	20.0 h2,m 0.39	9 20.09 (see Table 0 0.26 2 (follow st	20 e 9a)	.1 20.09 29 0.51 to 7 in Tab 09 20.06	0.8 le 9c)	0.94	0.98		(89)
Utilisation faction (89)m= 0.97 Mean internal	20.06 2 etor for gair 0.94	20.06 ns for r 0.88 ure in t	20.08 rest of d 0.75 the rest	20.08 welling, 0.57 of dwell	20.0 h2,m 0.39 ing T2	9 20.09 (see Table 0 0.26 2 (follow st	20 e 9a) 0.2 eps 3	.1 20.09 29 0.51 to 7 in Tab 09 20.06	0.8 le 9c)	0.94	0.98	0.45	(89)
Utilisation factors (89)m= 0.97 Mean internation (90)m= 18.66	20.06 z ctor for gair 0.94 I temperate 19.01	20.06 ns for r 0.88 ure in 1 19.42 ure (fo	20.08 rest of d 0.75 the rest 19.82 r the wh	20.08 welling, 0.57 of dwell 20.01	20.0 h2,m 0.39 ing T2 20.0	9 20.09 (see Table 0 0.26 2 (follow stress 2 20.09 = fLA × T1	20 9a) 0.2 eps 3 20.	.1 20.09 29 0.51 20 to 7 in Tab 20 20.06 - fLA) × T2	0.8 le 9c) 19.8 fLA = Liv	0.94 19.19 ving area ÷ (4	0.98 18.61 4) =	0.45	(89) (90) (91)
Utilisation fact (89)m= 0.97 Mean internation fact (90)m= 18.66	20.06 2 etor for gair 0.94 I temperate 19.01 I temperate 19.54	20.06 ns for r 0.88 ure in t 19.42 ure (fo	20.08 rest of d 0.75 the rest 19.82 r the wh 20.25	20.08 welling, 0.57 of dwell 20.01 ole dwe 20.43	20.0 h2,m 0.39 ing T2 20.0 lling) 20.4	9 20.09 (see Table 0 0.26 2 (follow st. 8 20.09 = fLA × T1 9 20.5	20 9a) 0.2 eps 3 20. + (1 20	.1 20.09 29 0.51 to 7 in Tab 09 20.06 - fLA) × T2 .5 20.47	0.8 le 9c) 19.8 ftA = Liv 20.23	0.94 19.19 ving area ÷ (-	0.98	0.45	(89)

(00)	1											1	(02)
(93)m= 19.24	19.54	19.9	20.25	20.43	20.49	20.5	20.5	20.47	20.23	19.69	19.19		(93)
8. Space hea				re ohtair	ned at st	en 11 of	Table 9	n so tha	t Ti m=(76)m an	d re-calc	rulate	
the utilisation			•		ica at st	ор 11 OI	Table 3	J, 30 tria		7 0)111 411	a re care	Julato	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm	1:	1		1			1	1		•	
(94)m= 0.97	0.93	0.87	0.76	0.59	0.42	0.29	0.32	0.54	0.81	0.94	0.97		(94)
Useful gains	1	r `	r `	r e		005.7	045.00	007.07	400.45	400.44	440.00	İ	(OE)
(95)m= 440.75		546.29	531.19	445.95	307.94	205.7	215.23	327.97	428.45	430.11	418.09		(95)
Monthly aver	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]											()		
(97)m= 823.91	804.69	734.34	612.19	469.18	311.54	206.24	216.12	338.95	517.41	681.01	816.26		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m= 285.07	198.83	139.91	58.32	17.28	0	0	0	0	66.19	180.65	296.24		
			•				Tota	l per year	(kWh/yea) = Sum(9	8) _{15,912} =	1242.49	(98)
Space heating requirement in kWh/m²/year									23.24	(99)			
9b. Energy re	quiremer	nts – Coi	mmunity	heating	scheme								
This part is used for space heating, space cooling or water heating provided by a community scheme.													
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none									0	(301)			
Fraction of space heat from community system 1 – (301) =										1	(302)		
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter													
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump								1	(303a)				
Fraction of tot	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem			1	(305)
Distribution lo	ss factor	(Table 1	12c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space heatin	q											kWh/yea	- r
Annual space	_	requiren	nent									1242.49	7
Space heat from	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1304.62	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	g require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heatin	α												
Annual water	_	equirem	ent									1858.62	
If DHW from o		•									!		<u> </u>
Water heat fro	om Comr	nunity h	eat pump)				(64) x (30	03a) x (30	=	1951.55	(310a)	
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	32.56	(313)		
Cooling Syste	m Energ	y Efficie	ncy Ration	0								0	(314)
Space cooling	g (if there	is a fixe	ed cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for											i		_
mechanical ve	entilation	- baland	ced, extra	act or po	sitive in	put from	outside					113.73	(330a)

warm air heating system fans					0	(330b)					
pump for solar water heating					0	(330g)					
Total electricity for the above, kWh/yea	r	=(330a) + (330	b) + (330g) =		113.73	(331)					
Energy for lighting (calculated in Apper	ndix L)				245.94	(332)					
Electricity generated by PVs (Appendix	M) (negative quantity))			-108.82	(333)					
Total delivered energy for all uses (307	Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3507.02										
12b. CO2 Emissions – Community heating scheme											
		Energy kWh/year	Emission fact kg CO2/kWh		missions g CO2/year						
CO2 from other sources of space and v Efficiency of heat source 1 (%)		P) sing two fuels repeat (363) to	(366) for the second	l fuel	280	(367a)					
CO2 associated with heat source 1	[(307b	o)+(310b)] x 100 ÷ (367b) x	0.52	=	603.55	(367)					
Electrical energy for heat distribution		[(313) x	0.52	=	16.9	(372)					
Total CO2 associated with community	systems	(363)(366) + (368)(372	2)	=	620.45	(373)					
CO2 associated with space heating (se	econdary)	(309) x	0	=	0	(374)					
CO2 associated with water from immer	sion heater or instanta	neous heater (312) x	0.22	=	0	(375)					
Total CO2 associated with space and v	vater heating	(373) + (374) + (375) =			620.45	(376)					
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	59.02	(378)					
CO2 associated with electricity for light	ing	(332))) x	0.52	=	127.64	(379)					
Energy saving/generation technologies Item 1	(333) to (334) as appl	icable	0.52 × 0.01	1 =	-56.48	(380)					
Total CO2, kg/year	sum of (376)(382) =			F	750.64] (383)					
Dwelling CO2 Emission Rate	(383) ÷ (4) =			F	14.04	(384)					

El rating (section 14)

(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:47:33

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 14.74 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

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

Roof (no roof) OK 1.40 (max. 3.30)

Openings 1.40 (max. 2.00)

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

2a Thermal bridging

Air permeability at 50 pascals 3.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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 electric heat pump		
Photovoltaic array		

		l Iser I	Details:										
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					010943 on: 1.0.5.50					
	Property Address: 01 - C Address:												
Address: 1. Overall dwelling dime	ensions:												
1. Overall aweiling aime		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)				
Ground floor				(1a) x		2.65	(2a) =	161.36	(3a)				
Total floor area TFA = (1	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:													
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır				
Number of chimneys		- + -	0] = [0	x 4	40 =	0	(6a)				
Number of open flues	0 + 0		0	i = F	0	x2	20 =	0	(6b)				
Number of intermittent fa	ns			'	0	x -	10 =	0	(7a)				
Number of passive vents	;			F	0	x ′	10 =	0	(7b)				
Number of flueless gas fi	res			F	0	X	40 =	0	(7c)				
G				L					`				
							Air ch	nanges per ho	our				
	ys, flues and fans = $(6a)+(6b)+(6b)$				0		÷ (5) =	0	(8)				
If a pressurisation test has be Number of storeys in the	peen carried out or is intended, procee the dwelling (ns)	ed to (17),	otherwise of	continue fr	om (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 fo	r masoni	y constr	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 (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 $(18) = [(17) \div 20] + (18)$	•	•	•	cuc or c	листорс	arca	0.15	(17)				
•	es if a pressurisation test has been do				is being u	sed		3.13	` ′				
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) =				0.15	(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 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	1 0.33	1 0.32		1.00	1.12	1.10	J					

Adjusted infiltration rate (allowing for shelter	and wind s	speed) =	(21a) x	(22a)m					
0.19 0.19 0.18 0.16 0.1		0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effective air change rate for the ap If mechanical ventilation:	oplicable ca	ise		-	-	-			7/2
If exhaust air heat pump using Appendix N, (23b) =	(23a) x Fmv (equation (N5)) othe	rwise (23h) = (23a)			0.5	$= \frac{1}{2}$
If balanced with heat recovery: efficiency in % allow	` , ` .	. `	,, .	,) = (20a)			0.5	
					26\m . /	22h) [1 (226)	74.8	(23
a) If balanced mechanical ventilation with 24a)m= 0.32 0.31 0.31 0.29 0.2		0.27	0.26	0.28	0.29	0.29	0.3	- 100] 	(24
b) If balanced mechanical ventilation with		L	L	<u> </u>			0.0		,-
24b)m= 0 0 0 0 0 0		0	0	0	0	0	0		(2
c) If whole house extract ventilation or po									•
if $(22b)m < 0.5 \times (23b)$, then $(24c) = (24c)$	•				.5 × (23b	o)			
24c)m= 0 0 0 0 0	-i	0	0	0	0	0	0		(2
d) If natural ventilation or whole house po	sitive input	ventilati	on from I	oft	<u> </u>		ı		
if $(22b)m = 1$, then $(24d)m = (22b)m$	•				0.5]			_	
24d)m= 0 0 0 0 0	0	0	0	0	0	0	0		(2
Effective air change rate - enter (24a) or (24b) or (24	c) or (24	d) in box	(25)					
25)m= 0.32 0.31 0.31 0.29 0.2	9 0.27	0.27	0.26	0.28	0.29	0.29	0.3		(2
3. Heat losses and heat loss parameter:									
ELEMENT Gross Openings	Net Ar	ea	U-val	ue	AXU		k-value	e A 2	Χk
area (m²) m²	ı, A	m²	W/m2	!K	(W/	K)	kJ/m²-l	K kJ/	/K
Vindows Type 1	12.7	1 x1	/[1/(1.4)+	0.04] =	16.85				(2
Vindows Type 2	3.46	_x 1	/[1/(1.4)+	0.04] =	4.59				(2
Floor	60.89	x	0.13	=	7.91569	9	75	4566.7	5 (2
Valls Type1 29.71 16.17	13.54	4 x	0.18	=	2.44		60	812.4	(2
Valls Type2 13.52 0	13.52	2 X	0.17	=	2.27		60	811.2	(2
otal area of elements, m ²	104.1	2							— (3
Party wall	29.7	1 x	0		0		45	1336.9	5 (3
Party ceiling	60.89	9					30	1826.7	
nternal wall **	146.1	7				[9	1315.5	3 (3
for windows and roof windows, use effective window			g formula 1	/[(1/U-valu	ıe)+0.04] á	ו as given in			<u> </u>
st include the areas on both sides of internal walls and	partitions								
Fabric heat loss, $W/K = S (A \times U)$			(26)(30)) + (32) =				34.06	(3
leat capacity Cm = S(A x k)				((28).	(30) + (32	2) + (32a)	(32e) =	10669.53	(3
hermal mass parameter (TMP = Cm ÷ TFA	A) in kJ/m²K	<u>,</u>		= (34)	÷ (4) =			175.23	(3
For design assessments where the details of the const	ruction are no	t known pi	recisely the	e indicative	values of	TMP in T	able 1f		
an be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using	. Annendiy	K						10.47	(3
details of thermal bridging are not known (36) = 0.05								10.47	(3
otal fabric heat loss	<i>x</i> (0.)			(33) +	(36) =			44.53	(3
entilation heat loss calculated monthly				(38)m	= 0.33 × ((25)m x (5)		_
Jan Feb Mar Apr M	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 16.89 16.69 16.49 15.5 15.	- - 	14.3	14.1	14.7	15.3	15.69	16.09		(3
Heat transfer coefficient, W/K		•	•	(39)m	= (37) + (38)m	•	•	
39)m= 61.42 61.22 61.02 60.02 59.00	32 58.82	58.82	58.62	59.22	59.82	60.22	60.62		
00/111= 011.12 01.122 01.02 00.02									

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 1.01	1.01	1	0.99	0.98	0.97	0.97	0.96	0.97	0.98	0.99	1		
	!	!	Į.	ļ		<u> </u>	<u> </u>		Average =	Sum(40) ₁	12 /12=	0.98	(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	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		01		(42)
Annual averag Reduce the annua not more that 125	je hot wa al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.86		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage is								1 222		1			
(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		
()										I ım(44) ₁₁₂ =	L	982.3	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			. ,	L		` ′
(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		
	<u> </u>			l		ı	ı		Total = Su	. <u>I</u> ım(45) ₁₁₂ =	=	1287.96	(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46	to (61)			L		
(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				!		!	!						
Storage volum	ne (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	-			_			, ,						
Otherwise if no		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage a) If manufact		oclared I	occ foct	or ic kno	wo (k\\/k	n/dov/):							(40)
ŕ				JI IS KIIO	wii (Kvvi	i/day).					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost fro b) If manufact		•			or is not		(48) x (49)) =		1	10		(50)
Hot water stor			-							0	02		(51)
If community h	-			`		,							()
Volume factor	from Ta	ble 2a								1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter (50) or ((54) in (5	55)								1.	.03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains												x H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nual) fro	m Table			•	•	•	•		0		(58)
Primary circuit	`	,			59)m = ((58) ± 36	35 × (41)	ım			<u> </u>		(/
(modified by				,		` '	, ,		r thermo	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)
			l	L		L	<u> </u>	L	L	<u> </u>			

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	00) -	0) 0		0	0	0	0	1	(61)
Total heat requir				alculated	l for es	ch month							[.(59)m + (61)m	` '
	166.72	175.79	158.56	156.09	140.49		147.	_	147.11	164.37	172.58	184.6		(62)
Solar DHW input cal		using App	endix G or	Appendix	H (nega	tive quantit) (ente	L er '0'	if no sola	r contribu	tion to wate	L er heating)	1	
(add additional I												0,		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	1	(63)
Output from wat	er heat	er				•	•	,			•	!		
(64)m= 188.81	166.72	175.79	158.56	156.09	140.49	135.89	147.	78	147.11	164.37	172.58	184.6]	
						•	(Outp	ut from wa	ater heat	er (annual)	l12	1938.8	(64)
Heat gains from	water l	heating,	kWh/mo	onth 0.2	5 ′ [0.8	5 × (45)m	+ (6°	1)m] + 0.8 x	: [(46)m	ı + (57)m	+ (59)m	ı]	
(65)m= 88.62	78.77	84.29	77.73	77.74	71.72	71.03	74.9	98	73.92	80.5	82.39	87.22		(65)
include (57)m	in calc	ulation o	of (65)m	only if c	ylinde	is in the	dwelli	ng d	or hot w	ater is	from com	munity h	neating	
5. Internal gair	ns (see	Table 5	and 5a):										
Metabolic gains	(Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
(66)m= 100.33	100.33	100.33	100.33	100.33	100.33	3 100.33	100.	33	100.33	100.33	100.33	100.33		(66)
Lighting gains (d	calculat	ed in Ap	pendix	L, equati	ion L9	or L9a), a	lso se	ee T	able 5					
(67)m= 15.62	13.87	11.28	8.54	6.38	5.39	5.82	7.5	7	10.16	12.9	15.06	16.05		(67)
Appliances gain	s (calcu	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ole 5	-	-		
(68)m= 175.19	177	172.42	162.67	150.36	138.79	131.06	129.	24	133.82	143.58	155.89	167.46		(68)
Cooking gains (calculat	ted in Ap	pendix	L, equat	ion L1	5 or L15a), also	o se	e Table	5	-	-		
(69)m= 33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.0)3	33.03	33.03	33.03	33.03		(69)
Pumps and fans	gains	(Table 5	ia)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g. eva	poratio	n (negat	ive valu	es) (Tab	le 5)									
(71)m= -80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.2	27	-80.27	-80.27	-80.27	-80.27		(71)
Water heating g	ains (Ta	able 5)											_	
(72)m= 119.11	117.22	113.3	107.96	104.49	99.61	95.47	100.	78	102.67	108.19	114.43	117.23		(72)
Total internal g	ains =				(6	6)m + (67)m	n + (68))m +	(69)m + (70)m + (71)m + (72))m	_	
(73)m= 363.02	361.2	350.1	332.27	314.34	296.89	285.45	290.	69	299.75	317.77	338.48	353.84		(73)
6. Solar gains:														
Solar gains are cal		Ü					tions t	o cor	nvert to th	e applica		tion.		
Orientation: Ac	cess Fa ble 6d	actor	Area m²			lux able 6a			g_ able 6b	7	FF Fable 6c		Gains (W)	
					_		1 [` '	1,
Northeast 0.9x	0.77	X	12.		X	11.28] X [] [0.63	_	0.7	=	43.83	(75)
Northeast 0.9x	0.77	X	12.		X	22.97	X [0.63	X	0.7	=	89.21	[(75)
Northeast 0.9x	0.77	X	12.		x	41.38	X [0.63	×	0.7	=	160.73	[(75)
Northeast 0.9x	0.77	X	12.		X	67.96] X [] [0.63		0.7	=	263.96	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	91.35	X		0.63	X	0.7	=	354.82	(75)

Nawthanat F					г			1			- 1				–
Northeast _{0.9x}	0.77	×	12.	71	X L	9	7.38	X		0.63	X	0.7	=	378.27	(75)
Northeast _{0.9x}	0.77	Х	12.	71	X	(91.1	X		0.63	X	0.7	=	353.87	(75)
Northeast _{0.9x}	0.77	Х	12.	71	x [7	72.63	X		0.63	X	0.7	=	282.11	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	5	50.42	X		0.63	X	0.7	=	195.85	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	2	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	1	1.28	X		0.63	x	0.7	=	11.93	(81)
Northwest 0.9x	0.77	X	3.4	16	x	2	22.97	X		0.63	x	0.7	=	24.29	(81)
Northwest 0.9x	0.77	X	3.4	16	x	4	1.38	x	(0.63	x	0.7	=	43.75	(81)
Northwest _{0.9x}	0.77	Х	3.4	16	х	6	7.96	x	(0.63	х	0.7	=	71.86	(81)
Northwest _{0.9x}	0.77	x	3.4	16	x	g	1.35	x		0.63	x	0.7	=	96.59	(81)
Northwest 0.9x	0.77	x	3.4	16	x	g	7.38	х	(0.63	x	0.7	=	102.98	(81)
Northwest 0.9x	0.77	x	3.4	16	x	,	91.1	х		0.63	x	0.7	=	96.33	(81)
Northwest 0.9x	0.77	х	3.4	16	x [7	2.63	x		0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	x	3.4	16	x [5	50.42	x		0.63	T x	0.7		53.32	(81)
Northwest 0.9x	0.77	x	3.4	16	x [2	28.07	x		0.63	x	0.7	=	29.68	(81)
Northwest 0.9x	0.77	x	3.4	16	x [14.2	X		0.63	x	0.7		15.01	(81)
Northwest _{0.9x}	0.77	x	3.4	16	χΓ		9.21	X		0.63	×	0.7		9.74	(81)
_					-			J			_ '			L	
Solar gains in	watts, cal	culated	for eac	h month	1			(83)m	n = Sun	n(74)m	(82)m				
(83)m= 55.76		204.48	335.82	451.41	$\overline{}$	1.25	450.2	358		249.17	138.7	70.16	45.53		(83)
Total gains – i	nternal an	ıd solar	(84)m =	= (73)m	+ (8	3)m	, watts					!	!	_	
(84)m= 418.78	474.7	554.59	668.09	765.75	77	'8.14	735.65	649	9.6	548.92	456.47	408.63	399.37		(84)
7. Mean inter	nal tempe	erature	(heating	seasor	า)									_	
Temperature	•		`			area 1	from Tal	ole 9	, Th1	(°C)				21	(85)
Utilisation fac	•	• .			_				,	()					`
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec]	
(86)m= 0.99	0.98	0.94	0.84	0.66	+	.47	0.35	0.4	- +	0.68	0.91	0.98	0.99		(86)
Mean interna	l temperat	tura in l	ivina ar	na T1 /f		w sto	ne 3 to 7	Tin T	L Table	Oc)			!	_	
(87)m= 19.72	19.91	20.24	20.66	20.9	1	0.98	21	20.		20.92	20.57	20.08	19.69	7	(87)
` ′	<u> </u>			<u> </u>			<u> </u>			!			1 .0.00	_	()
Temperature	,			i	1		ì	1		<u> </u>	20.4	20.00	T 20 00	7	(88)
(88)m= 20.08	20.08	20.08	20.1	20.1	1 20	0.11	20.11	20.	11	20.11	20.1	20.09	20.09	_	(00)
Utilisation fac		ī			h2,r	m (se	ì	9a)						7	
(89)m= 0.98	0.97	0.93	0.81	0.61	0	.41	0.28	0.3	33	0.61	0.89	0.97	0.99		(89)
		_	he rest	of dwel	ling ⁻	T2 (f	ollow ste	eps 3	8 to 7	in Tabl	e 9c)			_	
Mean interna	I tempera	ture in t												1	
Mean interna (90)m= 18.37	l tempera	ture in t 19.12	19.7	20	2	0.1	20.11	20.	.11	20.04	19.6	18.9	18.34		(90)
	 	1		i	2	0.1	20.11	20.	11			18.9 ring area ÷ (<u> </u>	0.46	(90) (91)
	18.64	19.12	19.7	20				<u> </u>	!_	fl			<u> </u>	0.46	
(90)m= 18.37	18.64	19.12	19.7	20	elling			<u> </u>	– fLA	fl		ring area ÷ (<u> </u>	0.46	
(90)m= 18.37 Mean interna	18.64 I tempera 19.22	19.12 ture (fo	19.7 r the wh 20.14	20 ole dwe 20.41	elling 2	g) = fl	LA × T1	+ (1	– fLA	f a) × T2 20.45	20.04	ring area ÷ (4) =	0.46	(91)

												ı	
(93)m= 18.99	19.22	19.64	20.14	20.41	20.5	20.52	20.52	20.45	20.04	19.44	18.96		(93)
8. Space hea													
Set Ti to the the utilisation			•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l	l	<u> </u>			<u> </u>	1 3						
(94)m= 0.98	0.96	0.92	0.81	0.63	0.44	0.31	0.37	0.64	0.89	0.96	0.98		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m		•							
(95)m= 409.79	457.75	512.63	544.45	484.7	341.51	229.38	239.25	349.38	404.73	393.8	392.15		(95)
Monthly aver	age exte	rnal tem	perature	from T	able 8	,	,				,	ı	
(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	i e				ì	-``	- ` 	<u> </u>			l	1	(07)
(97)m= 902.19	876.84	801.64	674.58	521.27	347.3	230.39	241.26	375.79	564.85	743.31	894.73		(97)
Space heatin (98)m= 366.34	g require 281.63	215.02	93.69	27.2	vvn/mon	$\ln = 0.02$	24 X [(97])m – (95 0)m] X (4 ⁻	1)m 251.65	373.92		
(96)111= 300.34	201.03	213.02	93.09	21.2						<u> </u>	<u> </u>	1728.59	(98)
			111411 / 6	.,			TOLA	l per year	(KVVII/yeai) = Sum(9	O)15,912 =		╡``
Space heatin	g require	ement in	kVVh/m²	/year								28.39	(99)
9b. Energy red	•		The state of the s	Ĭ									
This part is us Fraction of spa										unity sch	neme.	0	(301)
·			•		•	•	(Table T	1) 0 11 11	JIIE			0	╡`
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so									ıp to four (other heat	sources; ti	he latter	
includes boilers, here		-			rom powe	stations.	see Appei	iuix C.				1	(303a)
Fraction of total				•	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for c	commun	ity heati	ng syste	m					1.05	(306)
Space heating	g										'	kWh/yea	 r
Annual space	heating	requiren	nent									1728.59	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	1815.02	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su _l	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating													
Annual water l	_	•										1938.8	
If DHW from c Water heat fro)				(64) x (30)3a) x (30	5) x (306) :	=	2035.74	(310a)
Electricity use		-					0.01	× [(307a).	(307e) +	· (310a)((310e)] =	38.51	(313)
Cooling Syste	m Energ	y Efficie	ncy Ratio	0								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	oumps a	nd fans v	within dv	velling (Table 4f)	:							
mechanical ve							outside					148.82	(330a)
											•		

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		148.82	(331)
Energy for lighting (calculated in Appendix L)				275.82	(332)
Electricity generated by PVs (Appendix M) (negative quantity	')			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		4166.58	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CHI Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second	fuel	280	(367a)
CO2 associated with heat source 1 [(307	(b)+(310b)] x 100 ÷ (367b) x	0.52	=	713.76	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	19.99	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	733.75	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			733.75	(376)
CO2 associated with electricity for pumps and fans within dw	relling (331)) x	0.52	=	77.24	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	143.15	(379)
Energy saving/generation technologies (333) to (334) as app Item 1	licable	0.52 × 0.01	- [-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				897.66	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				14.74	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:47:15

Project Information:

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

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.98m² **Plot Reference:** Site Reference : Highgate Road - GREEN 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 14.20 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 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) 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 - Heat pump

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:	0.47	
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: 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 electric heat pump		
Photovoltaic array		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012	<u> </u>	Strom Softwa					010943 on: 1.0.5.50	
	F	Property	Address	01 - D					
Address: 1. Overall dwelling dime	anaiona:								
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.65	(2a) =	164.25	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	61.98	(4)			J		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	164,25	(5)
2. Ventilation rate:								104.20	(0)
2. Ventilation rate.	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating + 0	- + -	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	╡╻┝	0]	0	x	20 =	0	(6b)
Number of intermittent fa	ins			J	0	x -	10 =	0	(7a)
Number of passive vents	;			L	0	x ·	10 =	0	(7b)
Number of flueless gas fi				L	0	x 4	40 =	0	(7c)
rambor of hadrood gad h				L	0			0	(70)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+($	7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended, proceed	ed to (17),	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9).	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	uction	[(0)	1,10.1 =	0	(11)
if both types of wall are p	resent, use the value corresponding t			•					` `
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	ı 1 (seal	ed) else	enter ()				0	(12)
If no draught lobby, en	,	(000)	ou), 0.00	ontor o				0	(13)
	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metro	•	•	•	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$ if a pressurisation test has been do				io hoina u	and		0.15	(18)
Number of sides sheltere		ne or a de	gree air pe	пеаышу	is being u	seu		0	(19)
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			1	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	x (20) =				0.15	(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]	
· · · · · · · · · · · · · · · · · · ·		•	•		•	•	•	•	

	ation rate	0.18	0.16	0.16	0.14		<u> </u>	<u>` </u>	0.40	0.47	0.40		
0.19 Calculate effe					l -	0.14 se	0.14	0.15	0.16	0.17	0.18		
If mechanic		_										0.5	(23
If exhaust air h	eat pump ι	ısing Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)), othe	rwise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	very: effici	iency in %	allowing f	or in-use fa	actor (from	Table 4h) =				75.65	(23
a) If balance	d mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24
b) If balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	/IV) (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 h if (22b)r	ouse ext n < 0.5 ×			•	•				5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation			•	•				0.51			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				l	
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losse	e and ha	ot loce r	paramoto	or:									
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	IE	AXU		k-value	e AX	k
	area		m		A ,n		W/m2		(W/I	<)	kJ/m²·ł		
Windows					12.07	x1,	/[1/(1.4)+	0.04] =	16				(27
Floor					61.98	X	0.13	= [8.0574		75	4648.5	(28
Walls Type1	30.8	7	12.07	7	18.8	X	0.18	= [3.38		60	1128	(29
Walls Type2	27.4	5	0		27.45	x	0.17	_ = [4.61		60	1647	(29
Total area of e	lements,	, m²			120.3								_ (31
Party wall					31.67	Х	0	=	0		45	1425.15	(32
Party ceiling					61.89						30	1856.7	(32
Internal wall **	į.				95.03					Ī	9	855.27	(32
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	re)+0.04] a	s given in	paragraph	3.2	_
include the after	ss, W/K =	= S (A x	U)	,			(26)(30)	+ (32) =				32.05	(33
		,	,						(00) - (00	0) + (225)	(32e) =	11560.62] (34
Fabric heat los	Cm = S(Axk)						((28)	.(30) + (32)	1) + (32a).	()		╡
Fabric heat los Heat capacity Thermal mass	•	,	P = Cm ÷	- TFA) ir	n kJ/m²K				$\div (4) =$	L) + (32a).	(0_0)	186.52	(35
Fabric heat los Heat capacity Thermal mass For design asses:	paramet	ter (TMF	tails of the	•			ecisely the	= (34)	÷ (4) =	, , ,		186.52	<u></u> (35
Fabric heat los Heat capacity	parametes when	ter (TMF ere the det tailed calcu	tails of the ulation.	constructi	ion are not	known pr	ecisely the	= (34)	÷ (4) =	, , ,		9.43](35](36
Fabric heat lost Heat capacity Thermal mass For design assess can be used instead the trings of thermal bridg	paraments who ad of a detection and of a detection and bridging a large serious and bridging a large se	ter (TMF ere the det tailed calcu x Y) calc	tails of the ulation. culated u	constructius	ion are not pendix k	known pr	ecisely the	= (34)	÷ (4) =	, , ,		9.43](36
Fabric heat lost Heat capacity Thermal mass For design assess can be used inste Thermal bridg if details of thermal Total fabric he	parameters when the sad of a determined by the same of a determined by the same of the sam	ter (TMF ere the dec tailed calcu x Y) calcu are not kn	tails of the ulation. culated u	constructiusing Ap	ion are not pendix k	known pr	ecisely the	= (34) e indicative (33) +	$\div (4) =$ • values of $(36) =$	TMP in T	able 1f](36
Fabric heat lost Heat capacity Thermal mass For design assess can be used inste Thermal bridg if details of thermat Total fabric heat	paramer sments who ad of a det es: S (L al bridging at loss at loss ca	ter (TMF ere the dec ailed calcu x Y) calcu are not known	tails of the ulation. culated u own (36) =	constructions and constructions and constructions are constructed as the construction of the construction	pendix h	known pr		= (34) = indicative (33) + (38)m	$\div (4) =$ • values of $(36) =$ $= 0.33 \times ($	<i>TMP in T</i> 25)m x (5	able 1f	9.43](36
Fabric heat los Heat capacity Thermal mass For design assess can be used inste	parameters when the sad of a determined by the same of a determined by the same of the sam	ter (TMF ere the dec tailed calcu x Y) calcu are not kn	tails of the ulation. culated u	constructiusing Ap	ion are not pendix k	known pr	Aug	= (34) e indicative (33) +	$\div (4) =$ • values of $(36) =$	TMP in T	able 1f	9.43](36](37
Fabric heat lost Heat capacity Thermal mass For design assess can be used instet Thermal bridg if details of thermal Total fabric heat Ventilation heat (38)m= 16.97	paramer sments whe ad of a det es: S (L al bridging a at loss at loss ca Feb	ter (TMF ere the dec tailed calcu x Y) calcu are not know alculated Mar 16.56	tails of the ulation. culated u own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix h	known pr	Aug	= (34) e indicative (33) + (38)m Sep 14.73	\div (4) = \cdot values of (36) = \cdot = 0.33 × (\cdot Oct 15.34	25)m x (5 Nov 15.75	able 1f	9.43	_
Fabric heat lost Heat capacity Thermal mass For design assess can be used instead for thermal bridge if details of thermated Total fabric heat Ventilation heat Language Langu	paramer sments whe ad of a det es: S (L al bridging a at loss at loss ca Feb	ter (TMF ere the dec tailed calcu x Y) calcu are not know alculated Mar 16.56	tails of the ulation. culated u own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix h	known pr	Aug	= (34) e indicative (33) + (38)m Sep 14.73	$\div (4) =$ • values of $(36) =$ $= 0.33 \times ($ Oct	25)m x (5 Nov 15.75	able 1f	9.43](36](37

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.94	0.94	0.94	0.92	0.92	0.9	0.9	0.9	0.91	0.92	0.92	0.93		
	!								Average =	Sum(40) ₁	12 /12=	0.92	(40)
Number of day	<u> </u>	1 ` ` 	· ·										
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 requ	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		04		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the α	lwelling is	designed i	` ,		se target o		2.58		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								LOOP		1 1101			
(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		
` ,									I Total = Su	ım(44) ₁₁₂ =	-	990.95	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	0 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	ım(45) ₁₁₂ =	=	1299.3	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)	1				
(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) includir	na anv sa	alar or M	/\/\HRS	etorana	within es	ama vas	امء		0		(47)
If community h	` '	•				Ū		anio voo	001		0		(47)
Otherwise if no	-			_			, ,	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):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact			-										(54)
Hot water stor If community h	•			ie Z (KVV	n/litre/da	ly)				0.	02		(51)
Volume factor	•		011 4.5							1	03		(52)
Temperature f			2b							-	.6		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or		_	,							-	03		(55)
Water storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m		'		
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain												x H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
	<u> </u>	ļ.		<u>l</u>	L		L	L		<u> </u>	<u> </u>		(58)
Primary circuit Primary circuit	,	,			59)m – 1	(58) <u>-</u> 36	S5 ~ (41)	ım			0		(30)
(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)
		<u> </u>	L	L		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>			*

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$												
		``	00) +	0 7 (41) o	0	0	T 0	0	1	(61)	
Total heat required for water									<u> </u>	[(50)m + (61)m	(0.)	
(62)m= 189.99 167.74 176			141.20		148.		165.33	173.63	185.74	(39)III + (81)III]	(62)	
Solar DHW input calculated using			ļ]	(02)	
(add additional lines if FGH							ii continbu	lion to wat	er ricating)			
·) (0	0	0	0	0	0	0	1	(63)	
Output from water heater	I				<u> </u>		<u> </u>		<u> </u>	1		
(64)m= 189.99 167.74 176	5.85 159	49 156.98	141.20	3 136.6	148.	6 147.93	165.33	173.63	185.74	1		
						Output from w	<u> </u>	<u> </u>	<u> </u>	1950.14	(64)	
Heat gains from water hea	tina kWI	/month 0.2	25 ′ [0 8	35 × (45)m						1	_	
(65)m= 89.01 79.12 84.	-		71.98		75.2		80.82	82.74	87.6]	(65)	
include (57)m in calculat	ion of (6	!	cylinde	is in the			ater is f	rom com	ımunity k	J neating		
5. Internal gains (see Tab	· ·	· ·	oy iii idoi	10 111 1110	awo	ig or not w	ator io i	10111 00111	irriariity i	louting		
Metabolic gains (Table 5),		οα).										
	lar A	or May	Jun	Jul	Au	g Sep	Oct	Nov	Dec	1		
(66)m= 101.85 101.85 101	_	 	101.8		101.8		101.85	101.85	101.85		(66)	
Lighting gains (calculated i	n Appen	dix L. equa	tion L9	or L9a). a	also se	e Table 5	1	1	<u> </u>	ı		
(67)m= 16.02 14.23 11.	- i -		5.53	5.97	7.77		13.23	15.45	16.47]	(67)	
Appliances gains (calculate	ed in Apr	endix L. ec	uation	 L13 or L1	л (За), а	 Iso see Ta	ble 5		<u> </u>	ı		
(68)m= 177.91 179.76 175			140.9		131.2		145.81	158.31	170.06	1	(68)	
Cooking gains (calculated	in Apper	dix Legua	tion I 1	 5 or I 15a) also	see Table	· 5			J		
(69)m= 33.19 33.19 33.	- i -		33.19		33.1		33.19	33.19	33.19	1	(69)	
Pumps and fans gains (Tal	 ole 5a)	l								J		
· 		0	0	T 0	0	0	0	0	0	1	(70)	
Losses e.g. evaporation (n	egative v	L alues) (Tal	ole 5)	_!	<u> </u>	!			<u> </u>	J		
(71)m= -81.48 -81.48 -81			-81.48	8 -81.48	-81.4	8 -81.48	-81.48	-81.48	-81.48	1	(71)	
Water heating gains (Table			-							J		
(72)m= 119.64 117.73 113		39 104.89	99.97	95.78	101.1	4 103.05	108.62	114.92	117.74	1	(72)	
Total internal gains =	!		ļ			m + (69)m +		<u> </u>	<u> </u>	1		
(73)m= 367.13 365.28 35	54 335	.9 317.69	300	288.41	293.7	·	321.22	342.23	357.82	1	(73)	
6. Solar gains:									l			
Solar gains are calculated using	solar flux	rom Table 6a	and ass	ociated equa	ations to	convert to th	ne applica	ble orienta	tion.			
Orientation: Access Facto		rea		lux		g_		FF		Gains		
Table 6d		n²	Т	able 6a		Table 6b	Т	able 6c		(W)		
Northeast _{0.9x} 0.77	x	12.07	x	11.28] x [0.63	x	0.7	=	41.62	(75)	
Northeast 0.9x 0.77	x	12.07	X	22.97	x	0.63	x	0.7	=	84.72	(75)	
Northeast 0.9x 0.77	x	12.07	x	41.38] x [0.63	x [0.7	=	152.64	(75)	
Northeast 0.9x 0.77	x	12.07	х	67.96	Ī×[0.63	x [0.7	=	250.67	(75)	
Northeast 0.9x 0.77	x	12.07	x	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.	07	x	91.1	x_[0.63	x	0.7	=	336.05	(75)
Northeast 0.9x	0.77	х	12.	07	x	72.63	x_[0.63	x	0.7	=	267.9	(75)
Northeast 0.9x	0.77	х	12.	07	x	50.42	x_[0.63	x	0.7	=	185.99	(75)
Northeast 0.9x	0.77	Х	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	×		0.63	_ x	0.7		52.37	(75)
Northeast 0.9x	0.77	х	12.	07	x	9.21	i x		0.63	x	0.7	=	33.99	(75)
							•							
Solar gains ir	n watts, ca	alculated	I for eac	h month			(83)m	ı = Sı	um(74)m .	(82)m				
(83)m= 41.62	84.72	152.64	250.67	336.95	359.2	3 336.05	267	'.9	185.99	103.53	52.37	33.99		(83)
Total gains –	internal a	and solar	(84)m =	= (73)m	+ (83)	m , watts						•	•	
(84)m= 408.75	449.99	506.64	586.58	654.65	659.2	3 624.46	561.	.62	488.92	424.75	394.6	391.81		(84)
7. Mean inte	ernal temp	perature	(heating	season)									
Temperatur	e during h	neating p	eriods ir	the livi	ng are	a from Ta	ble 9,	Th	1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see	Table 9a)								
Jan	Feb	Mar	Apr	May	Jur	n Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m= 0.99	0.98	0.96	0.89	0.73	0.53	0.39	0.4	5	0.72	0.93	0.98	0.99		(86)
Mean intern	al temper	ature in	living an	ea T1 (fo	ollow s	tens 3 to	7 in T	able	9c)			•		
(87)m= 19.86	20.01	20.29	20.66	20.9	20.98	_i	20.9		20.93	20.61	20.18	19.84		(87)
					المديدة		مامام ۵		-2 (00)		!	Į.		
Temperature (88)m= 20.13		20.14	20.15	20.15	20.17	<u> </u>	20.1		20.16	20.15	20.15	20.14		(88)
` /		<u> </u>				!		''	20.10	20.10	20.10	20.14		(00)
Utilisation fa	 				1	`	T			T	1	T	Ī	(00)
(89)m= 0.99	0.98	0.95	0.86	0.68	0.46	0.32	0.3	37	0.65	0.91	0.98	0.99		(89)
Mean intern	al temper	ature in	the rest	of dwell	ing T2	(follow ste	eps 3	to 7	in Tabl	e 9c)		_	•	
(90)m= 18.61	18.83	19.23	19.75	20.05	20.1	20.17	20.1	17	20.1	19.7	19.09	18.59		(90)
									f	fLA = Livir	ng area ÷ (4) =	0.41	(91)
Mean intern	al temper	ature (fo	r the wh	ole dwe	lling) =	= fLA × T1	+ (1 -	– fL	A) x T2					
(92)m= 19.13	19.32	19.67	20.12	20.4	20.49	20.51	20.5	51	20.44	20.07	19.54	19.1		(92)
Apply adjust	tment to t	he mean	interna	temper	ature	from Table	e 4e, v	whe	re appro	opriate			•	
(93)m= 19.13	19.32	19.67	20.12	20.4	20.49	20.51	20.5	51	20.44	20.07	19.54	19.1		(93)
8. Space he	ating requ	uirement												
Set Ti to the					ned at	step 11 of	Table	e 9b	o, so tha	t Ti,m=	(76)m an	id re-cald	culate	
the utilisatio	Feb	Mar		May	Jur	n Jul	Ι	ا ما	Sep	Oct	Nov	Dec		
Utilisation fa			Apr	iviay	Jui	ı Jui	I A	ug	Sep	Oct	INOV	Dec		
(94)m= 0.98	0.97	0.95	0.86	0.69	0.49	0.35	0.4	4	0.68	0.91	0.97	0.99		(94)
Useful gains								!						
(95)m= 402.16		479.15	504.57	454.72	323.1	5 217.17	226.	.61	331.3	385.86	383.5	386.49		(95)
Monthly ave		rnal tem	perature	from T	able 8	!		!				<u>I</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 ra	te for me	an intern	al tempe	erature,	Lm , V	V =[(39)m	x [(93	3)m-	- (96)m]				
(97)m= 866.53	839.72	764.37	640.06	494.25	328.9	6 218.04	228.	.34	356.44	538.18	711.9	859.04		(97)
Space heati	ng require	ement fo	r each n	nonth, k	Wh/mo	onth = 0.02	24 x [(97)	m – (95)m] x (4	1)m		•	
(98)m= 345.5	269.72	212.21	97.55	29.41	0	0	0		0	113.33	236.45	351.58		

-	Total per year (kWh/	year) = Sum(98) _{15,912} =	1655.74	(98)
Space heating requirement in kWh/m²/year			26.71	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating p Fraction of space heat from secondary/supplementary heating (Table	•	nmunity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =	,	Ī	1	(302)
The community scheme may obtain heat from several sources. The procedure allows	for CHP and up to f	L our other heat sources; the	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See Approximation of heat from Community heat pump	ppendix C.	Г	1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating eyetem	(302) x (303a) =	1	(305)
Distribution loss factor (Table 12c) for community heating system	nealing system	L	1.05	(306)
		L		
Space heating Annual space heating requirement		Γ	1655.74	<u>'</u>
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1738.52	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating		_		
Annual water heating requirement			1950.14	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2047.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	37.86	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsi	ide	Γ	131.85	(330a)
warm air heating system fans		Ī	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	131.85	(331)
Energy for lighting (calculated in Appendix L)		Ī	282.93	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		Ī	-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (3	15) + (331) + (33	32)(237b) =	4092.13	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh k	missions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two forms	fuels repeat (363) to	(366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b))] x 100 ÷ (367b) x	0.52	701.79	(367)
Electrical energy for heat distribution [(313)	x	0.52	19.65	(372)

Total CO2 associated with community sy	ystems	(363)(366) + (368)(37	72) =	721.4	(373)
CO2 associated with space heating (sec	condary)	(309) x	0 =	0	(374)
CO2 associated with water from immers	ion heater or instanta	neous heater (312) x	0.22	0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =		721.4	(376)
CO2 associated with electricity for pump	s and fans within dwe	elling (331)) x	0.52	68.4	3 (378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	146.8	(379)
Energy saving/generation technologies (Item 1	(333) to (334) as appl	icable	0.52 x 0.01 =	-56.4	(380)
Total CO2, kg/year	sum of (376)(382) =			880.2	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.2	(384)
El rating (section 14)				88.9	7 (385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:46:56*

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)

24.25 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

11.65 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 - Heat pump

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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
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 electric heat pump		
Photovoltaic array		

		Heor	Details:						
A No	Noil look are	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:	5.1011.107.11 2012		y Address:		0.011.		7 0 10 10	711 11010100	
Address :		·							
1. Overall dwelling dime	ensions:								
Ground floor		Ar	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	-) . (4 -) . (4 -) . (4 -) . (4 -)	. (4.5)		(1a) x	2	65	(2a) =	184.02	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(1n)	69.44	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	184.02	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
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				Ĺ	0		10 =	0	(7a)
Number of passive vents				L	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	0		÷ (5) =	0	(8)
•	peen carried out or is intended			ontinue fr			- (3) =	0	(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			•	ruction			0	(11)
deducting areas of openii		oriding to the gre	aler wall are	a (anter					
If suspended wooden f	floor, enter 0.2 (unseale	d) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
ŭ	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2	, ,	_	. (45)		0	(15)
Infiltration rate	aro avaraged is subject		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic $(18) = (17)$	•	•	•	etre or e	envelope	area	3	$=$ $\begin{pmatrix} (17) \\ (49) \end{pmatrix}$
•	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere			,	,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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]	
					<u> </u>			J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19 Calculate effe	0.19	0.18	0.16	0.16 he appli	0.14 Cable ca	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		•	ato for t	пс арри	oabio oa	00					[0.5	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)		Ì	0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =			Ì	74.8	(230
a) If balance	d mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	_
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(24
b) If balance	d mech	anical ve	ntilation	without	heat red	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 h if (22b)r		tract ver (23b), t		•					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-			
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	eat loss r	paramete	ėr.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	K)	k-value kJ/m².k		X k
Windows Type		(111-)	11	_	8.97		۷۷/۱۱۱۷ +(1.4)/[]/		11.89		KJ/III-•I	KU/	(27
Windows Type					2.92	_	/[1/(1.4)+	Ļ		=			(27
Walls Type1			44.0	$\overline{}$		=		— ;	3.87	북 ,			
Walls Type1	41.5		11.89		29.62	_	0.18	=	5.33	륵 ¦	60	1777.2	=
Total area of e	16.7		0		16.73	=	0.17	= [2.81		60	1003.8	
Party wall	iemenis	, 111-			58.24	=							(31)
					40.43	=	0	=	0		45	1819.35	=
Party floor					69.44					[40	2777.6	=
Party ceiling					69.44					Ĺ	30	2083.2	=
Internal wall **					136.2			<i>r</i>		. L	9	1225.89	9 (32
* for windows and ** include the area						ated using	i tormula 1.	/[(1/U-valu	ie)+0.04] a	is given in	paragraph	3.2	
Fabric heat los	s, W/K :	= S (A x	U)	,			(26)(30)	+ (32) =				23.9	(33
Heat capacity		•	,					((28)	.(30) + (32	2) + (32a).	(32e) =	10687.04	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =		[153.9	(35
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<					[6.99	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)				,·		r		_
Total fabric he		-l-: !-:							(36) =	(E)		30.9	(37
Ventilation hea					1	1, .1	Α		= 0.33 × (.			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38
(38)m= 19.27	19.04	18.81	17.67	17.44	16.3	16.3	16.08	16.76	17.44	17.9	18.35		(30
Heat transfer o	nofficiar	at \///K						(20)m	= (37) + (37)	38/m			
39)m= 50.16	49.93	49.71	48.57	48.34	47.2	47.2	46.97	47.66	48.34	48.79	49.25		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.72	0.72	0.72	0.7	0.7	0.68	0.68	0.68	0.69	0.7	0.7	0.71		
		!	<u>. </u>	<u>. </u>		!	!		Average =	Sum(40) ₁	12 /12=	0.7	(40)
Number of da	`	1 ·	· ·						l _				
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	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ 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.		23		(42)
Annual average Reduce the annual not more that 125	ial average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								1 - 22		1			
(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		
	!	!	<u> </u>	ļ.		<u> </u>	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1046.65	(44)
Energy content o	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(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		
If instantaneous			-f /		()		havea (40		Total = Su	m(45) ₁₁₂ =	= [1372.32	(45)
If instantaneous		· ·	·	1	,.		, ,	, , , I		1			
(46)m= 21.34 Water storage	18.67	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67		(46)
Storage volun) includir	ng anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	` '					_							()
Otherwise if n	_			-			, ,	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-								02		(51)
If community	•			0 2 (1111)	1,11ti 0, de	•97				0.	02		(01)
Volume factor	•									1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost from	om watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	03		(55)
Water storage	e loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circui	t loss (ar	nnual) fro	m Table	3							0		(58)
Primary circui	,	,			59)m = ((58) ÷ 36	65 × (41)	m					
(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 o	·alculated	for each	month ((61)m –	(60) ÷	365 🗸 (41)m							
(61)m= 0	0	0	0	0 1)111 =	00) +	1 0))	0	0	0	0	1	(61)
													J · (59)m + (61)m	(-)
(62)m= 197.5		183.69	165.44	162.7	146.19		153	_	153.24	171.52	180.38	193.07	(39)III + (01)IIII]	(62)
Solar DHW inpu													J	(/
(add addition										i ooninba	iion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	1	(63)
Output from	uwater hea	ter	<u> </u>			-				l		<u> </u>	J	
(64)m= 197.5		183.69	165.44	162.7	146.19	141.17	153	.84	153.24	171.52	180.38	193.07	1	
		I	<u> </u>	ļ	<u> </u>	1		Outp	out from wa	ater heate	r (annual)₁	12	2023.16	(64)
Heat gains fr	om water	heating.	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	(1)m	1] + 0.8 >	د [(46)m	+ (57)m	+ (59)m	 n]	-
(65)m= 91.53		86.92	80.02	79.94	73.62	72.78	76.	_	75.96	82.87	84.98	90.04]	(65)
include (57	7)m in cal	culation of	of (65)m	only if c	vlinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal			. ,		•							,	<u> </u>	
Metabolic ga	·													
Jan	T '	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.6	2 111.62	111.62	111.62	111.62	111.62	111.62	111	.62	111.62	111.62	111.62	111.62		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				-	
(67)m= 18	15.98	13	9.84	7.36	6.21	6.71	8.7	72	11.71	14.87	17.35	18.5]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a),	also	see Ta	ble 5		-	_	
(68)m= 195.9	9 198.02	192.9	181.98	168.21	155.27	146.62	144	.59	149.71	160.62	174.4	187.34]	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L1	or L15a), als	o se	e 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 f	ans gains	(Table	5а)			•							-	
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•				•		•	-	
(71)m= -89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89	0.3	-89.3	-89.3	-89.3	-89.3]	(71)
Water heatin	g gains (T	able 5)	-	-	-					-	-	-	_	
(72)m= 123.0	2 121.01	116.83	111.14	107.44	102.24	97.82	103	.49	105.5	111.39	118.03	121.02]	(72)
Total interna	al gains =				(6	6)m + (67)n	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	-	
(73)m= 393.4	9 391.5	379.21	359.45	339.5	320.21	307.64	313	.29	323.41	343.36	366.27	383.34]	(73)
6. Solar gai	ns:													
Solar gains are	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		_	g_ able 6b	т	FF able 6c		Gains	
						able ba	,	_ '	able ob	_ '	able oc		(W)	,
Northeast 0.9x		X	8.9)7	X	11.28	X		0.63	X	0.7	=	30.93	(75)
Northeast 0.9x		X	8.9	7	X	22.97	X		0.63	×	0.7	=	62.96	(75)
Northeast 0.9x	0	X	8.9	97	X	41.38	X	<u> </u>	0.63	×	0.7	=	113.43	(75)
Northeast 0.9x		X	8.9	7	x	67.96	X	<u> </u>	0.63	×	0.7	=	186.29	(75)
Northeast 0.9x	0.77	X	8.9	7	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	×	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	X	8.9	97	х	91.1	X	0.63	X	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	X	8.9	97	х	72.63	X	0.63	X	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	X	8.9	97	х .	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	Х	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 1	06.25		0.63	x	0.7	=	94.82	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x 1	19.01		0.63	x	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x 1	18.15]	0.63	x	0.7	=	105.44	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x 1	13.91		0.63	x	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x 1	04.39		0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x .	92.85]	0.63	×	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	×	2.9	92	x =	31.49	Ī	0.63	×	0.7	=	28.1	(79)
Solar gains in						1	`	n = Sum(74)m.		1		7	(00)
(83)m= 63.76		89.96	281.11	356.62	372.4	351.39	292	.25 221.08	138.7	6 78.25	53.36]	(83)
Total gains – i $(84)m = 457.26$		50iai 69.17	640.56	696.12	692.61	659.04	605	.54 544.49	482.1	2 444.51	436.7	1	(84)
` '	LL				<u> </u>	039.04	003	.54 544.49	402.17	2 444.51	430.7]	(04)
7. Mean inter	•		`		/								
Temperature	ŭ	٠.			Ū		ble 9	, Th1 (°C)				21	(85)
Utilisation fac					` 					1		7	
Jan	 	Mar	Apr	May	Jun	Jul	 	ug Sep	Oct	+	Dec		(00)
(86)m= 0.98	0.96	0.91	8.0	0.62	0.43	0.31	0.3	36 0.59	0.85	0.96	0.98]	(86)
Mean interna	 	T		· `	1	eps 3 to 7	7 in T	able 9c)				7	
(87)m= 20.14	20.31 2	0.56	20.83	20.96	20.99	21	2	1 20.98	20.8	20.44	20.12]	(87)
Temperature	during hea	ting p	eriods ir	rest of	dwelling	g from Ta	able 9	9, Th2 (°C)		_		_	
(88)m= 20.32	20.32 2	0.33	20.34	20.34	20.36	20.36	20.	36 20.35	20.34	20.34	20.33		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,m (s	ee Table	9a)						
(89)m= 0.97	0.95	0.9	0.77	0.58	0.39	0.27	0.3	31 0.54	0.83	0.95	0.98		(89)
Mean interna	l temperatu	ıre in t	the rest	of dwelli	ina T2 (1	ollow ste	eps 3	to 7 in Tabl	e 9c)	-	•	_	
(90)m= 19.17		9.77	20.14	20.3	20.35	20.36	20.		20.11	19.61	19.15]	(90)
				!	!	!		1	LA = Liv	ving area ÷ (4) =	0.34	(91)
Mean interna	l temperatu	ıro (fo	r tha wh	ماه طسم	lling) – f	: Δ ∪ T 1	 /1	_ fl ∧\ ∨ T≎					
(92)m= 19.51	 	`				1	Ť	- i 	00.05	. 1 40 0	10.40	1	(02)
	1 19.77 1 7	().()4	20.38	20.53	20.57	20.58	20	58 20.55	20.35	199	19.48		(92)
Apply adjustr		mean	20.38 interna	20.53 temper	20.57 ature fro	20.58 om Table	20. e 4e.		20.35 opriate		19.48]	(92)

(93)m= 19.51	19.72	20.04	20.38	20.53	20.57	20.58	20.58	20.55	20.35	19.9	19.48		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l		<u> </u>				5						
(94)m= 0.97	0.94	0.89	0.77	0.59	0.4	0.28	0.32	0.55	0.83	0.94	0.97		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m= 441.94	482.27	508.95	494.78	412.34	280.41	187.58	195.95	300.31	398.27	418.19	424.3		(95)
Monthly average		1	-	from T	1	·	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 loss rate	i	i	· ·		ì	- ` 	<u> </u>	<u> </u>			i		()
(97)m= 762.69	740.05	672.95	557.45	426.72	281.99	187.77	196.33	307.58	471.09	624.48	752.71		(97)
Space heatin (98)m= 238.64	g require 173.23	122.02	r each n 45.12	10.7	Wh/mon	$\frac{10 - 0.02}{0}$	24 x [(97])m – (95 0)m] x (4 54.18	1)m 148.53	244.34		
(98)m= 238.64	173.23	122.02	45.12	10.7	0	0				l .		4000.70	7(00)
							rota	l per year	(kvvn/year) = Sum(9	8)15,912 =	1036.76	(98)
Space heatin	g requir	ement in	kWh/m²	/year								14.93	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme								
This part is use Fraction of spa										unity sch	neme.		7(204)
·			•		•	_	(Table T	1) 0 11 11	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so									up to four	other heat	sources; ti	he latter	
includes boilers, he Fraction of hea		-			rom powei	r stations.	See Appei	naix C.				1	(303a)
Fraction of total				•	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem		1	(305)	
Distribution los	ss factor	(Table 1	12c) for d	commun	ity heatii	ng syste	m					1.05	(306)
Space heating	a										!	kWh/yea	
Annual space	_	requiren	nent									1036.76	7
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1088.59	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/suլ	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	7												
Annual water h		equirem	ent									2023.16	
If DHW from c													-
Water heat fro		•)						5) x (306) :		2124.32	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)([310e)] =	32.13	(313)
Cooling System Energy Efficiency Ratio										0	(314)		
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											i		7,000
mechanical ve	ntilation	- baland	ed, extr	act or po	sitive in	put from	outside					169.72	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		169.72	(331)
Energy for lighting (calculated in Appendix L)				317.84	(332)
Electricity generated by PVs (Appendix M) (negative quantity	y)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3591.65	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	IP) using two fuels repeat (363) to	(366) for the second	fuel	280	(367a)
CO2 associated with heat source 1 [(307	7b)+(310b)] x 100 ÷ (367b) x	0.52	=	595.54	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.68	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	612.21	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instant	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			612.21	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	=	88.09	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	164.96	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	olicable	0.52 × 0.01	-	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				808.78	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				11.65	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:46:41*

Proiect Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 69.61m²Site Reference:Highgate Road - GREENPlot Reference:01 - 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)

24.38 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

11.70 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 - Heat pump

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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
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 electric heat pump		
Photovoltaic array		

		Lleo	Details:						
Access an Name .	No: Unahowa	0361		- M	L		CTDO	010010	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					010943 on: 1.0.5.50	
Continuito 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(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (4.5)		(1a) x	2	65	(2a) =	184.47	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	F(1n)	69.61	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	184.47	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of altimospess	heating he	ating		,			40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(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	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)	+(6b)+(7a)+(7b)+(7c) =	Г	0		÷ (5) =	0	(8)
•	peen carried out or is intended			ontinue fr			- (0) =	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			•	ruction			0	(11)
deducting areas of openii		maing to the git	eater wan are	a (anter					
If suspended wooden f	floor, enter 0.2 (unseale	d) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
ŭ	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	arro avaraged in subject		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic $(18) = (17)$	•	•	•	etre or e	envelope	area	3	(17)
•	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere				,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	x (20) =				0.15	(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		
					<u> </u>			I	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		-	rate for t	he appli	cable ca	se						· 	—
If mechanical If exhaust air h			andiv N (2	3h) - (23a	a) × Emy (e	aguation (1	VS)) othe	rwisa (23h) <i>- (</i> 23a)			0.5	(23:
If balanced with		0 11		, ,	, ,	. ,	,, .	`) = (23a)			0.5	(23)
		•	•	_					2h\m . /	00k) f	4 (00.0)	74.8	(23
a) If balance (24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	23b) x [0.3	÷ 100] 	(24
b) If balance					<u> </u>	l	l		<u> </u>		0.5		(2
(24b)m= 0		o 0	0	0 0	0	0	0	0	0	0	0]	(24
					ļ	<u> </u>		<u> </u>					(= .
c) If whole h	n < 0.5 ×			•					5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation 1 , the			•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	at lose r	naramete	or.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	16	AXU		k-value	e A	X k
	area	-	m		A ,r		W/m2		(W/		kJ/m²-l		/K
Windows Type	e 1				8.97	х1.	/[1/(1.4)+	0.04] =	11.89				(27
Windows Type	2				2.92	x1.	/[1/(1.4)+	0.04] =	3.87				(27
Walls Type1	41.5	59	11.89	9	29.7	x	0.18	=	5.35	= [60	1782	(29
Walls Type2	18.4	1	0		18.41	X	0.17	<u> </u>	3.09	₹ i	60	1104.0	6 (29
Total area of e	elements	, m²			60								 (31
Party wall					38.68	3 x	0		0		45	1740.0	6 (32
Party floor					69.61						40	2784.4	4 (32
Party ceiling					69.61					[30	2088.3	╡
Internal wall **	:				136.2	=					9	1225.8	= `
* for windows and	l roof wind				alue calcul		ı formula 1	/[(1/U-valu	ıe)+0.04] á	L as given in			· <u>o</u> _(
Fabric heat los				s and pan	inions		(26)(30)	+ (32) =				24.2	(33
Heat capacity		•	0)				, , , , ,		(30) + (32	2) + (32a).	(32e) =	10725.79	(34
Thermal mass	•	,	P = Cm -	- TFA) ir	n k.l/m²K			***	÷ (4) =	_, . (0_0,	(020)	154.08	(35
For design assess	sments wh	ere the de	tails of the	•			ecisely the	` '	. ,	TMP in T	able 1f	134.00	(00
Thermal bridg				usina An	pendix l	<						6.99	(36
if details of therma						•						0.99	(00
Total fabric he			()	(1	,			(33) +	(36) =			31.19	(37
Ventilation 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= 19.31	19.08	18.86	17.71	17.49	16.34	16.34	16.12	16.8	17.49	17.94	18.4		(38
Heat transfer	coefficier	nt, W/K			-	-	-	(39)m	= (37) + (38)m	-	•	
(39)m= 50.5	50.28	50.05	48.91	48.68	47.54	47.54	47.31	47.99	48.68	49.13	49.59		
					<u> </u>			<u> </u>	ь		<u>. </u>		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.73	0.72	0.72	0.7	0.7	0.68	0.68	0.68	0.69	0.7	0.71	0.71		
	1			ı		ı	ı		Average =	Sum(40) ₁ .	12 /12=	0.7	(40)
Number of da	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	ating ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occ 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		24		(42)
Annual average Reduce the annual not more that 125	ial average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.32		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								- 1					
(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		
									Total = Su	m(44) ₁₁₂ =		1047.84	(44)
Energy content o	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(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		
If instantaneous	watar baati	ing at naint	of upo (no	hot woto	· otorogol	ontor O in	hayaa (16		Total = Su	m(45) ₁₁₂ =	• [1373.88	(45)
If instantaneous		· ·	,	ı	, , , , , , , , , , , , , , , , , , ,		, ,	, , , I	1	1			(40)
(46)m= 21.37 Water storage	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69		(46)
Storage volun) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	` '					_							` '
Otherwise if n	_			_			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature											0		(49)
Energy lost from		•			!4		(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-								02		(51)
If community	•			_ (., 0, 0.0	-97				0.	02		(0.)
Volume factor	r from Ta	ble 2a								1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost from	om watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	e loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circui	t loss (ar	nnual) fro	m Table	- 							0		(58)
Primary circui	,	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	y factor f	rom Tab	le H5 if t	here is s	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 o	ealculated	for each	month ((61)m –	(60) ± 3	65 v (41	۱m							
(61)m= 0	0	0	0	0	00) - 0	00 x (+1)) 0		0	0	0	0	1	(61)
		<u> </u>		alculated	for eac	h month							J · (59)m + (61)m	` ,
(62)m= 197.7		183.83	165.57	162.82	146.29	141.27	153.	_	153.35	171.65	180.52	193.22]	(62)
Solar DHW inpu		using App	<u> </u>	Appendix	H (negat	I ive quantity	/) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	1	
(add addition												0,		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from	water hea	ter					•					•	•	
(64)m= 197.7	2 174.51	183.83	165.57	162.82	146.29	141.27	153.	96	153.35	171.65	180.52	193.22]	
	•							Outp	ut from wa	ater heate	er (annual) ₁	12	2024.72	(64)
Heat gains fi	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	+ (6	1)m	1] + 0.8 x	([(46)m	+ (57)m	+ (59)m	n]	
(65)m= 91.58	81.36	86.97	80.06	79.98	73.65	72.81	77.0)3	76	82.92	85.03	90.09]	(65)
include (5	7)m in cald	culation	of (65)m	only if c	ylinder	is in the	dwelli	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):										
Metabolic ga	ins (Table	e 5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	лg	Sep	Oct	Nov	Dec]	
(66)m= 111.8	3 111.83	111.83	111.83	111.83	111.83	111.83	111.	83	111.83	111.83	111.83	111.83		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso s	ee T	Table 5				_	
(67)m= 18.0 ²	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 of	ains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Ta	ble 5		-	-	
(68)m= 196.3	9 198.42	193.29	182.36	168.55	155.58	146.92	144.	88	150.02	160.95	174.75	187.72]	(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a), also	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 f	ans gains	(Table 5	5a)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)									
(71)m= -89.4	6 -89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.	46	-89.46	-89.46	-89.46	-89.46]	(71)
Water heatin	g gains (T	able 5)											_	
(72)m= 123.1	121.08	116.89	111.2	107.5	102.29	97.87	103.	54	105.55	111.45	118.1	121.09]	(72)
Total intern	al gains =				(66	s)m + (67)m	ı + (68)m +	- (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 394.0	7 392.08	379.76	359.97	339.98	320.65	308.06	313.	71	323.86	343.85	366.79	383.9		(73)
6. Solar gai	ns:													
Solar gains are		•				·	itions t	0 CO		e applica		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Ta	ıx ıble 6a		Т	g_ able 6b	т	FF able 6c		Gains (W)	
North coat a c				1			1 1						. ,	1,
Northeast 0.9		X	8.9		_	11.28	X [0.63	_ ×	0.7	=	30.93	(75)
Northeast 0.9		X	8.9			22.97	X		0.63	×	0.7	=	62.96	(75)
Northeast 0.9		X	8.9			41.38	X		0.63	×	0.7	=	113.43	[(75)
Northeast 0.9		X	8.9		-	67.96	X		0.63	_ ×	0.7	=	186.29	(75)
Northeast 0.9	0.77	X	8.9	7	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	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)7	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	1	0.63	x	0.7		94.82	(79)
Southwest _{0.9x}	0.77	x	2.9)2	X	119.01	1	0.63	x	0.7		106.2	(79)
Southwest _{0.9x}	0.77	x	2.9)2	X	118.15	Ī	0.63	x	0.7	<u> </u>	105.44	(79)
Southwest _{0.9x}	0.77	x	2.9)2	X	113.91	Ī	0.63	x	0.7		101.65	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	104.39	Ī	0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	92.85	Ī	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	j	0.63	x	0.7	=	39.33	(79)
Southwest _{0.9x}	0.77	x	2.9)2	x	31.49	j	0.63	×	0.7		28.1	(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	138.70	6 78.25	53.36		(83)
Total gains – i	nternal and	d solar	(84)m =	= (73)m ·	+ (83)m	, watts		-			-	-	
7. Mean internal temperature (heating season)]	(84)
` '		l			<u> </u>	659.46	605	.97 544.94	482.6	445.04	437.26		(84)
` '	nal tempe	rature	(heating	season)				482.6	445.04	437.26	21	(84)
7. Mean inter	nal temper during hea	rature (ating p	(heating eriods ir	season the livi) ng area	from Tal			482.6	445.04	437.26	21	_
7. Mean inter	nal temper during hea	rature (ating p	(heating eriods ir	season the livi) ng area	from Tal	ble 9		482.6 Oct		437.26 Dec	21	_
7. Mean inter Temperature Utilisation fac	nal tempe during hea ctor for gain	rature (ating p	(heating eriods ir iving are	season the livil ea, h1,m) ng area (see T	from Tal	ble 9	, Th1 (°C)				21	_
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.98	nal tempel during hea ctor for gain Feb	rature (ating points for li Mar 0.92	(heating eriods ir iving are Apr 0.8	season the living ea, h1,m May) ng area (see T Jun 0.44	from Tal able 9a) Jul 0.32	ble 9	, Th1 (°C) ug Sep 6 0.59	Oct	Nov	Dec	21	(85)
7. Mean inter Temperature Utilisation fac	nal tempe during hea etor for gain Feb 0.96	rature (ating points for li Mar 0.92	(heating eriods ir iving are Apr 0.8	season the living ea, h1,m May) ng area (see T Jun 0.44	from Tal able 9a) Jul 0.32	ble 9	Th1 (°C) Sep 0.59 Table 9c)	Oct	Nov 0.96	Dec	21	(85)
7. Mean intercontrol Temperature Utilisation factor Jan (86)m= 0.98 Mean internation (87)m= 20.14	rnal temper during heater for gain Feb 0.96 ltemperat 20.3	rature of atting points for line of the control of	(heating eriods ir iving are 0.8 iving are 20.83	season the livings, h1,m May 0.62 ea T1 (for 20.96	ng area (see T Jun 0.44 ollow ste 20.99	from Tal able 9a) Jul 0.32 eps 3 to 7	ble 9 A 0.3 7 in T	Th1 (°C) Sep 0.59 Table 9c) 1 20.98	Oct 0.85	Nov 0.96	Dec 0.98	21	(85)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.98 Mean interna (87)m= 20.14 Temperature	nal temper during heater for gain Feb 0.96 lt temperat 20.3 during heater	rature (ating points for li Mar 0.92 ure in l 20.55	(heating eriods ir iving are 0.8 iving are 20.83 eriods ir	season the livin ea, h1,m May 0.62 ea T1 (for 20.96	ng area (see T Jun 0.44 bllow ste 20.99 dwellin	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Ta	ble 9 A 0.3 7 in T	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C)	Oct 0.85	Nov 0.96	Dec 0.98	21	(85)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.98 Mean interna (87)m= 20.14 Temperature (88)m= 20.32	rnal temper during hea etor for gain Feb 0.96 Il temperat 20.3 during hea 20.32	rature (ating points for limits of	(heating eriods ir iving are 20.83) eriods ir 20.34	season the living the) ng area (see T Jun 0.44 ollow sto 20.99 dwellin 20.36	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Ta 20.36	ble 9 A 0.3 7 in T 2 able 9	Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C)	Oct 0.85	Nov 0.96	Dec 0.98	21	(85) (86) (87)
7. Mean intercent Temperature Utilisation factors Jan (86)m= 0.98 Mean internations (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors	rnal temper during heater for gain Feb 0.96 ltemperat 20.3 during heater for gain eter for gain	rature of ating points for line of the control of t	(heating eriods ir iving are 0.8 iving are 20.83 eriods ir 20.34 est of decided and the control of the control	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling,	ng area (see T Jun 0.44 ollow ste 20.99 dwellin 20.36 h2,m (s	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Ta 20.36	ble 9 A 0.3 7 in T 2 able 9 20.	Table 9c) 1 20.98 9, Th2 (°C)	Oct 0.85 20.79 20.34	Nov 0.96 20.44	Dec 0.98 20.12 20.33	21	(85) (86) (87) (88)
7. Mean intercontrol of the control	rnal temper during heater for gain Feb 0.96 lt temperat 20.3 during heater for gain 0.95	rature of ating points for line of the control of t	(heating eriods ir iving are 0.8 iving are 20.83 eriods ir 20.34 est of do 0.77	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58) ng area (see T	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Ta 20.36 eee Table 0.27	ble 9 A 0.3 7 in T 2 able 9 20. 9a) 0.3	Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35	Oct 0.85 20.79 20.34 0.83	Nov 0.96	Dec 0.98	21	(85) (86) (87)
7. Mean intercent Temperature Utilisation fact [86]m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation fact (89)m= 0.97 Mean internation fact (89)m= 0.97	rnal temper during heat temperat 20.3 during heat 20.32 etor for gail 0.95	rature of ating points for in 1 20.55 ating points for rough on 1 20.9 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1	criods ir Apr 0.8 iving are 20.83 eriods ir 20.34 est of do 0.77 the rest	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 rest of 20.34 welling, 0.58 of dwelling) ng area (see T	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Ta 20.36 eee Table 0.27 follow ste	ble 9 A 0.3 7 in T 2 able 9 20. 99a) 0.3	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 to 7 in Table	Oct 0.85 20.79 20.34 0.83 e 9c)	Nov 0.96 20.44 20.34	Dec 0.98 20.12 20.33	21	(85) (86) (87) (88) (89)
7. Mean intercontrol of the control	rnal temper during heat temperat 20.3 during heat 20.32 etor for gail 0.95	rature of ating points for line of the control of t	(heating eriods ir iving are 0.8 iving are 20.83 eriods ir 20.34 est of do 0.77	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58) ng area (see T	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Ta 20.36 eee Table 0.27	ble 9 A 0.3 7 in T 2 able 9 20. 9a) 0.3	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 to 7 in Tabl 36 20.33	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1	Nov 0.96 20.44 20.34 0.95	Dec 0.98 20.12 20.33 0.98		(85) (86) (87) (88) (89)
7. Mean intercent Temperature Utilisation fact [86]m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation fact (89)m= 0.97 Mean internation fact (89)m= 0.97	rnal temper during heat temperat 20.3 during heat 20.32 etor for gail 0.95	rature of ating points for in 1 20.55 ating points for rough on 1 20.9 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1 20.0 ating points for rough on 1	criods ir Apr 0.8 iving are 20.83 eriods ir 20.34 est of do 0.77 the rest	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 rest of 20.34 welling, 0.58 of dwelling) ng area (see T	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Ta 20.36 eee Table 0.27 follow ste	ble 9 A 0.3 7 in T 2 able 9 20. 99a) 0.3	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 to 7 in Tabl 36 20.33	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1	Nov 0.96 20.44 20.34	Dec 0.98 20.12 20.33 0.98	0.38	(85) (86) (87) (88) (89)
7. Mean intercent Temperature Utilisation fact Jan (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation fact (89)m= 0.97 Mean internation (90)m= 19.16 Mean internation (90)m= 19.16	during heat temperat 20.3 during heat 20.32 ctor for gain 0.95 ltemperat 19.4 dtemperat 19.4	rature of ating points for in the second sec	cheating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 the rest 20.13 er the wh	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling 20.3	mg area (see T Jun 0.44 collow str 20.99 dwellin 20.36 collow str 20.35 collows to 20.35 co	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Ta 20.36 eee Table 0.27 follow ste 20.36	ble 9 A 0.3 7 in T 2 able 9 20. 9a) 0.3 eps 3 20.	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 4 to 7 in Table 36 20.33 f fLA) x T2	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1 LA = Liv	Nov 0.96 20.44 20.34 0.95	Dec 0.98 20.12 20.33 0.98 19.14 4) =		(85) (86) (87) (88) (89) (90) (91)
7. Mean intercent Temperature Utilisation factors Jan (86)m= 0.98 Mean internations (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97 Mean internations (90)m= 19.16	rnal temper during heater for gain separate 20.3 during heater 20.32 etor for gain separate 19.4 ltemperat 19.74	rature ating points for line at the second s	cheating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 the rest 20.13 er the who 20.4	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 to rest of 20.34 welling, 0.58 of dwelling 20.3) ng area (see T	from Tal able 9a) Jul 0.32 eps 3 to 7 21 g from Tal 20.36 eee Table 0.27 follow ste 20.36 fLA × T1 20.6	ble 9 A 0.3 7 in T 2 able 9 20. 9a) 0.3 2pps 3 20. + (1 20	Th1 (°C) Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 10.54 to 7 in Table 36 20.33 f fLA) × T2 6 20.58	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1 LA = Liv	Nov 0.96 20.44 20.34 0.95 19.6 ving area ÷ (-	Dec 0.98 20.12 20.33 0.98		(85) (86) (87) (88) (89)

(00)	1 40 74	T 00 00		00.55			l	00.50	00.07	10.00	40.54	l	(02)
(93)m= 19.53 8. Space hea	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51		(93)
Set Ti to the				re obtair	ed at ste	ep 11 of	Table 9	b, so tha	t Ti.m=(76)m an	d re-calc	culate	
the utilisation			•			ор о.							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		ains, hm	i									l	
(94)m= 0.97	0.95	0.9	0.78	0.6	0.41	0.29	0.33	0.56	0.83	0.94	0.97		(94)
Useful gains	1	· `	r `	·									(05)
(95)m= 442.81	(95)m= 442.81 483.37 510.56 497.42 415.67 283.37 189.97 198.39 303.11 400.16 419.22 425.1 Monthly average external temperature from Table 8												(95)
(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]												(55)	
(97)m= 769.26	746.33	678.64	562.34	430.79	285.07	190.19	198.8	310.81	475.38	629.94	759.24		(97)
Space heating	ng requir	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= 242.87	176.71	125.05	46.74	11.25	0	0	0	0	55.96	151.71	248.6		
	•	•	•		•	•	Tota	l per year	(kWh/yea) = Sum(9	8) _{15,912} =	1058.9	(98)
Space heatir	ng require	ement in	kWh/m²	?/year								15.21	(99)
9b. Energy re	quiremer	nts – Coi	mmunity	heating	scheme	.							
This part is us	ed for sp	ace hea	iting, spa	ace cool	ing or wa	ater heat				unity sch	neme.		_
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none									0	(301)			
Fraction of space heat from community system 1 – (301) =										1	(302)		
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter													
includes boilers, includes fraction of he		-			rom powe	r stations.	See Appei	ndix C.				1	(303a)
Fraction of tot	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribution lo	ss factor	(Table 1	12c) for o	commun	ity heatii	ng syste	m					1.05	(306)
Space heatin	q											kWh/yea	—' r
Annual space	•	requiren	nent									1058.9	7
Space heat fro	om Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1111.84	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	g require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	α												
Annual water	_	requirem	ent									2024.72	
If DHW from o		•									!		<u></u>
Water heat fro	om Comr	nunity he	eat pump)				(64) x (30	03a) x (30	5) x (306) :	=	2125.95	(310a)
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	32.38	(313)
Cooling Syste	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for											'		_ _
mechanical ve	entilation	- balanc	ed, extra	act or po	sitive in	put from	outside					170.14	(330a)

warm air heating system fans				0	(330b)						
pump for solar water heating				0	(330g)						
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		170.14	(331)						
Energy for lighting (calculated in Appendix L)		318.62	(332)								
Electricity generated by PVs (Appendix M) (negative quantity) -108.82											
Total delivered energy for all uses (307) + (309) + (310) + (3	312) + (315) + (331) + (33	32)(237b) =		3617.74	(338)						
12b. CO2 Emissions – Community heating scheme											
	Energy kWh/year	Emission facto		nissions ı CO2/year							
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)	IP) using two fuels repeat (363) to	(366) for the second f	uel	280	(367a)						
CO2 associated with heat source 1 [(30	7b)+(310b)] x 100 ÷ (367b) x	0.52	=	600.15	(367)						
Electrical energy for heat distribution	[(313) x	0.52	=	16.8	(372)						
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	616.95	(373)						
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)						
CO2 associated with water from immersion heater or instant	taneous heater (312) x	0.22	=	0	(375)						
Total CO2 associated with space and water heating	(373) + (374) + (375) =			616.95	(376)						
CO2 associated with electricity for pumps and fans within dv	velling (331)) x	0.52	=	88.3	(378)						
CO2 associated with electricity for lighting	(332))) x	0.52	=	165.36	(379)						
Energy saving/generation technologies (333) to (334) as applitem 1	plicable	0.52 x 0.01	= [-56.48	(380)						
Total CO2, kg/year sum of (376)(382) =				814.14	(383)						
Dwelling CO2 Emission Rate (383) ÷ (4) =				11.7	(384)						

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:46:26

Project Information:

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

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.62m2 Site Reference :

Plot Reference: 01 - G 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 13.11 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 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 - Heat pump

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 m ³ /m ² h	
Dorty Walle II value	0.141/217	
Party Walls U-value	0 W/m²K	

Photovoltaic array

		User_[Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					0010943 on: 1.0.5.50	
		Property	Address	01 - G					
Address: 1. Overall dwelling dime	ancione:								
1. Overall dwelling dime	ensions.	Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		.65	(2a) =	134.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	50.62	(4)			_		
Dwelling volume			00.02)+(3c)+(3c	1)+(3e)+	(3n) =	40444	7(5)
				(00)1(00	71(00)1(00	a)	(011) =	134.14	(5)
2. Ventilation rate:	main seconda	ıry	other		total			m³ per hou	ır
Number of chimneys	heating heating	, 		7 = [x	40 =	-	(6a)
•		ᆜ 닏	0	╛╘	0		20 =	0	╡``
Number of open flues	0 + 0	+	0	」 ⁻	0			0	(6b)
Number of intermittent fa	ans			L	0	x	10 =	0	(7a)
Number of passive vents	5				0	Х	10 =	0	(7b)
Number of flueless gas f	ïres				0	х	40 =	0	(7c)
							Air ch	nanges per ho	SUP.
lafitantina dan ta abisana	(Co) (Cb)	(7a) . (7b) .	(7 0)	_					_
	eys, flues and fans = (6a)+(6b)+ been carried out or is intended, proce			continue fr	0 om (9) to 1		÷ (5) =	0	(8)
Number of storeys in t		ou to (11),	ouror moo (oriando n	0111 (0) 10 ((10)		0	(9)
Additional infiltration						[(9))-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber frame of	or 0.35 fc	r masoni	y consti	ruction			0	(11)
if both types of wall are p deducting areas of openi	present, use the value corresponding ings): if equal user 0.35	to 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	nter 0.05, else enter 0							0	(13)
Percentage of window	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 metr lity value, then $(18) = [(17) \div 20] +$	•	•	•	etre of e	envelope	e area	3	(17)
·	es if a pressurisation test has been do				is being u	sed		0.15	(18)
Number of sides sheltered			,	Í	· ·			0	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified		1	1		•		1	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		1	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 = (2	22)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>	•					_	-	

0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe	ctive air	change i	rate for t	he appli	cable ca	se	<u> </u>		ļ		<u>!</u>		
If mechanica												0.5	(2:
If exhaust air h		0		, ,	,	. ,	,, .	`) = (23a)			0.5	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(2
a) If balance						- ` 	- 	<u> </u>	2b)m + (23b) × [- ` ` `	÷ 100]	
24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b	m = (22)	2b)m + (23b)		Ī	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				_				
<u> </u>	n < 0.5 ×	<u> </u>	· ·	<u> </u>	ŕ	· ` `	É `		`	ŕ	1	1	(0
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilation								0.51				
24d)m= 0	0	0	0	0	0	0	0.5 + [(2	0	0.5]	0	0		(2
Effective air			,			<u> </u>							(_
25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(2
0.31	0.31	0.51	0.29	0.20	0.26	0.20	0.26	0.27	0.20	0.29	0.3		(2
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros	_	Openin		Net Ar		U-val		AXU		k-value		Χk
Caralanna	area	(m²)	m	l ²	A ,r		W/m2		(W/	K)	kJ/m²-l	K kJ	
/indows					8.97	x1	/[1/(1.4)+	0.04] = [11.89	ᆗ,			(2 —
/alls Type1	31.4	4	8.97		22.43	3 X	0.18	= [4.04	!	60	1345.8	3 (2
Valls Type2	22.9	92	0		22.92	2 x	0.17	=	3.85		60	1375.2	2 (2
otal area of e	lements	, m²			54.32	2							(3
arty wall					30.08	3 X	0	=	0		45	1353.6	3 (3
arty floor					50.62	2				[40	2024.8	3 (3
arty ceiling					50.62	2					30	1518.6	3 (3
nternal wall **	:				83.2						9	748.8	<u> </u>
for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	n paragraph	n 3.2	
* include the area				ls and par	titions								
abric heat los	3s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				19.78	(3
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	8366.8	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			165.29	(3
or design asses: an be used inste				construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
an be usea inste hermal bridge				ıcina Δr	nandiy l	<i>(</i>						5.00	$\neg_{\prime 2}$
details of therma	•	,			-	`						5.92	(3
otal fabric he		are not kir	OWII (30) =	- 0.00 X (3	'')			(33) +	(36) =			25.7	<u></u> (3
	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × ((25)m x (5)		
	ı	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
entilation hea	l Feb							-	-	 	+		
entilation hea	Feb 13.69	13.52	12.69	12.53	11.7	11.7	11.53	12.03	12.53	12.86	13.19		(3
Jan 8)m= 13.86	13.69	13.52	12.69	12.53	11.7	11.7	11.53		<u> </u>	<u> </u>	13.19		(3
entilation hea	13.69	13.52	12.69	12.53	37.39	37.39	37.23		12.53 = (37) + (38.22	<u> </u>	38.89	1	(3)

Heat loss par	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.78	0.78	0.77	0.76	0.76	0.74	0.74	0.74	0.75	0.76	0.76	0.77		
						l	l		Average =	: Sum(40) ₁	12 /12=	0.76	(40)
Number of da	-	nth (Tab	le 1a)		ı			1	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 hea	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occ 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		71		(42)
Annual avera Reduce the annu not more that 12:	ial 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		1											
(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		
	•								Total = Su	ım(44) ₁₁₂ =	-	897.28	(44)
Energy content of	of hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x C	OTm / 3600) 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		_
If instantaneous	water heat	ing at naint	of upo (no	hot woto	r otorogol	ontor O in	hayaa (16		Total = Su	ım(45) ₁₁₂ =	= [1176.48	(45)
If instantaneous	1	· ·	·	i	, , , , , , , , , , , , , , , , , , ,		, ,	, , , -	1		<u> </u>		(40)
(46)m= 18.3 Water storage	16 2 loss:	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72		(46)
Storage volur) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature											0		(49)
Energy lost fr		•			or io not		(48) x (49)) =		1	10		(50)
b) If manufactHot water sto			-							0	02		(51)
If community	•			_ (,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77				0.	.02		(= -)
Volume facto	r from Ta	ble 2a								1.	.03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fr		•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	e loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	it loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar 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 ca	alculated f	or each	month (′61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0	0	0	0	0	0	0 0	0	П	0	0	0	0	1	(61)
	uired for	water he	eating ca	L	L I for eac	h month	(62)ı	——I m =	0 85 x (′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 177.25		165.36	149.47	147.37	132.96	128.91	139.		139	154.93	162.27	173.4]	(62)
Solar DHW input	calculated u	using App	endix G or	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	J	
(add additiona												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from w	ater heat	er					•	•			•	•	•	
(64)m= 177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.	.78	139	154.93	162.27	173.4]	
	•			•	•	•		Outp	ut from wa	ater heate	er (annual)	12	1827.32	(64)
Heat gains fro	m water l	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	ı] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 84.78	75.41	80.82	74.71	74.84	69.22	68.71	72.3	32	71.23	77.36	78.96	83.5]	(65)
include (57)	m in calc	ulation o	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	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 85.42	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 gains	(calculat	ed in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso s	ее Т	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 ga	ins (calcu	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5		_		
(68)m= 148.84	150.39	146.5	138.21	127.75	117.92	111.35	109.	.81	113.7	121.99	132.45	142.28]	(68)
Cooking gains	s (calculat	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 fa	ns gains	(Table 5	5a)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.	33	-68.33	-68.33	-68.33	-68.33		(71)
Water heating	gains (T	able 5)											_	
(72)m= 113.95	112.22	108.64	103.76	100.59	96.14	92.35	97.	2	98.93	103.97	109.67	112.23		(72)
Total interna	l gains =				(66)m + (67)m	n + (68	8)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 325.01	323.3	313.57	298.03	282.52	267.37	257.39	262.	.22	270.09	285.81	303.84	317.1		(73)
6. Solar gain														
Solar gains are		ŭ				•	tions t	to co	nvert to th	e applical		tion.		
Orientation:	Access Fa Table 6d	actor	Area m²		Flu	ıx ble 6a		т.	g_ able 6b	т	FF able 6c		Gains (W)	
-							1 1	1 (1
Northeast 0.9x	0.77	X	8.9		_	11.28	X		0.63	_ ×	0.7	=	30.93	(75)
Northeast 0.9x	0.77	X	8.9			22.97	X		0.63	╛ [╵] ┝	0.7	_ =	62.96	(75)
Northeast 0.9x	0.77	X	8.9			41.38	X		0.63	×	0.7	=	113.43	(75)
Northeast 0.9x	0.77	X	8.9		_	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	X	8.9	97	X S	97.38	x [0.63	x	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	x	8.9	97	х	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	Х	8.9)7	х	72.63	x [0.63	x	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	Х	8.9)7	x t	50.42] x [0.63	х	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	x	8.9	97	x 2	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast _{0.9x}	0.77	x	8.9	97	х	14.2	х	0.63	_ x [0.7	=	38.92	(75)
Northeast 0.9x	0.77	X	8.9)7	х	9.21	x	0.63	_ x [0.7	=	25.26	(75)
•		<u> </u>											
Solar gains in	watts, ca	alculated	I for eacl	h month			(83)m =	Sum(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	nd solar	(84)m =	= (73)m	+ (83)m	, watts						•	
(84)m= 355.94	386.26	427.01	484.32	532.94	534.34	507.13	461.32	408.31	362.75	342.76	342.36		(84)
7. Mean inte	rnal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	n the livi	ng area	from Tal	ole 9, 1	h1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.98	0.96	0.93	0.82	0.64	0.44	0.32	0.37	0.61	0.87	0.96	0.98		(86)
Mean interna	al temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Ta	ole 9c)		-	•	•	
(87)m= 20.13	20.27	20.52	20.81	20.95	20.99	21	21	20.97	20.77	20.42	20.11		(87)
Temperature	during b	eating n	oriode ir	rost of	dwelling	from To	hla a	Th2 (°C)	<u> </u>	!	!		
(88)m= 20.27	20.27	20.28	20.29	20.29	20.31	20.31	20.31		20.29	20.29	20.28		(88)
` '	ļ			<u> </u>	<u> </u>	<u> </u>							, ,
Utilisation fa					T	1	T	1 0.50	0.04	T 0.05	0.00		(89)
(89)m= 0.97	0.96	0.91	0.79	0.59	0.4	0.27	0.31	0.56	0.84	0.95	0.98		(03)
Mean interna	al temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)		T	Ī	
(90)m= 19.1	19.31	19.66	20.06	20.24	20.3	20.31	20.31		20.03	19.54	19.09		(90)
								1	LA = Livir	ng area ÷ (4) =	0.49	(91)
Mean_interna	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 –	fLA) × T2					
(92)m= 19.61	19.78	20.08	20.43	20.59	20.64	20.65	20.65	20.62	20.39	19.97	19.59		(92)
Apply adjust	ment to the	ne mean	interna	temper	ature fro	m Table	4e, w	here appro	opriate			•	
(93)m= 19.61	19.78	20.08	20.43	20.59	20.64	20.65	20.65	20.62	20.39	19.97	19.59		(93)
8. Space hea	·												
Set Ti to the the utilisation					ned at st	ep 11 of	Table	9b, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa			•	iviay	<u> </u>	<u> </u>	7.05	,	000	1407	_ <u></u>		
(94)m= 0.97	0.95	0.91	0.79	0.61	0.42	0.3	0.34	0.58	0.85	0.95	0.97		(94)
Useful gains	, hmGm ,	W = (94	4)m x (84	 4)m	<u>!</u>	!	!	-1	<u>I</u>	<u>!</u>	<u>!</u>		
(95)m= 344.68	367.88	388.24	384.81	326.31	224.34	151.08	157.68	3 238.18	307.45	324.2	332.97		(95)
Monthly ave	rage exte	rnal tem	perature	from T	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 rat	_				Lm , W	=[(39)m	x [(93)	m- (96)m]			•	
(97)m= 605.37		532.59	442.53	339.89	225.9	151.29	158.09		374.26	496.17	598.46		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(9	7)m – (95)m] x (4	1)m		•	
(98)m= 193.95	146.61	107.39	41.56	10.1	0	1 0	l 0	l 0	49.71	123.82	197.53		

		_		_
	Total per year (kWh/	/year) = Sum(98) _{15,912} =	870.67	(98)
Space heating requirement in kWh/m²/year			17.2	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating praction of space heat from secondary/supplementary heating (Tabl		mmunity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =	,	Γ	1	(302)
The community scheme may obtain heat from several sources. The procedure allows	s for CHP and up to f	ے four other heat sources; the	e latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See A Fraction of heat from Community heat pump	Appendix C.	Г	1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system	meag eyere		1.05	(306)
Space heating		L	kWh/year	
Annual space heating requirement		Γ	870.67	7
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	914.2	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		Γ	1827.32	7
If DHW from community scheme:		_		⊿ –
Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	1918.69	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	7e) + (310a)(310e)] =	28.33	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outs	side	Ε	107.68	(330a)
warm air heating system fans		Ī	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =	107.68	(331)
Energy for lighting (calculated in Appendix L)		Ī	239.96	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (3	315) + (331) + (33	32)(237b) =	3071.72	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh k	Emissions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	fuels repeat (363) to	(366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b	o)] x 100 ÷ (367b) x	0.52	525.1	(367)
Electrical energy for heat distribution [(313)) x	0.52	14.7	(372)

Total CO2 associated with community sy	stems	(363)(366) + (368)(37	2)	=	539.8	(373)
CO2 associated with space heating (second	ondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion	on heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wa	ter heating	(373) + (374) + (375) =			539.8	(376)
CO2 associated with electricity for pumps	and fans within dwe	lling (331)) x	0.52	=	55.89	(378)
CO2 associated with electricity for lighting	9	(332))) x	0.52	=	124.54	(379)
Energy saving/generation technologies (3 Item 1	333) to (334) as appli	cable	0.52 × 0.01	= _	-56.48	(380)
Total CO2, kg/year	sum of (376)(382) =				663.75	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.11	(384)
El rating (section 14)					90.7	(385)

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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: 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 25.77 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.51 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)

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

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 **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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	400.007	
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
Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
ased on:		
Overshading:	Average or unknown	
Windows facing: North East	9.56m²	
Windows facing: South East	8.76m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

		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	01 - H					
1. Overall dwelling dime	ensions:								
3		Are	a(m²)		Av. He	ight(m)		Volume(m ³	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	<u> </u>	0	Ī - Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ns				0	x '	10 =	0	(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)+(ontinus fr	0		÷ (5) =	0	(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 padeducting 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	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	0.15	(17)
•	es if a pressurisation test has been do				is being u	sed		0.10	(10)
Number of sides sheltere	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) =				0.15	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1	1 00.	1 7.09	Сор	1 000	1 1101		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]	
	2)	1	1	•	1	1	ı	ı	
Wind Factor (22a)m = (2.23) m = (2.23)		0.05	T 0.00	4	1.00	4 40	1 10	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					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effective of the control o		•	rate for t	пе арріі	саріе са	se						0.5	(238
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)			0.5	(231
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				75.65	(23)
a) If balance	ed mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (22	2b)m + (23b) × [ا (23c) – 1		`
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3	-	(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		(24
c) If whole h				•					- (00)	`			
	i	(23b), t	· ` `	ŕ		· ` `	ŕ	<u> </u>	· ` `			İ	(0.4
(24c)m= 0	0	0		0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losse	c and he	nat loce r	paramete	or:							•		
S. Fleat losse ELEMENT	S and the Gros		Openin		Net Ar	ea	U-valı	16	AXU		k-value	e A X	X k
	area		m		A ,r		W/m2		(W/I	K)	kJ/m²-ł		
Windows Type	e 1				9.56	x1,	/[1/(1.4)+	0.04] =	12.67				(27
Windows Type	2				8.76	x1,	/[1/(1.4)+	0.04] =	11.61				(27
Walls Type1	61.0)9	18.3	2	42.77	, X	0.18	=	7.7	$\overline{}$ [60	2566.2	(29
Nalls Type2	3.80	6	0		3.86	x	0.17	=	0.65	$\overline{}$	60	231.6	(29
Total area of e	lements	, m²			64.95	5							— (31
Party wall					37.5	x	0		0	\neg [45	1687.5	(32
Party floor					63.92	2					40	2556.8	(32
Party ceiling					63.92	2				Ī	30	1917.6	(32
nternal wall **					113.4	7				Ī	9	1021.23	3 (32
* for windows and					alue calcul		formula 1	/[(1/U-valu	re)+0.04] a	L as given in	paragraph		 `
** include the area				ls and pari	titions		(26)(30)	(22) _			ı		٦,,,,
Fabric heat los		•	U)				(20)(30)		(20) + (2)	2) + (225)	(220) -	32.63	(33)
Heat capacity		,	0 – Cm	TEA) in	\ \ \ \/m2\			***	.(30) + (32) $\div (4) =$	2) + (32a).	(32e) =	9980.93	(34)
Thermal mass For design assess	•	•		•			acisaly the	` '	. ,	TMD in T	ahle 1f	156.15	(35
can be used inste				CONSTRUCT	on are no	. Kirowir pr	colocity tire	maioanvo	values of	77011 117 11	abio II		
Thermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						7.91	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric he									(36) =			40.54	(37
entilation hea	i								= 0.33 × (.	1	1	
Jan 17.5	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20
(38)m= 17.5	17.29	17.08	16.03	15.82	14.77	14.77	14.56	15.19	15.82	16.24	16.66	l	(38
Heat transfer (39)m= 58.04	57.83	nt, W/K 57.62	56.57	56.36	55.32	55.32	55.11	(39)m 55.73	= (37) + (37)	38)m 56.78	57.2	ı	

Heat loss pa	arameter (HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.9	1 0.9	0.9	0.89	0.88	0.87	0.87	0.86	0.87	0.88	0.89	0.89		
									Average =	Sum(40) ₁ .	12 /12=	0.88	(40)
Number of o	- i	<u> </u>	<u> </u>							·			
Ja	-	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 h	eating ene	rgy requi	irement:								kWh/ye	ar:	
	ccupancy, I3.9, N = 1 I3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		09		(42)
Annual ave Reduce the ar	nual average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.84		(43)
Ja	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usag		r day for ea				Table 1c x	_	<u>'</u>	<u> </u>	!			
(44)m= 92.2	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 conten					190 x Vd,r								
(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 instantaneou	ıs water heat	ing at point	of use (no	o hot water	· storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	- L	1319.1	(45)
(46)m= 20.5		18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87		(46)
Water stora		1 10.01	10.11	10.10	10.01	12.00		1 1.00	10.70	10.20	10.01		(- /
Storage vol	ume (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If communit	y heating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise in		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water stora a) If manuf	_	oclared l	oss fact	or ie kna	wn (k\//k	v/dav/).							(40)
Temperatur				JI 15 KI10	wii (Kvvi	i/uay).					0		(48)
Energy lost				aar			(48) x (49)	١ _			0		(49)
b) If manuf		•			or is not		(40) X (40)	, –		1	10		(50)
Hot water s	torage loss	factor fr	om Tabl	le 2 (kW	h/litre/da	ıy)				0.	02		(51)
If communit			on 4.3										
Volume factoring Temperatur			2h							-	03		(52) (53)
Energy lost				oor			(47) v (51)) x (52) x (52) _		.6		. ,
Enter (50)		•	, KVVII/yt	zai			(47) X (31)) X (JZ) X (33) –		03		(54) (55)
Water stora	` , ` `	,	for each	month			((56)m = ((55) × (41)	m		00		()
(56)m= 32.0		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder cont												×Н	(30)
(57)m= 32.0	01 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
		ļ		<u>l</u>	<u> </u>	<u> </u>	<u> </u>	L			0		(58)
Primary circ	`	,			59)m = ((58) <u>–</u> 36	35 x (41)	ım			o .		(50)
-	by factor f			,	•	. ,	, ,		r thermo	stat)			
(modilied	e, idolo.	ioiii iab								,			

Combi loss ca	lculated	for each	month ((61)m –	(60) ± 3	65 v (41	١m						
(61)m= 0	0	0	0	0 0	00) + 3	03 × (41)) 0	0	Ιο	0	0	1	(61)
												J · (59)m + (61)m	(- /
(62)m= 192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.0		167.01	175.46	187.72	1	(62)
Solar DHW input	L											1	()
(add additiona									ar continoc	morrio wan	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter					!		1	Į.	<u> </u>	ı	
(64)m= 192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.0	2 149.37	167.01	175.46	187.72]	
L	1	<u> </u>		ļ		ļ		utput from w	ater heat	_ I er (annual)₁	112	1969.94	(64)
Heat gains fro	m water	heating,	kWh/me	onth 0.2	5 ′ [0.85	5 × (45)m	+ (61)m] + 0.8	x [(46)m	n + (57)m	+ (59)m	 .]	-
(65)m= 89.69	79.71	85.26	78.58	78.55	72.42	71.67	75.7		81.37	83.35	88.26	1	(65)
include (57)	m in calc	culation of	of (65)m	only if c	vlinder	is in the	dwellir	ng or hot v	vater is t	from com	munity h	ı neating	
5. Internal ga					,			<u> </u>			,	,	
Metabolic gair	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g 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 gains	(calcula	ted in Ap	pendix	L, equat	on L9 c	r L9a), a	lso se	e Table 5			-	•	
(67)m= 16.29	14.47	11.77	8.91	6.66	5.62	6.07	7.9	10.6	13.46	15.7	16.74]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	lso see Ta	ble 5	-	•	•	
(68)m= 182.71	184.61	179.83	169.66	156.82	144.75	136.69	134.	3 139.57	149.75	162.58	174.65		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	÷ 5	•	-	•	
(69)m= 33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.4	5 33.45	33.45	33.45	33.45		(69)
Pumps and fa	ns gains	(Table 5	ōa)					•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)			•		•	•	•	
(71)m= -83.6	-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	gains (T	able 5)		-		-				-	-	•	
(72)m= 120.56	118.62	114.6	109.13	105.58	100.58	96.34	101.7	8 103.71	109.37	115.76	118.63		(72)
Total internal	gains =				(66)m + (67)m	ı + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 373.91	372.05	360.55	342.05	323.41	305.31	293.45	298.8	308.23	326.92	348.4	364.37		(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	itions to	convert to the	he applica	ble orienta	tion.		
Orientation:			Area		Flu			g_ Table 6b	-	FF		Gains	
_	Table 6d		m²			ble 6a		Table 6b		Table 6c		(W)	,
Northeast _{0.9x}	0.77	Х	9.5	56	x	11.28	x	0.63	x [0.7	=	32.96	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	22.97	X	0.63	×	0.7	=	67.1	(75)
Northeast 0.9x	0.77	X	9.5	56	х	41.38	X	0.63	x [0.7	=	120.89	(75)
Northeast 0.9x	0.77	Х	9.5	56	x	67.96	X	0.63	x	0.7	=	198.54	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	91.35	X	0.63	X	0.7	=	266.88	(75)

N1464 -		_					, ,						– ,
Northeast _{0.9x}	0.77	X	9.5	56	X	97.38	X	0.63	×	0.7	=	284.52	(75)
Northeast _{0.9x}	0.77	X	9.5	56	Х	91.1	X	0.63	×	0.7	=	266.17	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	72.63	X	0.63	×	0.7	=	212.19	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	50.42	X	0.63	x	0.7	=	147.31	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	28.07	X	0.63	X	0.7	=	82	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	14.2	X	0.63	X	0.7	=	41.48	(75)
Northeast 0.9x	0.77	X	9.5	56	X	9.21	x	0.63	X	0.7	=	26.92	(75)
Southeast 0.9x	0.77	X	8.7	' 6	x :	36.79	x	0.63	x	0.7	=	98.5	(77)
Southeast 0.9x	0.77	X	8.7	7 6	X	62.67	x	0.63	x	0.7	=	167.79	(77)
Southeast 0.9x	0.77	X	8.7	' 6	X	85.75	x	0.63	x	0.7	=	229.57	(77)
Southeast _{0.9x}	0.77	X	8.7	' 6	x 1	06.25	x	0.63	X	0.7	=	284.45	(77)
Southeast _{0.9x}	0.77	X	8.7	76	x 1	19.01	x	0.63	x	0.7	=	318.61	(77)
Southeast _{0.9x}	0.77	x	8.7	7 6	x 1	18.15	x	0.63	×	0.7	-	316.31	(77)
Southeast 0.9x	0.77	x	8.7	' 6	x 1	13.91	х	0.63	x	0.7		304.95	(77)
Southeast 0.9x	0.77	x	8.7	' 6	x 1	04.39	x	0.63	x	0.7	=	279.47	(77)
Southeast 0.9x	0.77	x	8.7	' 6	x	92.85	j x	0.63	- x	0.7	=	248.58	(77)
Southeast 0.9x	0.77	x	8.7	' 6	х	69.27	X	0.63	x	0.7		185.44	(77)
Southeast _{0.9x}	0.77	x	8.7	' 6	x	44.07	X	0.63	×	0.7	=	117.98	(77)
Southeast 0.9x	0.77	X	8.7	······································	x	31.49] _x	0.63	- x	0.7		84.3	(77)
_					<u> </u>								
Solar gains in	watts. calc	culated	for eac	h month			(83)m	n = Sum(74)m	(82)m				
(83)m= 131.47		350.47	483	585.49	600.83	571.12	491		267.44	159.46	111.22		(83)
Total gains – i	nternal and	d solar	(84)m =	= (73)m	+ (83)m	, watts	•						
(84)m= 505.38	606.94	711.02	825.05	908.91	906.14	864.57	790	.48 704.13	594.37	507.86	475.59		(84)
7. Mean inter	nal tempe	rature ((heating	season)								
Temperature			`		•	from Tal	ble 9.	Th1 (°C)				21	(85)
Utilisation fac	_	•			•		,	, ,					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aı	ug Sep	Oct	Nov	Dec		
(86)m= 0.97	0.94	0.87	0.73	0.55	0.39	0.28	0.3		0.8	0.94	0.97		(86)
Mean interna	l tomporat	uro in l	ivina or	00 T1 /f/	llow etc	nc 2 to -	7 in T	able 0e)	<u> </u>		•		
(87)m= 19.93	r	20.51	20.81	20.95	20.99	21	2		20.76	20.3	19.89		(87)
` ′	<u> </u>			!		!					10.00		, ,
Temperature	 -				`		1	` 	T 20.40	20.40	00.47		(88)
(88)m= 20.16	20.16	20.17	20.18	20.18	20.2	20.2	20.	.2 20.19	20.18	20.18	20.17		(00)
Utilisation fac					h2,m (s	i	9a)					Ī	
(89)m= 0.96	0.92	0.85	0.69	0.51	0.34	0.23	0.2	26 0.47	0.77	0.93	0.97		(89)
Mean_interna	l temperat	ure in t	he rest	of dwell	ing T2 (t	follow ste	eps 3	to 7 in Tab	le 9c)				
(90)m= 18.74	19.11	19.56	19.97	20.13	20.19	20.2	20.	.2 20.17	19.91	19.29	18.69		(90)
										ina oroo . /	4) _		(91)
	<u> </u>								fLA = Liv	ing area ÷ (4) =	0.38	(91)
Mean interna	l temperat	ure (fo	r the wh	ole dwe	lling) = 1	LA × T1	+ (1			ing area - (4) =	0.38	(91)
Mean interna	 	ure (fo	r the wh	ole dwe	lling) = 1	LA × T1	+ (1	– fLA) × T2		19.67	19.14	0.38	(92)
	19.52	19.92	20.29	20.44	20.5	20.5	20.	– fLA) × T2 .5 20.47	20.23	_		0.38	

(93)m= 19.19	19.52	19.92	20.29	20.44	20.5	20.5	20.5	20.47	20.23	19.67	19.14		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		ļ					19						
(94)m= 0.95	0.91	0.84	0.7	0.52	0.36	0.25	0.29	0.49	0.77	0.92	0.96		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m		•	•						
(95)m= 481.7	555.07	597.49	576.76	475.72	323.61	215.39	225.34	345.69	458.98	466.53	457.07		(95)
Monthly avera		1	. 	r	T T								
(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		1	644.22	erature, 492.83	i	- ` 	<u> </u>	<u>`</u>		740.00	054.77		(07)
(97)m= 864.4	845.57	773.35			326.09	215.79	226.04	355.11	542.96	713.83	854.77		(97)
Space heatin (98)m= 284.73	195.21	130.84	48.57	12.73	0	0.02	0	0	62.48	178.05	295.89		
(50)= 254.75	100.21	100.04	40.07	12.70				l per year			<u> </u>	1208.5	(98)
Casas bootin	a roquir	omont in	Is\A/b/m2	2/voor			rota	ii poi youi	(KVVIII y Cal) = Gam(o	O)15,912 —		닠``
Space heatin	•										l	18.91	(99)
9b. Energy rec	•		The state of the s	Ĭ									
This part is use Fraction of spa			• .		•		.	•		unity scr	neme.	0	(301)
Fraction of spa			-		•	_		, -			[[1	(302)
·			•	•	•	•	allows for	CUD and	un to forus	other boot		-	(302)
The community so includes boilers, h									ир во тоиг	otner neat	sources, ir	ie iallei	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	0			(3	02) x (303	a) =	1	(304a)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem		Ì	1	(305)
Distribution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space heating		`	,		·	0 ,					L	kWh/yea	 r
Annual space	_	requiren	nent									1208.5	
Space heat fro	m Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	- [1268.93	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	a 4a or A	ppendix	E)	[0	(308
Space heating	,		•	_	•	,			· · 01) x 100 ·	,	[[0	(309)
			0000	,,,	- p. o	itali y cyc			,	,	l		` ′
Water heating Annual water h		equirem	ent								[1969.94	7
If DHW from c	_	-									l	1000.04	
Water heat fro)				(64) x (30	03a) x (30	5) x (306) :	= [2068.44	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	33.37	(313)
Cooling System Energy Efficiency Ratio 0											0	(314)	
Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =											0	(315)	
Electricity for p	,			•		,		•	•		Į		
mechanical ve							outside					135.98	(330a)
											L	i	

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		135.98	(331)
Energy for lighting (calculated in Appendix L)				287.67	(332)
Electricity generated by PVs (Appendix M) (negative quantity	')			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3652.2	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto		nissions CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second f	uel	280	(367a)
CO2 associated with heat source 1 [(307	(b)+(310b)] x 100 ÷ (367b) x	0.52	=	618.6	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	17.32	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	635.93	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			635.93	(376)
CO2 associated with electricity for pumps and fans within dw	relling (331)) x	0.52	=	70.57	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	149.3	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	licable	0.52 x 0.01	= [-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				799.32	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				12.51	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:45:56*

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 26.33 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.53 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 - Heat pump

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	10.070	<u> </u>
Continuous supply and extract system		
	0.47	
Specific fan power:	• • • • • • • • • • • • • • • • • • • •	214
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	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	
ventilation rate.	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	O 11/111 IX	
Photovoltaic array		

		Hear	Details:							
Access an Name	No: Unabore	User		- NI	L		CTDO	010010		
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50		
Contware Hame.	Ottoma 1		y Address:		31011.		7 01010	7.0.0.00		
Address :		·								
1. Overall dwelling dime	ensions:									
Ground floor		Ar	ea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)	
	-) . (41-) . (4 -) . (4 -1) . (4 -)	. (4.5)		(1a) x	2	65	(2a) =	159.9	(Sa)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	F(1II)	60.34	(4)) (O.) (O.)	I) (O)	(0.)		_	
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	159.9	(5)	
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r	
Number of altimospess	heating he	ating					40 =	-	_	
Number of chimneys			0] = [0			0	(6a)	
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)	
Number of intermittent fa				Ĺ	0		10 =	0	(7a)	
Number of passive vents	i			L	0	X '	10 =	0	(7b)	
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)	
Air changes per hour										
Infiltration due to chimne	ovs flues and fans = (6a)	+(6b)+(7a)+(7b)	+(7c) =	Г	0		÷ (5) =	0	(8)	
•	peen carried out or is intended,			continue fr			- (3) =	0	(0)	
Number of storeys in the	he dwelling (ns)							0	(9)	
Additional infiltration						[(9)	-1]x0.1 =	0	(10)	
	0.25 for steel or timber fra present, use the value correspo			•	uction			0	(11)	
deducting areas of openii		maing to the gre	aler wall are	a (aitei						
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								0	(13)	
ŭ	s and doors draught strip	pped						0	(14)	
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)	
Infiltration rate	aEO avaraged in aubic	motroe nor	(8) + (10)	, , ,	, , ,	, ,	oroo	0	(16)	
If based on air permeabil	q50, expressed in cubic	-	•	•	etre or e	envelope	area	3	(17)	
•	es if a pressurisation test has b				is being u	sed	ļ	0.15	(18)	
Number of sides sheltere			,	,	Ü			0	(19)	
Shelter factor			(20) = 1 -	[0.0 75 x (1	9)] =			1	(20)	
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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			
					<u> </u>			I		

Adjusted infiltr	ation rat	te (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		•	rate ior t	пе арріі	саріе са	se						0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	h heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h	ı) =				75.65	(23
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (I	ЛV) (24b	o)m = (22	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r		tract ver × (23b), t		•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)		•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)					
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losse	s and he	eat loss	paramet	er:									
LEMENT	Gros area		Openin m	=	Net Ar A ,r		U-val W/m2		A X U (W/I	〈)	k-value kJ/m²-l		
Windows Type	e 1				4.7	x1	/[1/(1.4)+	0.04] =	6.23				(27
Vindows Type	e 2				6.09	x1	/[1/(1.4)+	0.04] =	8.07				(27
Vindows Type	e 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		60	2345.4	(29
Walls Type2	27.3	31	0		27.3	X	0.17	=	4.59		60	1638.6	(29
Total area of e	elements	s, m²			80.11								(31
Party wall					16.88	3 x	0	=	0		45	759.6	(32
Party floor					60.34	1					40	2413.6	(32
Party ceiling					60.34	1					30	1810.2	(32
nternal wall **	•				107.9	1					9	971.190	1 (32
for windows and						ated using	formula 1	1/[(1/U-valu	ıe)+0.04] a	is given in	paragraph	3.2	
* include the area abric heat los				is and par	uuons		(26)(30) + (32) =				29.8	(33
Heat capacity		•	0,					, , ,	(30) + (32	2) + (32a).	(32e) =	9938.59](34
hermal mass		. ,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K				÷ (4) =	, , ,	` ,	164.71	(35
or design asses an be used inste	sments wh	nere the de	tails of the	,			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	<						7.62	(36
f details of therma		are not kn	own (36) =	= 0.05 x (3	11)								_
Total fabric he									(36) =			37.42	(37
entilation hea		1	·						= 0.33 × () 	l	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m= 16.52	16.32	16.12	15.13	14.93	13.94	13.94	13.75	14.34	14.93	15.33	15.72		(38)
` ′		<u> </u>	13.13	14.93	13.94	13.94	13.73			l	15.72		(30)
Heat transfe		53.54	52.55	52.35	51.36	51.36	51.16	51.76	= (37) + (3 52.35	52.75	53.14		
(00)111=	00.71	00.01	02.00	02.00	01.00	01.00	01.10			Sum(39) ₁	<u> </u>	52.5	(39)
Heat loss pa	rameter (I	HLP), W	m²K						= (39)m ÷				_
(40)m= 0.89	0.89	0.89	0.87	0.87	0.85	0.85	0.85	0.86	0.87	0.87	0.88		_
Number of d	avs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.87	(40)
Jan	i	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 requ	irement:								kWh/ye	ear:	
Assumed so	ou no nov	NI											(40)
Assumed oc if TFA > 1	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.		99		(42)
if TFA £ 1: Annual avera	,	ater usad	ae in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		81	.49		(43)
Reduce the ann	ual average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.70		(10)
not more that 1.		· ·				<u> </u>							
Jan Hot water usag		Mar r day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
	'	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64		
(44)m= 89.64	00.30	03.12	79.00	76.6	73.34	73.34	70.0			m(44) ₁₁₂ =	L	977.9	(44)
Energy content	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			. ,	L	077.0	(```
(45)m= 132.9	3 116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74		
If in atomton a cur	water beet	na ot noint	of upo (no	hot water	· otorogo)	antar O in	havea (16		Γotal = Su	m(45) ₁₁₂ =	=	1282.18	(45)
If instantaneous			·			1		` '	40.00	17.70	1004		(46)
(46)m= 19.94 Water storage		18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31		(46)
Storage volu) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storag		eclared I	oss facto	or is kno	wn (kWh	n/day).					0		(48)
Temperature				01 10 1410	("uay).					0		(49)
Energy lost f				ear			(48) x (49)) =			10		(50)
b) If manufa	cturer's d	eclared o	cylinder l	loss fact									,
Hot water sto	•			le 2 (kW	h/litre/da	ıy)				0.	02		(51)
If community Volume factor	_		011 4.3							1	.03		(52)
Temperature			2b							—	.6		(53)
Energy lost f	rom wate	r storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) o	r (54) in (55)								1.	03		(55)
Water storag	je loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m= 32.01		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder conta	ins 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	хН	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from	om Table 3			0		(58)
Primary circuit loss calculated		(58) ÷ 365 × (41)m			
(modified by factor from Tab	ole H5 if there is solar wa	ater heating and	a cylinder 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 2	23.26	(59)
Combi loss calculated for each	n month (61)m = (60) ÷ 3	365 × (41)m				
(61)m= 0 0 0	0 0 0	0 0	0 0	0	0	(61)
Total heat required for water h	neating calculated for ea	ch month (62)m :	= 0.85 × (45)m +	(46)m + (5	 7)m + (59)m + (61)m	
(62)m= 188.21 166.19 175.25	158.09 155.64 140.1	135.53 147.37	146.69 163.88	ì í	184.02	(62)
Solar DHW input calculated using App			I L O' if no solar contribut	ļļ_	l neating)	
(add additional lines if FGHRS	· · · · · ·					
(63)m = 0 0 0	0 0 0	0 0	0 0	0	0	(63)
Output from water heater		<u> </u>	1	ļl		
(64)m= 188.21 166.19 175.25	158.09 155.64 140.1	135.53 147.37	146.69 163.88	172.05 1	184.02	
(0.7)	1	-	put from water heate			(64)
Heat gains from water heating	. kWh/month 0.25 ′ [0.8], ,
(65)m= 88.42 78.6 84.11	77.57 77.59 71.59	70.91 74.84	73.78 80.33		87.03	(65)
` '	! ! !			<u> </u>		(00)
include (57)m in calculation	. ,	is in the aweiling	or not water is if	om commu	unity neating	
5. Internal gains (see Table !	,					
Metabolic gains (Table 5), Wa		1 1 .				
Jan Feb Mar	Apr May Jun	Jul Aug	Sep Oct	Nov	Dec	(0.0)
(66)m= 99.56 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 A	```	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 1	15.93	(67)
Appliances gains (calculated in	n Appendix L, equation I	L13 or L13a), als	o see Table 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 1	166.13	(68)
Cooking gains (calculated in A	ppendix L, equation L15	5 or L15a), also s	ee Table 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	32.96	(69)
Pumps and fans gains (Table	5a)	•				
(70)m = 0 0 0	0 0 0	0 0	0 0	0	0	(70)
Losses e.g. evaporation (nega	ative 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	-79.65	(71)
Water heating gains (Table 5)	.1 1		ļ l	I		
(72)m= 118.85 116.96 113.06	107.74 104.29 99.43	95.3 100.59	102.47 107.97	114.19 1	116.97	(72)
Total internal gains =	 	<u> </u>	+ (69)m + (70)m + (7	<u> </u>		
(73)m= 361.01 359.2 348.18	, , , , , , , , , , , , , , , , , , , 	, , , , , , , , , , , , , , , , , , , 	298.19 316.08	<u> </u>	351.9	(73)
6. Solar gains:	9:210: 200:0	200.00	200.10	000.00	50.10	
Solar gains are calculated using sola	ar flux from Table 6a and asso	ciated equations to c	onvert to the applicat	ole orientation	1.	
Orientation: Access Factor		ux	g_	FF	Gains	
Table 6d				able 6c	(W)	
Southeast 0.9x 0.77 x	6.09 ×	36.79 ×	0.63 ×	0.7	= 68.48	(77)
Southeast 0.9x 0.77 x		62.67 X	0.63 x	0.7	= 116.65](77)
0.11 ×		<u></u> "		0.7		1, ,

Jan	Feb	Mar	Apr	May	Ju		Α	ug Se	ер	Oct	Nov	Dec]	
Temperature of Utilisation fact	_	•			-		ole 9	Th1 (°C	;)				21	(85)
7. Mean interr														
(84)m= 492.41	586.37	667.88	741.48	786.63	771.	86 740.9	698	.24 649.	.37	569.55	494.64	463.96]	(84)
Total gains – in	iternal ar	nd solar	(84)m =	(73)m -	+ (83	m , watts							-	
(83)m= 131.4	227.17	319.7		473.96	476.	51 456.92	409			253.46	157.99	112.06		(83)
Solar gains in v	vatts, ca	lculated	I for each	month			(83)m	ı = Sum(74	l)m	.(82)m				
Northwest _{0.9x}	0.77	X	2.92	2	x	9.21	X	0.63	3	X	0.7	=	8.22	(81)
Northwest 0.9x	0.77	×	2.92		x _	14.2	X	0.63]	0.7	=	12.67	(81)
Northwest 0.9x	0.77	X	2.92		×	28.07	X	0.63] × [0.7	=	25.05	(81)
Northwest 0.9x	0.77	X	2.92	2	x	50.42	X	0.63	3] x [0.7	=	44.99	(81)
Northwest 0.9x	0.77	x	2.92	2	x	72.63	X	0.63	3	x [0.7	=	64.81	(81)
Northwest 0.9x	0.77	X	2.92		x	91.1	x	0.63	3	_ x [0.7	=	81.3	(81)
Northwest 0.9x	0.77	X	2.92	2	x	97.38	x	0.63	3	x [0.7	=	86.9	(81)
Northwest _{0.9x}	0.77	x	2.92	2	x	91.35	x	0.63	3	_ x [0.7	=	81.52	(81)
Northwest _{0.9x}	0.77	x	2.92	2	x \Box	67.96	x	0.63	3	_ x [0.7		60.64	(81)
Northwest _{0.9x}	0.77	x	2.92	2	x 🗀	41.38	x	0.63	3] × [0.7	_ =	36.93	(81)
Northwest _{0.9x}	0.77	x	2.92		x \Box	22.97	x	0.63	3] x [0.7		20.5	(81)
Northwest 0.9x	0.77	x	2.92	2	x	11.28	x	0.63	3] x [0.7	=	10.07	(81)
Southwest _{0.9x}	0.77	x	4.7		x \Box	31.49	j	0.63	3] x [0.7	=	45.23	(79)
Southwest _{0.9x}	0.77	x	4.7		x	44.07	ĺ	0.63	3] x [0.7	=	63.3	(79)
Southwest _{0.9x}	0.77	x	4.7		x	69.27	ĺ	0.63	3] × [0.7	=	99.49	(79)
Southwest _{0.9x}	0.77	x	4.7		x –	92.85	1	0.63]	0.7	=	133.37	(79)
Southwest _{0.9x}	0.77	x	4.7		x	104.39	1	0.63]	0.7	=	149.94	(79)
Southwest _{0.9x}	0.77	×	4.7		x [113.91]	0.63] ^ L] x [0.7	= =	163.62	(79)
Southwest _{0.9x}	0.77	$=$ $\stackrel{\wedge}{}$	4.7		`	118.15]	0.63		」^L] _x 「	0.7	= =	169.71	(79)
Southwest _{0.9x}	0.77	$=$ $\stackrel{\wedge}{}$	4.7		^	119.01]	0.63		」^L] x 「	0.7	\dashv	170.94	(79)
Southwest _{0.9x}	0.77	$=$ $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$	4.7		`	106.25]]	0.63		」^L 1 _× 「	0.7	- -	152.62	(79)
Southwest _{0.9x}	0.77	- ` - ` ×	4.7		x L	62.67 85.75]]	0.63		」	0.7		90.02	(79)
Southwest _{0.9x}	0.77	×	4.7		×	36.79]]	0.63		」×] _× 「	0.7	=	52.85	(79)
Southwest _{0.9x}	0.77	×	6.09	<u>'</u>	×	31.49]	0.63		」 ×	0.7	╡ -	58.6	(77)
Southeast 0.9x	0.77	×	6.09		×	44.07] X] ,	0.63]	0.7	=	82.02	(77)
Southeast 0.9x	0.77	x	6.09		×	69.27] X] ,	0.63]	0.7	=	128.92	(77)
Southeast 0.9x	0.77	X	6.09		× _	92.85] X]	0.63]	0.7	=	172.81	(77)
Southeast 0.9x	0.77	X	6.09		x _	104.39] X]	0.63]	0.7	=	194.29	(77)
Southeast 0.9x	0.77	X	6.09		x	113.91] X]	0.63]	0.7	=	212.01	(77)
Southeast 0.9x	0.77	X	6.09		x _	118.15] X	0.63]	0.7	=	219.9	(77)
Southeast 0.9x	0.77	×	6.09		x _	119.01	X	0.63]	0.7	=	221.5	(77)
Southeast 0.9x	0.77	X	6.09		x	106.25	X	0.63	3] x [0.7	=	197.75	(77)
O		\neg		=	\vdash		ī			╡╞		=		=

(86)m= 0.97 0.93 0.87 0.75 0.59 0.42 0.3 0.34 0.53 0.8 0.94 0.97]	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_	
(87)m= 20.03 20.28 20.56 20.82 20.95 20.99 21 21 20.97 20.8 20.38 19.99]	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_	
(88)m= 20.17 20.18 20.18 20.19 20.2 20.21 20.21 20.21 20.2 20.2 20.19 20.18]	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	_	
(89)m= 0.96 0.92 0.85 0.72 0.55 0.37 0.25 0.28 0.48 0.76 0.92 0.97]	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 18.9 19.24 19.63 19.99 20.14 20.2 20.21 20.21 20.18 19.97 19.41 18.84]	(90)
$fLA = Living area \div (4) =$	0.44	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		
(92)m= 19.4 19.7 20.04 20.35 20.5 20.55 20.56 20.56 20.53 20.34 19.84 19.35]	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	-	
(93)m= 19.4 19.7 20.04 20.35 20.5 20.55 20.56 20.56 20.53 20.34 19.84 19.35	J	(93)
8. Space heating requirement	. 1-1-	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-cale the utilisation factor for gains using Table 9a	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec]	
Utilisation factor for gains, hm:	_	
(94)m= 0.95 0.92 0.85 0.72 0.56 0.39 0.27 0.3 0.5 0.77 0.92 0.96]	(94)
Useful gains, hmGm , W = (94)m x (84)m	7	
(95)m= 469.79 536.92 566.33 537.01 442.7 303.05 202.92 212.18 325.06 438.84 454.12 446.31]	(95)
Monthly average external temperature from Table 8	٦	(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	J	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 814.42 795.35 725.02 601.93 460.68 305.71 203.32 212.81 333 509.67 672 805.28	1	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m	J	(- /
(98)m= 256.41 173.67 118.07 46.74 13.38 0 0 0 0 52.7 156.87 267.08	1	
Total per year (kWh/year) = Sum(98) _{15,912} =	1084.92	(98)
Space heating requirement in kWh/m²/year	17.98	(99)
9b. Energy requirements – Community heating scheme		J
This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources;	the latter	•
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		1,,,,,,,,
Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	-
Annual space heating requirement	1084.92]

		,		7
Space heat from Community heat pump	(98) x (304a) x	x (305) x (306) =	1139.16	(307a)
Efficiency of secondary/supplementary heating system in	n % (from Table 4a or Appe	ndix E)	0	(308
Space heating requirement from secondary/supplementa	ary system (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		[1933.02	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	x (305) x (306) =	2029.67	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	31.69] (313)
Cooling System Energy Efficiency Ratio		[0] (314)
Space cooling (if there is a fixed cooling system, if not er	nter 0) = (107) ÷ (314	l) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive inp	ut from outside	· [128.36	(330a)
warm air heating system fans		[0	(330b)
pump for solar water heating		ĺ	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	0b) + (330g) =	128.36	(331)
Energy for lighting (calculated in Appendix L)		ĺ	273.64	(332)
Electricity generated by PVs (Appendix M) (negative qua	antity)	ĺ	-108.82	(333)
T . I . II		,		
Total delivered energy for all uses (307) + (309) + (310)	+ (312) + (315) + (331) + (3	32)(237b) =	3462.02	(338)
12b. CO2 Emissions – Community heating scheme	+ (312) + (315) + (331) + (3	(32)(237b) =	3462.02	(338)
	+ (312) + (315) + (331) + (3 Energy kWh/year	Emission factor		(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) If there is C	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) If there is C	Energy kWh/year t CHP) CHP using two fuels repeat (363) to	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 =	Emissions kg CO2/year	(367a) (367)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 =	280 587.37	(367a) (367) (372)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(376)	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 =	280 587.37 16.45 603.81	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary)	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(376)	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or insertions.	Energy kWh/year (CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(376) (309) x tantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81 0 603.81	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instance CO2 associated with space and water heating	Energy kWh/year (CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(376) (309) x tantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81 0 603.81	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instance CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(376) (309) × stantaneous heater (312) × (373) + (374) + (375) = In dwelling (331)) × (332))) ×	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81 0 603.81 66.62	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instant CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(376) (309) × stantaneous heater (312) × (373) + (374) + (375) = In dwelling (331)) × (332))) × stapplicable	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81 0 603.81 66.62 142.02	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instance CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as litem 1	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(376) (309) × stantaneous heater (312) × (373) + (374) + (375) = In dwelling (331)) × (332))) × stapplicable	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	280 280 587.37 16.45 603.81 0 603.81 66.62 142.02	(367a) (367) (372) (373) (374) (375) (376) (378) (379)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:45:43*

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 28.11 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.06 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 - Heat pump

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	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	5.45m²	
Windows facing: South East	6.09m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

		Hear I	Details:								
Access an Name	No: Usaham	USEI I		- M	L		CTDO	040042			
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 n: 1.0.5.50			
		Property	Address:		CIGIII						
Address :											
1. Overall dwelling dime	ensions:										
Ground floor			ea(m²) 48.96	(1a) x		ight(m) 65	(2a) =	Volume(m³) (3a)		
	a) ((1b) ((1a) ((1d) ((1a) (03	[(Σα) -	129.74			
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+.	(111)	48.96	(4)) . (2-) . (2-	4) . (2 -) .	(0-)		_		
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	129.74	(5)		
2. Ventilation rate:	main seco	ondary	other		total			m³ per hou	r		
Number of chimneys	heating hea	ting		1 = [40 =	-	_		
Number of chimneys		<u> </u>	0]	0		20 =	0	(6a)		
Number of open flues		0 +	0] ⁻	0			0	(6b)		
Number of intermittent fa				Ļ	0		10 =	0	(7a)		
Number of passive vents				Ļ	0		10 =	0	(7b)		
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)		
Air changes per hour											
Infiltration due to chimne	ys, flues and fans = (6a)+	(6b)+(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)		
If a pressurisation test has b	een carried out or is intended, p	proceed to (17),	otherwise c	ontinue fr			` ′	<u> </u>	 _`		
Number of storeys in the	ne dwelling (ns)							0	(9)		
Additional infiltration	.25 for steel or timber frai	ma or 0 35 fo	r maconr	v constr	ruction	[(9)	-1]x0.1 =	0	(10)		
	resent, use the value correspon			•	uction			0	(11)		
deducting areas of openin	•	\ O 4 (\ -				ı		_		
If no draught lobby, en	floor, enter 0.2 (unsealed)	or 0.1 (seai	ea), eise	enter U				0	(12)		
• ,	s and doors draught strip	ped						0	(14)		
Window infiltration	,		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)		
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13)	+ (15) =		0	(16)		
	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)		
If based on air permeabil	•							0.15	(18)		
	es if a pressurisation test has be	en done or a de	egree air per	meability	is being u	sed	ı		7(40)		
Number of sides sheltere Shelter factor	eu		(20) = 1 - [0.075 x (1	19)] =			0	(19)		
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(21)		
Infiltration rate modified f									`		
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>		L	l			

Adjusted infiltr	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
Calculate effec	l				l -							J	
If mechanica	al ventila	ition:										0.5	(23a)
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced with	heat reco	overy: effici	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(23c)
a) If balance	d mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(24a)
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]	(24b)
c) If whole h if (22b)n		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)n		on or when (24d)							0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	•	
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)
3. Heat losse	s and he	eat loss r	paramete	ėr.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		X k J/K
Windows Type		(111)	•••		5.45				7.23		10/111	T. T.	(27)
Windows Type					6.09	= .			8.07	=			(27)
Walls Type1	35.		11.54				0.18		4.28	╡╶	60	1425.	` <i>`</i>
Walls Type2				<u>+</u>	23.76	=		_				= ==	=
Total area of e	35.9		0		35.99	=	0.17	=	6.04		60	2159.	`
	ieilieilis	, 111-			71.29	=			_				(31)
Party wall					14.89	=	0	=	0		45	670.0	=
Party floor					48.96					Ĺ	40	1958.	= `
Party ceiling					48.96	<u> </u>				Į	30	1468.	= '
Internal wall **					96.46					[9	868.1	4 (32c)
* for windows and ** include the area						ated using	i formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	1 3.2	
Fabric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				25.62	(33)
Heat capacity	Cm = S	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	8550.39	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			174.64	(35)
For design assess can be used inste				constructi	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	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) =			31.71	(37)
Ventilation 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= 13.4	13.24	13.08	12.28	12.12	11.31	11.31	11.15	11.64	12.12	12.44	12.76		(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m		-	
(39)m= 45.11	44.95	44.79	43.99	43.83	43.03	43.03	42.87	43.35	43.83	44.15	44.47		
Stroma FSAP 201	2 Version	1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39) ₁	12 /12=	43.9 ⊳ age	2 0 (3/ 9)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.92	0.92	0.91	0.9	0.9	0.88	0.88	0.88	0.89	0.9	0.9	0.91		
						•	•	•	Average =	: Sum(40) ₁	12 /12=	0.9	(40)
Number of day	<u> </u>		· ·		l .	Ι			Ι	T			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct 31	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 occurring TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		.66		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		3.61		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 7 -		1	30		
(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		
										im(44) ₁₁₂ =		883.37	(44)
Energy content of							OTm / 3600			1			
(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 v	vater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =	=	1158.23	(45)
(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	1		<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		0		(47)
If community h	-			-			, ,		(01.1	(4 -)			
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in ((47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f					`	• ,					0		(49)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If manufact			-										
Hot water stor If community h	-			le 2 (kW	h/litre/da	ay)				0.	.02		(51)
Volume factor	•		011 4.5							1.	.03		(52)
Temperature f			2b							-	.6		(53)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter (50) or	(54) in (5	55)								1.	.03		(55)
Water storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
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	m Append	x H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t 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 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 calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	00) -	0) 0		0	0	T 0	0	1	(61)
Total heat requi													[(50)m + (61)m	(- /
	154.95	163.65	147.98	145.94	131.7		138.	_	137.68	153.38	` 	171.57	(59)III + (61)IIII]	(62)
Solar DHW input ca	Į						<u> </u>						I	(- /
(add additional											mon to wat	or modung)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0]	(63)
Output from wat	ter heat	:er				I					-1			
· -	154.95	163.65	147.98	145.94	131.7	3 127.77	138.	.47	137.68	153.38	160.59	171.57		
	'							Outp	out from wa	ater heat	er (annual)₁	12	1809.07	(64)
Heat gains from	water l	heating,	kWh/m	onth 0.2	5 ´[0.	85 × (45)m	n + (6	1)m	n] + 0.8 x	c [(46)m	n + (57)m	+ (59)m]	_
(65)m= 84.15	74.86	80.26	74.21	74.37	68.8	1 68.33	71.8	88	70.79	76.84	78.4	82.89]	(65)
include (57)m	in calc	ulation	of (65)m	only if c	ylinde	er is in the	dwell	ing	or hot w	ater is	from 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 gains	(Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Ju	n Jul	Αι	ug	Sep	Oct	Nov	Dec		
(66)m= 82.98	82.98	82.98	82.98	82.98	82.9	8 82.98	82.9	98	82.98	82.98	82.98	82.98		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
(67)m= 12.89	11.44	9.31	7.05	5.27	4.45	4.8	6.2	:5	8.38	10.64	12.42	13.24		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
(68)m= 144.53	146.03	142.25	134.21	124.05	114.5	108.13	106.	.63	110.41	118.45	128.61	138.16		(68)
Cooking gains (calculat	ted in Ap	pendix	L, equat	ion L	15 or L15a), als	o se	e 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	s gains	(Table 5	ia)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g. eva	poratio	n (negat	ive valu	es) (Tab	le 5)							-		
(71)m= -66.38	-66.38	-66.38	-66.38	-66.38	-66.3	8 -66.38	-66.	38	-66.38	-66.38	-66.38	-66.38		(71)
Water heating g	ains (T	able 5)									-	-		
(72)m= 113.1	111.4	107.87	103.07	99.95	95.5	7 91.84	96.6	62	98.31	103.28	108.89	111.41		(72)
Total internal g	gains =					66)m + (67)n	n + (68	3)m +	+ (69)m + ((70)m + (71)m + (72))m		
(73)m= 318.42	316.77	307.33	292.22	277.17	262.4	1 252.66	257.	.38	265	280.27	297.82	310.7		(73)
6. Solar gains:														
Solar gains are ca		ŭ	r flux from	Table 6a		•	ations t	to co	nvert to th	e applica		tion.		
Orientation: Ad	ccess Fa able 6d	actor	Area m²			Flux Fable 6a		т	g_ able 6b	_	FF Fable 6c		Gains	
	able ou				_	able ba	, ,	- 1	able ob	_ ,	able oc		(W)	7
Southeast 0.9x	0.77	X	6.0	9	×	36.79	X		0.63	x [0.7	=	68.48	(77)
Southeast 0.9x	0.77	X	6.0	9	X _	62.67	X		0.63	x [0.7	=	116.65	(77)
Southeast 0.9x	0.77	X	6.0	9	X	85.75	X		0.63	×	0.7	=	159.6	(77)
Southeast _{0.9x}	0.77	x	6.0	9	X	106.25	X		0.63	×	0.7	=	197.75	(77)
Southeast 0.9x	0.77	X	6.0	9	x	119.01	X		0.63	X	0.7	=	221.5	(77)

		_					, ,		_				_
Southeast 0.9x	0.77	X	6.0)9	X 1	18.15	X	0.63	X	0.7	=	219.9	(77)
Southeast 0.9x	0.77	X	6.0)9	x 1	13.91	X	0.63	X	0.7	=	212.01	(77)
Southeast 0.9x	0.77	X	6.0)9	X 1	04.39	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	х	0.7	=	58.6	(77)
Southwest _{0.9x}	0.77	x	5.4	15	x :	36.79		0.63	х	0.7	=	61.28	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x (62.67		0.63	х	0.7	=	104.39	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 8	85.75		0.63	х	0.7	=	142.83	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	06.25		0.63	x	0.7	=	176.97	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	19.01		0.63	x	0.7	=	198.22	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	18.15		0.63	x	0.7	=	196.79	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	13.91]	0.63	x	0.7	_ =	189.73	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	04.39		0.63	x	0.7	=	173.87	(79)
Southwest _{0.9x}	0.77	×	5.4	15	x .	92.85	֓֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֓֡֓֓֡	0.63	x	0.7	=	154.65	(79)
Southwest _{0.9x}	0.77	×	5.4	ļ5	x (69.27	j	0.63	x	0.7	=	115.37	(79)
Southwest _{0.9x}	0.77	×	5.4	15	x Z	44.07	j	0.63	x	0.7	=	73.4	(79)
Southwest _{0.9x}	0.77	×	5.4	ļ5	x :	31.49	֓֞֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֓֓֡֓֓֡	0.63	x	0.7	=	52.45	(79)
Solar gains in watts, calculated for each month													
7. Mean inter	nal temper	ature	(heating	season)								
Temperature	during hea	ting p	eriods ir	n the livii	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac				ea, h1,m	(see Ta	able 9a)						7	
Jan		Mar	Apr	May	Jun	Jul	 	ug Sep	Oct		Dec	1	
(86)m= 0.96	0.92	0.84	0.72	0.56	0.4	0.29	0.3	0.49	0.76	0.92	0.97]	(86)
Mean interna	l temperatu	ıre in I	iving are	ea T1 (fo	ollow ste	ps 3 to 7	7 in T	able 9c)				-	
(87)m= 20.14	20.38 2	0.64	20.86	20.96	20.99	21	2	1 20.98	20.85	20.47	20.09		(87)
Temperature	during hea	ting p	eriods ir	n rest of	dwelling	g from Ta	able 9	9, Th2 (°C)					
(88)m= 20.15	20.15 2	0.15	20.17	20.17	20.19	20.19	20.	19 20.18	20.17	20.17	20.16		(88)
Utilisation fac	tor for gain	s for r	est of d	wellina.	h2.m (se	ee Table	9a)			-	•	_	
(89)m= 0.95		0.82	0.68	0.52	0.35	0.24	0.2	0.44	0.72	0.9	0.96]	(89)
Mean interna	l temperati	ıre in 1	the rest	of dwelli	ing T2 (f	follow ste	ne 3	to 7 in Tahl	L a_9c)			J	
(90)m= 19.02		9.72	20.01	20.13	20.18	20.19	20.		20.01	19.51	18.97	1	(90)
. ,	<u> </u>				<u> </u>					/ing area ÷ (ļ	0.5	(91)
Maara la terr	l tower seed			ا- مام	II:\ ′	1 A	. /4	41 A) . TO		`			 ` ′
Mean interna (92)m= 19.58	 	`				i	Ť		00.40	1 10 00	10.50	1	(02)
134111= 1 19.08							100						
Apply adjustr		0.18 mean	20.43	20.54	20.58	20.59	20.		20.42		19.53]	(92)

												•	
(93)m= 19.58	19.87	20.18	20.43	20.54	20.58	20.59	20.59	20.57	20.42	19.99	19.53		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l				<u> </u>								
(94)m= 0.94	0.9	0.82	0.69	0.54	0.38	0.26	0.29	0.47	0.73	0.9	0.95		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m								•	
(95)m= 423.35	482.65	500.76	463.26	375.66	255.76	171.39	179.24	275.91	384.24	408.09	402.4		(95)
Monthly avera			i 			•					ı	Ī	4
(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	·	i	· ·		i	=[(39)m : 171.63	· · ·	<u> </u>		569.04	004.54	1	(07)
(97)m= 689.14 Space heatin	673.12	612.61	507.26	387.6	257.47		179.6	280.53	430.55		681.54		(97)
(98)m= 197.75	127.99	83.22	31.68	8.88	0	0.02	0	0	34.46	115.88	207.69		
(66)=	127.00	00.22	01.00	0.00							<u> </u>	807.54	(98)
Total per year (kWh/year) = Sum(98) _{15,912} = Space heating requirement in kWh/m²/year											=		
·	• .											16.49	(99)
9b. Energy red			· ·	Ĭ						., ,			
This part is use Fraction of spa										unity scr	neme.	0	(301)
·			•		-	_	(.,					(302)
Fraction of space heat from community system 1 – (301) =										1	(302)		
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.													
Fraction of hea		-			•							1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting syst	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for (commun	ity heatii	ng syste	m					1.05	(306)
Space heating	a											kWh/yea	- r
Annual space	_	requiren	nent									807.54	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	847.92	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	1												
Annual water h		equirem	ent									1809.07	
If DHW from c													<u> </u>
Water heat fro		•)				(64) x (30	03a) x (30	=	1899.52	(310a)	
Electricity used							0.01	× [(307a).	(307e) +	(310e)] =	27.47	(313)	
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											i		7(005.)
mechanical ve	ntilation	- baland	cea, extra	act or po	sitive in	put from	outside					104.15	(330a)

				_						
warm air heating system fans			0	(330b)						
pump for solar water heating			0	(330g)						
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	104.15	(331)						
Energy for lighting (calculated in Appendix L)			227.56	(332)						
Electricity generated by PVs (Appendix M) (negative quantity	/)		-108.82	(333)						
Total delivered energy for all uses (307) + (309) + (310) + (3	2970.34	(338)								
12b. CO2 Emissions – Community heating scheme										
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year							
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second fu	el 280	(367a)						
CO2 associated with heat source 1 [(307	7b)+(310b)] x 100 ÷ (367b) x	0.52	509.26	(367)						
Electrical energy for heat distribution	[(313) x	0.52	14.26	(372)						
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	523.52	(373)						
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)						
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	= 0	(375)						
Total CO2 associated with space and water heating	(373) + (374) + (375) =		523.52	(376)						
CO2 associated with electricity for pumps and fans within dw	/elling (331)) x	0.52	54.06	(378)						
CO2 associated with electricity for lighting	(332))) x	0.52	= 118.1	(379)						
Energy saving/generation technologies (333) to (334) as applitem 1	olicable	0.52 x 0.01 =	-56.48] (380)						
Total CO2, kg/year sum of (376)(382) =			639.2	(383)						
Dwelling CO2 Emission Rate (383) ÷ (4) =			13.06	(384)						

El rating (section 14)

(385)

90.88

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:45:30

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 26.29 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.28 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 - Heat pump

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	OK
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 electric heat pump		
Photovoltaic array		

		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: 02 - B Address:												
Overall dwelling dime	nsions:											
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)			
Ground floor			53.46	(1a) x	2	2.65	(2a) =	141.67	(3a)			
Total floor area TFA = (1a	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	0	x 1	10 =	0	(7a)			
Number of passive vents				Ī	0	x 1	10 =	0	(7b)			
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)			
				L								
				_			Air ch	anges per ho	our —			
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, proced			ontinuo fr	0		÷ (5) =	0	(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 prideducting areas of openir	resent, use the value corresponding t pas): if equal user 0.35	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	250 amaza dia adia adia		(8) + (10)					0	(16)			
•	q50, expressed in cubic metrity value, then $(18) = [(17) \div 20] +$		•	•	etre or e	envelope	area	3	(17)			
•	s if a pressurisation test has been do				is being u	sed		0.15	(10)			
Number of sides sheltere	ed							0	(19)			
Shelter factor			(20) = 1 -		19)] =			1	(20)			
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.15	(21)			
Infiltration rate modified for	 		1 .					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	4.3 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							•				
(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 infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
<i>alculate effe</i> If mechanic		•	rate for t	he appli	cable ca	se	-		-				—
If exhaust air h			endix N (2	3h) = (23a	a) × Fmv (e	equation (N	NS)) other	wise (23h) = (23a)			0.5	=
If balanced with		0		, ,	,	. `	,, .	`) = (20a)			0.5	=
		-	•	_					2h\ma . /	00h) [4 (22-)	75.65	(2
a) If balance 4a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	230) × [0.29	0.3	÷ 100]]	(2
,	<u> </u>	<u> </u>			<u> </u>		<u> </u>				0.3	İ	(2
b) If balance	ea mech	anicai ve	entilation 0	without	neat red	overy (i	0 (24b	0 = (22)	2b)m + (. 0	23b) ₀	0	1	(2
	<u> </u>	<u> </u>							0	0	0		(2
c) If whole h			then (24	•	•				.5 × (23b	o)		_	
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r			ole hous m = (22		•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				I	
5)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(:
									1	1		ı	
3. Heat losse LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		X k /K
indows Type		` ,			9.56	x1.	/[1/(1.4)+	0.04] =	12.67	<u></u>			(
indows Type	2				3.98	x ₁ ,	/[1/(1.4)+	0.04] =	5.28	一			(
/alls Type1	40.0	14	13.54	1	26.5	x	0.18		4.77	=	60	1590) (:
/alls Type2	12.1		0		12.16	=	0.17	-	2.04	북 ¦	60	729.6	=
otal area of e					52.2	' ^	0.17		2.04	[729.0	`\ (
arty wall	, ioi i ioi i io	,				=							`
-					27.88		0	= [0		45	1254.6	=
arty floor					53.46	_				Ĺ	70	3742.2	=
arty ceiling					53.46					Į	30	1603.8	3(
ternal wall **					102.0					Ĺ	9	918.27	7(
or windows and include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	1 3.2	
bric heat los				o ana pan			(26)(30)	+ (32) =				24.76	
eat capacity		•	-,					((28)	(30) + (32	2) + (32a).	(32e) =	9838.47	\exists
nermal mass		,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			** *	÷ (4) =	, (,	(= = 7	184.03	\exists
r design asses n be used inste	sments wh	ere the de	tails of the	•			ecisely the	` '		TMP in Ta	able 1f	104.03	
ermal bridg				usina An	pendix k	<						6.09	
details of therma					-							0.00	`
otal fabric he			, ,	·	,			(33) +	(36) =			30.85	
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 14.63	14.46	14.28	13.41	13.23	12.35	12.35	12.18	12.7	13.23	13.58	13.93		(
eat transfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
		-											
9)m= 45.49	45.31	45.14	44.26	44.08	43.21	43.21	43.03	43.56	44.08	44.43	44.78		

Author	Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(40)m= 0.85	0.85	0.84	0.83	0.82	0.81	0.81	0.8	0.81	0.82	0.83	0.84		
A.		!	!							Average =	Sum(40) ₁	12 /12=	0.83	(40)
4. Water heating energy requirement. **RWh/year:** Assumed occupancy, N if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) Annual average not value use transported by for each month Vd,m = factor from Table 2 to x (43) (44)me 84.44 81.37 78.3 75.23 72.16 89.09 89.09 72.16 75.23 78.3 81.37 84.44 Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm /3000 kWh/hooth (sea Tables 18, 1c, 1d) (45)me 125.22 199.62 113.01 98.53 94.54 81.58 75.6 86.75 87.78 102.3 111.67 121.27 Total = Sum(45), x = 1 121.27 Total = Sum(45), x = 1 121.27 If it it is a 1.75 18.18		<u> </u>							-			T _ 1		
### 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 ### Annual average had water usage in litres per day Vd.average = (25 x N) + 36 ### Reduce the annual varage had value 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, hor and cold) ### Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (44) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (44) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water storage loss: ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calc		-	_	<u> </u>	– –		-	Ť		-	 	\vdash		
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 E 13.9, N = 1	(41)m= 31	28	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 E 13.9, N = 1														
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 in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average a contained to a chieve a water use target or not more that 125 litres per persons per day (if water us, hot and colors) Jan	4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		79		(42)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (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 = Sum(44), vo = 921.15 (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) (46)m = 125.22 109.52 113.01 88.63 94.54 81.58 75.6 86.75 87.78 102.3 111.67 121.27 Total = Sum(45), vo = 120.778 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)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 (46)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 (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): Chemisse if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2b Energy lost from water storage, kWh/year (48) x (49) = 110 (50) (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51) If community heating see section 4.3 Volume factor from Table 2b (52) 1.03 (52) Temperature factor from Table 2b (53) 1.03 (52) Temperature factor from Table 2b (54) 1.03 (52) Temperature factor from Table 2b (55) (41)m (56)m = (55) x (41)m (56)m = (32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 10.98 32.01 (57) Primary circuit loss (annual) from Table 3 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)	Annual averag	ge hot wa al average	hot water	usage by	5% if the α	lwelling is	designed i	` ,		se target o		5.76		(43)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (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 = Sum(44), vo = 921.15 (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) (46)m = 125.22 109.52 113.01 88.63 94.54 81.58 75.6 86.75 87.78 102.3 111.67 121.27 Total = Sum(45), vo = 120.778 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)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 (46)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 (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): Chemisse if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2b Energy lost from water storage, kWh/year (48) x (49) = 110 (50) (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51) If community heating see section 4.3 Volume factor from Table 2b (52) 1.03 (52) Temperature factor from Table 2b (53) 1.03 (52) Temperature factor from Table 2b (54) 1.03 (52) Temperature factor from Table 2b (55) (41)m (56)m = (55) x (41)m (56)m = (32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 10.98 32.01 (57) Primary circuit loss (annual) from Table 3 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)	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Total = Sum(44)									1 - 22		L			
Energy content of hor water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) 45 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 Total = Sum(45) _{1.12} = 1207.78 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 46 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 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known:	(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		
(45)me	` '		l .				l .	<u> </u>		I Total = Su	ım(44) ₁₁₂ =	=	921.15	(44)
Total = Sum(45) 1	Energy content of	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
## instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) ## (46)me	(45)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		
(46)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 Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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): 0 (48) Temperature factor from Table 2b 0 (49) Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52) Temperature factor from Table 2b 0.6 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54) Energy lost										Total = Su	ım(45) ₁₁₂ =	=	1207.78	(45)
Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (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: 0 (48) a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) (49) 0 (49) Energy lost from Water storage, kWh/year (48) × (49) = 110 (50) (51) (50) (51) (50)	If instantaneous v	vater heatı	ng at point	of use (no	not water	r storage),	enter 0 in	boxes (46)	to (61)		,	 		
Storage volume (litres) including any solar or WWHRS storage within same vessel	` '		16.95	14.78	14.18	12.24	11.34	13.01	13.17	15.35	16.75	18.19		(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) = 110 (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) = 1.03 Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 1.03 Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 32.01 28.92 32.01 30.98	_) includir	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ല		0		(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 (47) × (51) × (52) × (53) = Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = (55) × (41)m) (56)m = (32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (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 (57)m = (32.01 28.92 32.01 30.98 32.01 30	-	` .					•		a	001		<u> </u>		(47)
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 110 (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) = 1.03 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 If cylinder contains dedicated solar storage, (57)m = (56)m × [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H (57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 Primary circuit loss (annual) from Table 3 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 thermostat)	-	-			-			, ,	ers) ente	er '0' in ((47)			
Temperature factor from Table 2b	Water storage	loss:		`					,		,			
Energy lost from water storage, kWh/year (48) × (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3 Volume factor from Table 2a 1.03 (52) Temperature factor from Table 2b 0.6 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 1.03 (54) (55) (55) (55) (1.03 (55)) (55) (1.03 (55)) (1.03 (5	a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(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 $((56)m = 32.01 28.92 32.01 30.98 32.01 30.9$	Temperature f	actor fro	m Table	2b								0		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day) $0.02 \qquad (51)$ If community heating see section 4.3 $ \text{Volume factor from Table 2a} \qquad \qquad 1.03 \qquad (52) $ Temperature factor from Table 2b $0.6 \qquad (53)$ Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = \qquad 1.03 \qquad (54)$ Enter (50) or (54) in (55) $ \qquad \qquad (103) \qquad (55) $ Water storage loss calculated for each month $ ((56)m = (55) \times (41)m) $ (56) $ \qquad \qquad (56)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 $ (56) $ \qquad \qquad (56)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 $ (56) $ \qquad \qquad (57)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 $ (57) $ \qquad \qquad (57)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 $ (57) $ \qquad \qquad (57)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 $ (58) $ \qquad \qquad (57)m = 32.01 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 $ (58) $ \qquad \qquad (58)m = 32.01 30.98 32.0$	0,		•					(48) x (49)) =		1	10		(50)
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	•			-										(= 4)
Volume factor from Table 2a		•			e Z (KVV	n/litre/da	ly)				0.	.02		(51)
Temperature factor from Table 2b	•	•		JII 4.5							1.	.03		(52)
Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (58) Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)				2b							-			
Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (58) Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	•		_	,										
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 $(57)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (57)$ Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
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 $(57)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (57)$ Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
Primary circuit loss (annual) from Table 3 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 thermostat)	` '												хН	. ,
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 thermostat)	(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
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 thermostat)		loca (ar	nual\ fra	m Toble	. 2		ı	ı		ı		<u> </u>		(58)
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	•	,	,			59)m = 4	(58) ± 36	35 × (41)	ım			·		(50)
	-				,	•	` '	, ,		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	365 × (41)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	То	0	1	(61)
	 auired for	water h	eating ca	L	L I for eac	h month	(62)n	n = 0.85 x	 (45)m +	(46)m +	(57)m +	ו - (59)m + (61)m	
(62)m= 180.5	-	168.29	152.02	149.82	135.07		142.0		157.58	165.17	176.55]	(62)
Solar DHW inpu	it calculated	using App	endix G oı	· Appendix	H (nega	tive quantity	y) (ente	r '0' if no sola	ar contribu	tion to wate	r heating)) T	
(add addition											•		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ter				•	•	•	•	•	•	•	
(64)m= 180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.0	2 141.28	157.58	165.17	176.55]	
				•	•	•		Output from w	ater heate	er (annual)	l12	1858.62	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	ı]	
(65)m= 85.86	76.36	81.8	75.56	75.66	69.92	69.36	73.0	7 71.98	78.24	79.93	84.54]	(65)
include (57	7)m in calc	culation	of (65)m	only if c	ylinder	is in the	dwelli	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):									
Metabolic ga	ins (Table	5), Wat	ts										
Jan		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.6	1 89.61	89.61	89.61	89.61]	(66)
Lighting gain	s (calculat	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	ılso se	e Table 5				-	
(67)m= 13.93	12.37	10.06	7.62	5.69	4.81	5.19	6.75	9.06	11.5	13.43	14.31]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	lso see Ta	ble 5		-	-	
(68)m= 156.2°	1 157.83	153.74	145.05	134.07	123.75	116.86	115.2	24 119.33	128.02	139	149.32]	(68)
Cooking gain	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	e 5		-	_	
(69)m= 31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.9	6 31.96	31.96	31.96	31.96]	(69)
Pumps and fa	ans gains	(Table 5	āa)										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. e	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -71.68	3 -71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.6	8 -71.68	-71.68	-71.68	-71.68]	(71)
Water heatin	g gains (T	able 5)										_	
(72)m= 115.4	113.63	109.94	104.94	101.69	97.11	93.22	98.2	1 99.98	105.16	111.01	113.63]	(72)
Total interna	al gains =				(66	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 335.42	2 333.71	323.63	307.48	291.33	275.55	265.16	270.0	08 278.24	294.57	313.32	327.14]	(73)
6. Solar gai													
Solar gains are		ŭ					ations to		ne applica		tion.		
Orientation:	Access F Table 6d	actor	Area m²			ux able 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Couthwoots							1 -					. ,	7,
Southweston		X	9.5		-	36.79] <u> </u>	0.63	×	0.7	=	107.5	[(79)
Southwesters	<u> </u>	X	9.5			62.67	ļ ļ	0.63	×	0.7	=	183.11	<u></u> (79)
Southwesto o	<u> </u>	X	9.5			85.75]	0.63	×	0.7	=	250.54	」 (79)
Southweston		X	9.5			106.25] <u> </u>	0.63	×	0.7	_ =	310.43	」 (79)
Southwest _{0.9x}	0.77	X	9.5	56	X	119.01	J L	0.63	Х	0.7	=	347.71	(79)

								_		_				
Southwest _{0.9x}	0.77	X	9.5	66	X	1	18.15	_	0.63	X	0.7	=	345.19	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	1	13.91]	0.63	X	0.7	=	332.8	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	1	04.39		0.63	X	0.7	=	304.99	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	9	92.85]	0.63	Х	0.7	=	271.28	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	6	9.27]	0.63	X	0.7	=	202.38	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	4	14.07]	0.63	X	0.7	=	128.76	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	3	31.49]	0.63	X	0.7	=	92	(79)
Northwest 0.9x	0.77	X	3.9	8	X	1	1.28	X	0.63	х	0.7	=	13.72	(81)
Northwest 0.9x	0.77	X	3.9	8	X	2	22.97	X	0.63	х	0.7	=	27.94	(81)
Northwest 0.9x	0.77	X	3.9	8	X	4	11.38	X	0.63	х	0.7	=	50.33	(81)
Northwest 0.9x	0.77	X	3.9	98	X	ε	67.96	X	0.63	х	0.7	=	82.66	(81)
Northwest 0.9x	0.77	X	3.9	98	X	9	91.35	X	0.63	х	0.7	=	111.11	(81)
Northwest 0.9x	0.77	X	3.9	8	x	9	97.38	X	0.63	x	0.7	=	118.45	(81)
Northwest 0.9x	0.77	X	3.9	98	x		91.1	X	0.63	x	0.7	=	110.81	(81)
Northwest 0.9x	0.77	X	3.9	8	x	7	72.63	X	0.63	x	0.7		88.34	(81)
Northwest _{0.9x}	0.77	X	3.9	8	X	5	50.42	x	0.63	x	0.7	=	61.33	(81)
Northwest _{0.9x}	0.77	X	3.9	98	X	2	28.07	x	0.63	x	0.7		34.14	(81)
Northwest 0.9x	0.77	X	3.9	98	x		14.2	X	0.63	x	0.7	=	17.27	(81)
Northwest _{0.9x}	0.77	X	3.9	8	X	,	9.21	x	0.63	x	0.7	=	11.21	(81)
Solar gains in							1	Ϋ́	n = Sum(74)m				1	(00)
(83)m= 121.22	211.05	300.87	393.09	458.82		63.65	443.61	393	.33 332.61	236.5	2 146.03	103.2]	(83)
Total gains – i					`			1 000	44 040.05	T 504.0	0 450 04	100.05	1	(0.4)
(84)m= 456.64	544.75	624.5	700.57	750.15	<u>L</u>	'39.2	708.77	663	.41 610.85	531.0	8 459.34	430.35	J	(84)
7. Mean inte	rnal tempe	erature	(heating	seasor	า)									_
Temperature	during he	eating p	eriods ir	the liv	ing	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisation fac	 				n (s	ee Ta	ible 9a)						1	
Jan	Feb	Mar	Apr	May	_	Jun	Jul	 	ug Sep	Oc	+	Dec	_	
(86)m= 0.97	0.93	0.85	0.71	0.54		0.37	0.27	0.	3 0.49	0.77	0.93	0.97]	(86)
Mean interna	al tempera	ture in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)				-	
(87)m= 20.24	20.47	20.71	20.91	20.98		21	21	2	1 20.99	20.88	20.55	20.2		(87)
Temperature	during he	eating p	eriods ir	rest of	dw	elling	from Ta	able 9	9, Th2 (°C)					
(88)m= 20.21	20.21	20.22	20.23	20.23	2	20.25	20.25	20.	25 20.24	20.23	3 20.23	20.22		(88)
Utilisation fac	ctor for ga	ins for r	est of d	welling,	h2	,m (se	ee Table	9a)						
(89)m= 0.96	0.92	0.83	0.67	0.49		0.33	0.22	0.2	25 0.43	0.73	0.92	0.97		(89)
Mean interna	al tempera	ature in t	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7 in Tab	ole 9c)			_	
(90)m= 19.21	19.53	19.86	20.13	20.21	Ť	20.24	20.25	20.	T T	20.1	19.66	19.17]	(90)
					-				<u>.</u>	fLA = Li	ving area ÷ (4) =	0.45	(91)
Mean interna	al temnera	nture (fo	r the wh	റില പ്യം	ماالد	a) – f	I Δ ∨ Τ1	+ (1	_ fl Δ\ ∨ Τα)				
(92)m= 19.68	19.95	20.25	20.48	20.56	$\overline{}$	9) – 1 20.58	20.59	20.	- 1	20.46	20.06	19.63	1	(92)
Apply adjusti								l					J	. ,
117 22,000		··		F				-,						

(93)m= 19.68	19.95	20.25	20.48	20.56	20.58	20.59	20.59	20.57	20.46	20.06	19.63		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	I	l					[· · · · · · · · · · · · · · · · · · ·						
(94)m= 0.96	0.91	0.83	0.68	0.51	0.35	0.24	0.27	0.46	0.74	0.91	0.96		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 436.32	496.94	519.33	479.81	383.83	257.86	172.14	180.05	279.24	394.63	420.13	414.76		(95)
Monthly aver		T T	·	r	r e	ī				ī			
(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	1	1			i	-``	- ` 	``		F7F 0F	C04.04		(07)
(97)m= 699.49	682.13	620.42	512.39	390.52	258.56	172.22	180.19	282.03	434.44	575.85	691.24		(97)
Space heatin (98)m= 195.8	124.45	75.21	23.46	4.97	0	0.02	0	0 0	29.62	112.12	205.7		
(55)1112 156.5	124.40	10.21	20.40	4.07				l per year		<u> </u>	└──┤	771.33	(98)
Casas bootin	a roquir	omant in	L(\A/b/m2	2/voor			rota	ii poi youi	(IKVVIII) year) = Gam(o	O)15,912 —		=
Space heatin	•											14.43	(99)
9b. Energy red			The state of the s	Ĭ									
This part is use Fraction of spa					•		• .	•		unity scr	neme.	0	(301)
Fraction of spa			•		-	_		, -			[[1	(302)
·			•	•	,	,	allows for	CUD and	un to form	other boot			(302)
The community so includes boilers, h		-							ир то тоиг с	otner neat	sources, ir	ie ialler	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for conf	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ting sys	tem		Ì	1	(305)
Distribution los	ss factor	(Table 1	12c) for c	commun	ity heatii	ng syste	m				[1.05	(306)
Space heating		`	,		,	5 ,					L	kWh/yea	
Annual space	-	requiren	nent								[771.33	<u>'</u>
Space heat fro	•	•		р				(98) x (30)4a) x (30	5) x (306) :	_ _ [809.9	(307a)
Efficiency of se	econdar	v/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)	[0	(308
Space heating			•	_	•	,			· · 01) x 100 -	,		0	(309)
	•			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		, ,					L		
Water heating Annual water h		requirem	ent								ſ	1858.62	
If DHW from c	_	-									L	1000.02	
Water heat fro)				(64) x (30	03a) x (30	5) x (306) :	= [1951.55	(310a)
Electricity use	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	27.61	(313)
Cooling System	m Energ	y Efficie	ncy Ratio	0							Ì	0	(314)
Cooling System	=9										L		
Space cooling	_	-	•	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Space cooling	(if there	is a fixe	d cooling	•		,		= (107) ÷	(314) =			0	(315)
	if there) oumps a	is a fixe	ed cooling	velling (T	Γable 4f)	:	outside	= (107) ÷	(314) =]	113.73	(315) (330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		113.73	(331)
Energy for lighting (calculated in Appendix L)				245.94	(332)
Electricity generated by PVs (Appendix M) (negative quantity	<i>'</i>)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3012.29	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second	fuel	280	(367a)
CO2 associated with heat source 1 [(307	'b)+(310b)] x 100 ÷ (367b) x	0.52	=	511.85	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	14.33	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	526.18	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			526.18	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	=	59.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	127.64	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	olicable	0.52 × 0.01	=	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				656.38	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				12.28	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:45:15*

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: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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 27.06 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.86 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 - Heat pump

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 electric heat pump		
Photovoltaic array		

		l Jser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Vei				010943 on: 1.0.5.50	
Address :	F	Property	Address	02 - C					
Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			72.62	(1a) x	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	10 =	0	(6a)
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	0	x 1	10 =	0	(7a)
Number of passive vents				Ī	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res			Ī	0	x 4	10 =	0	(7c)
				_					
						<u>_</u>	Air ch	nanges per ho	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		eu 10 (17),	otrierwise t	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	. ,	-	(- N		0	(15)
Infiltration rate	250 amaza dia adia adia arata		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$	•	•	•	etre or e	envelope	area	3	(17)
•	s if a pressurisation test has been do				is being u	sed		0.15	(10)
Number of sides sheltere	d							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18	x (20) =				0.15	(21)
Infiltration rate modified for			1 ,		<u> </u>	<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	4.3 4.4 4.3 3.8	3.6	3.1	4	4.3	4.5	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	elter an	d wind s	peed) =	(21a) x	(22a)m	_	_			
0.19 Calculate effe	0.19	0.18	0.16	0.16 he appli	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		•	ale for t	пе арри	cable ca	30						0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				74.8	(23)
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	_
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(24
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		(24
c) If whole h if (22b)r		tract ver (23b), t		-					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]			1	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		•		•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		
Windows Type		(111)		l	12.71				16.85		NO/III I	(10)	(27
Windows Type					3.46	_	/[1/(1.4)+	Ļ	4.59	\dashv			(27
Walls Type1	72.6	2	16.1	7	56.45	=	0.18	= [10.16	╡┌	60	3387	(29)
Walls Type1	17.7		0			=			2.99	륵 ¦		1066.8	= '
Total area of e					17.78	3 ×	0.17	[2.99	[60		(31)
Party wall	, ioi i ioi i io	,			90.4						AF	1264.4	_ `
Party floor					30.32	=	0	[0	L	45	1364.4	=
Party ceiling					72.62	=				Ĺ	40	2904.8	=
Internal wall **					72.62	=				Ĺ	30	2178.6	= `
internal wall * for windows and		014/0 1100 0	effootivo wi	ndow II v	146.1		formula 1	/[/1/ L.volu	(0) (0 (04) (l So givon in	9 norograph	1315.53	3 (32
** include the area						ateu using	i ioiiiiuia i	/[(1/ O- valu	1 0)+0.04] a	is giveri iii	i parayrapri	1 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				34.58	(33
Heat capacity	Cm = S	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	12217.13	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			168.23	(35)
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		_
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						7.11	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(22)	(20)				¬,
Total fabric he		alouloto -	l manthi	,					(36) =	(25)m + (F)	\	41.69	(37
Ventilation hea	Feb				lun	Jul	۸۰۰۰		= 0.33 × (l	1	1	
(38)m= 20.15	19.91	Mar 19.67	Apr 18.48	May 18.24	Jun 17.05	Jui 17.05	Aug 16.81	Sep 17.53	Oct 18.24	Nov 18.72	Dec 19.19		(38
(VV) - LULIO	1 .5.91	10.07	10.40	10.24	17.00	. 7.00	10.01	17.00	10.24	10.72	13.13	1	,50
								/= -·	(6-)	0.0)			
Heat transfer (39)m= 61.84	coefficier	nt, W/K 61.36	60.17	59.93	58.74	58.74	58.51	(39)m 59.22	= (37) + (38)m 60.41	60.89	1	

eat loss pa	rameter (HLP), W	m²K			1	1	(40)m	= (39)m ÷	· (4)			
0.85 O.85	0.85	0.84	0.83	0.83	0.81	0.81	0.81	0.82	0.83	0.83	0.84		_
umber of d	ave in mo	onth (Tah	le 1a)						Average =	Sum(40) ₁	12 /12=	0.83	(4
Jar	<u> </u>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
<u> </u>		1											
. Water he	ating ene	rgy requi	irement:								kWh/yea	ar:	
sumed oc	cupancy	N									04		()
if TFA > 1	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (TFA -13		31		(4
if TFA £ 13 inual aver	•	ator usar	na in litra	s nar da	v Vd av	orano –	(25 v NI)	± 36					(4
duce the anı	nual average	hot water	usage by	5% if the a	welling is	designed t			se target o		0.02		(-
t more that 1.	25 litres per	person per	day (all w	ater use, l	not and co	ld)			,				
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usag						1	· <i>'</i>			•			
)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		— ,
ergy content	of hot water	r used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D)Tm / 3600			m(44) ₁₁₂		1068.18	(4
)m= 145.2		131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63		
,	. 1	101.00	111.20	100.00	0 1.0	07.00	100.00		<u> </u>	m(45) ₁₁₂ =	<u> </u>	1400.56	(4
nstantaneous	s water heat	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(10)112	L		`
)m= 21.78	19.05	19.66	17.14	16.44	14.19	13.15	15.09	15.27	17.8	19.42	21.09		(4
ater storaç													
orage volu	•	•	•			_		ame ves	sel		0		(4
community herwise if	•			-			' '	ora) ant	or 'O' in <i>(</i>	17 \			
ater storaç		not wate	וו פוווט) ול	iciuues i	IIStaiitai	ieous co	ווטט וטוווי	ers) erik	ei U iii (47)			
If manufa		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(4
mperature	factor fro	om Table	2b								0		(4
ergy lost f	rom wate	r storage	, kWh/ye	ear			(48) x (49)) =		1	10		(5
If manufa			-										
ot water st	•			e 2 (kW	h/litre/da	ıy)				0.	02		(5
community Jume facto	_		011 4.3							1	03		(!
mperature			2b								.6		(!
ergy lost f	rom wate	r storage	. kWh/ve	ear			(47) x (51)) x (52) x ((53) =		.03		(!
nter (50) o		_	,								.03		(5
ater storaç	ge loss ca	lculated t	for each	month			((56)m = ((55) × (41)	m				
)m= 32.0°	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
ylinder conta		ed 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	Н	
7)m= 32.0°	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
mary circ	uit loss (a	nnual) fro	m Table	. 3				•	•		0		(!
mary circ	•	•			59)m = ((58) ÷ 36	65 × (41)	ım					,
modified				,		. ,	, ,		r thermo	stat)			

Combi loss calculate	d for each	month (′61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0 0	0	0	0	0	0	0		0	0	0	0	1	(61)
Total heat required for	r water he	eating ca	L	L I for eac	h month	(62)r	—— n =	0.85 × (45)m +	. (46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 200.48 176.93		167.75	164.91	148.1	142.94	155.	_	155.29	173.91	182.99	195.9]	(62)
Solar DHW input calculate	d using App	endix G oı	· Appendix	: H (negati	ve quantity	/) (ente	er '0'	if no sola	r contribu	tion to wate	er heating)		
(add additional lines											-		
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water he	ater				•	•				•	•	•	
(64)m= 200.48 176.93	186.33	167.75	164.91	148.1	142.94	155.	.87	155.29	173.91	182.99	195.9	1	
			•	•	•		Outp	ut from wa	ater heate	er (annual)	112	2051.4	(64)
Heat gains from water	r heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	ı] + 0.8 x	(46)m	n + (57)m	+ (59)m	١]	
(65)m= 92.5 82.17	87.8	80.78	80.67	74.25	73.37	77.6	67	76.64	83.67	85.85	90.98]	(65)
include (57)m in ca	lculation	of (65)m	only if c	ylinder i	s in the	dwelli	ing (or hot w	ater is f	from com	munity h	neating	
5. Internal gains (se	e Table 5	and 5a):										
Metabolic gains (Tab	le 5), Wat	ts											
Jan Feb		Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 115.4 115.4	115.4	115.4	115.4	115.4	115.4	115	.4	115.4	115.4	115.4	115.4	1	(66)
Lighting gains (calcul	ated in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5			-	-	
(67)m= 18.13 16.1	13.09	9.91	7.41	6.26	6.76	8.7	9	11.79	14.97	17.48	18.63]	(67)
Appliances gains (ca	culated in	Append	dix L, eq	uation L	13 or L1	3a), a	also	see Tal	ole 5	-	•	•	
(68)m= 203.33 205.44	200.13	188.81	174.52	161.09	152.12	150.	.01	155.32	166.64	180.93	194.36]	(68)
Cooking gains (calcu	ated in A	opendix	L, equat	ion L15	or L15a), also	o se	e Table	5	•	•	•	
(69)m= 34.54 34.54	34.54	34.54	34.54	34.54	34.54	34.5	54	34.54	34.54	34.54	34.54]	(69)
Pumps and fans gair	s (Table 5	āa)			•	•	•			•	•	•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evaporat	ion (negat	ive valu	es) (Tab	le 5)	-					-	-	-	
(71)m= -92.32 -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 gains	Table 5)				•		•			•		•	
(72)m= 124.33 122.28	118.01	112.2	108.43	103.13	98.61	104.	.39	106.45	112.46	119.24	122.28]	(72)
Total internal gains	=			(66))m + (67)m	ı + (68)m +	- (69)m + (70)m + (71)m + (72))m	•	
(73)m= 403.41 401.44	388.85	368.54	347.98	328.09	315.11	320.	.81	331.19	351.69	375.27	392.9]	(73)
6. Solar gains:													
Solar gains are calculate	•	r flux from	Table 6a		•	itions t	0 CO	nvert to th	e applica		tion.		
Orientation: Access Table 6		Area m²		Flu	ıx ble 6a		т.	g_ able 6b	-	FF Table 6c		Gains (W)	
						1 1	1 (_ '				1
Northeast 0.9x 0.7	7 ×	12.	71	X	11.28	X		0.63	_ ×	0.7	=	43.83	(75)
Northeast 0.9x 0.7		12.			22.97	X		0.63	x	0.7	=	89.21	(75)
Northeast 0.9x 0.7		12.		-	41.38	X		0.63	x	0.7	=	160.73	(75)
Northeast 0.9x 0.7		12.	71	-	67.96	X		0.63	x [0.7	=	263.96	(75)
Northeast 0.9x 0.7	7 ×	12.	71	x (91.35	x		0.63	X	0.7	=	354.82	(75)

Nawth a a a 4		_			_		٦ .		_			Γ	– ,,
Northeast _{0.9x}	0.77	×	12.	71	× L	97.38	X	0.63	X	0.7	=	378.27	(75)
Northeast _{0.9x}	0.77	X	12.	71	× L	91.1	X	0.63	X	0.7	=	353.87	(75)
Northeast _{0.9x}	0.77	X	12.	71	× L	72.63	X	0.63	X	0.7	=	282.11	(75)
Northeast _{0.9x}	0.77	X	12.	71	x _	50.42	×	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	×	0.63	X	0.7	=	35.79	(75)
Northwest _{0.9x}	0.77	X	3.4	ŀ6	x	11.28	x	0.63	X	0.7	=	11.93	(81)
Northwest _{0.9x}	0.77	X	3.4	ŀ6	x	22.97	x	0.63	X	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.4	ŀ6	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	x	3.4	16	х	91.35	×	0.63	x	0.7		96.59	(81)
Northwest _{0.9x}	0.77	x	3.4	ŀ6	x	97.38	= x	0.63	×	0.7	<u> </u>	102.98	(81)
Northwest _{0.9x}	0.77	x	3.4	ŀ6	х	91.1	Ī×	0.63	x	0.7	=	96.33	(81)
Northwest _{0.9x}	0.77	x	3.4	16	x $$	72.63	T x	0.63	x	0.7		76.8	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x Γ	50.42	Ī×	0.63	×	0.7		53.32	(81)
Northwest 0.9x	0.77	×	3.4	16	х	28.07	i x	0.63	×	0.7	=	29.68	(81)
Northwest 0.9x	0.77	×	3.4	16	x	14.2	X	0.63	×	0.7	=	15.01	(81)
Northwest 0.9x	0.77	×	3.4	16	x F	9.21	i x	0.63	×	0.7		9.74	(81)
							_						
Solar gains in	watts. calcu	ulated	for eacl	h month	1		(83)m	n = Sum(74)m .	(82)m				
(83)m= 55.76		04.48	335.82	451.41	481	.25 450.2	358		138.7	70.16	45.53		(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m	+ (83)m , watts	-	· ·		!	ļ.	ı	
(84)m= 459.17	514.94 59	93.33	704.36	799.39	809	.34 765.31	679	.71 580.35	490.4	445.43	438.43		(84)
7. Mean inter	nal temper	ature (heating	seasor	1)	-		•					
Temperature					<i>'</i>	ea from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation fac	•	•			-		•	, , ,					`
Jan	 -	Mar	Apr	May	Ť	ın Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	 	0.94	0.84	0.65	0.4	_	0.3		0.91	0.98	0.99		(86)
Mean interna	l tomporati	ıre in li	ivina ar	na T1 (f	ماامس	etone 3 to	7 in T	able 9c)			<u>l</u>		
(87)m= 19.91		20.38	20.74	20.93	20.	i	2		20.66	20.23	19.89		(87)
` ′	<u> </u>										10.00		, ,
Temperature					_	_ `	1	 	20.00	1 00 00	00.00	1	(88)
(88)m= 20.21	20.21 2	20.21	20.23	20.23	20.	25 20.25	20.	25 20.24	20.23	20.23	20.22		(00)
Utilisation fac		- 1			h2,m	(see Table	9a)				1	1	
(89)m= 0.98	0.97	0.93	0.81	0.61	0.4	1 0.28	0.3	33 0.6	0.89	0.97	0.99		(89)
Mean interna	l temperatu	ıre in t	he rest	of dwell	ing T	2 (follow sto	eps 3	to 7 in Tabl	e 9c)			_	
(90)m= 18.74	18.99 1	9.42	19.93	20.17	20.	24 20.24	20.	25 20.2	19.84	19.23	18.72		(90)
								1	LA = Liv	ving area ÷ (4) =	0.38	(91)
													_
Mean interna	l temperatu	ıre (for	the wh	ole dwe	elling)	= fLA × T1	+ (1	– fLA) × T2					
Mean interna (92)m= 19.19		ıre (foi	the wh	ole dwe	elling)		+ (1	- '	20.15	19.61	19.17		(92)
	19.41 1	9.79	20.24	20.46	20.	53 20.53	20.	54 20.49			19.17		(92)

Same 18-18 19-41 19-79 20-24 20-46 20-53 20-53 20-54 20-46 20-15 19-61 19-77 (93)							•							
Set 11 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			L		20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17		(93)
the utilisation Factor for gains using Table 9a	•													
Same Teb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)ms 0.98 0.97 0.93 0.81 0.62 0.43 0.3 0.35 0.62 0.88 0.96 0.98						Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (95)m Useful gains, hmGm, W = (95)m Useful gains, hmGm, hm			l	· · ·				7.0.9	Oop					
(95) (449.99 497.58 549.78 572.64 488.55 344.88 230.65 240.9 360.02 433.61 429.81 431.1 (95)	(94)m= 0.98	0.97	0.93	0.81	0.62	0.43	0.3	0.35	0.62	0.88	0.96	0.98		(94)
Monthly average external temperature from Table 8 (86)m	Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (97) (98) (98) (98) (98) (98) (98) (98) (97) (98)	(95)m= 449.99													
Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Monthly avera													
Space heating requirement for each month, kWh/month = 0.024 x [(97) m - (95)m] x (41) m (98)m Space heating requirement for each month, kWh/month = 0.024 x [(97) m - (95)m] x (41) m (98)m Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirements — Community heating scheme Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from several sources. The procedure allows for CHP and up to four other heat sources: the latter includes boliers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of total space heat from Community heat pump Space heat from community heat pump Space heat from community heat pump Space heat from secondary/supplementary heating system Space heating requirement														(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 350.35 266.26 197.66 78.97 19.77 0 0 0 0 103.45 234.84 357.33 (98) (98)														
Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirements Space heating space heating space heating space heating frable 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from community system Space heating (Table 11) '0' if none Space heat from community system Space heating (Table 11) '0' if none Space heating heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	` '						<u> </u>	l				911.39		(97)
Total per year (kWh/year) = Sum(98). 33.22 = 1608.62 (98) Space heating requirement in kWh/m²/year 22.15 (99) Sp. Energy requirements — Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301) Fraction of space heat from community system 1 — (301) = 1 (302) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of total space heat from Community heat pump (302) x (303a) = 1 (304a) Fractor for control and charging method (Table 4c(3)) for community heating system 1 (305) Distribution loss factor (Table 12c) for community heating system 1.05 (306) Space heating Space heating requirement (98) x (304a) x (305) x (306) = 1689.05 (307a) Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308) Space heating requirement (98) x (301) x 100 + (308) = 0 (309) Water heating Annual water heating requirement (98) x (301) x 100 + (308) = 0 (309) Water heating Annual water heating requirement (98) x (303) x (305) x (306) = 2153.97 (310a) Electricity used for heat distribution 0.01 x ((307a)(307e) + (310a)(310e)] = 38.43 (313) Cooling System Energy Efficiency Ratio 0 (314) Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f):			1			I	I				 	057.00		
Space heating requirement in kWh/m²/year Sp. Energy requirements — Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none This part is used for space heat from secondary/supplementary heating (Table 11) '0' if none Traction of space heat from community system 1 — (301) = The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heating system This part is used for space heat from Community heating system Space heating KWh/year Annual space heating requirement Space heat from Community heat pump Space heat from Community heat pump Space heat from Community heat pump Space heating requirement from secondary/supplementary system in % (from Table 4a or Appendix E) Space heating Annual water heating Annual water heating requirement If DHW from community scheme: Water heating Annual water heating requirement (64) × (303a) × (305) × (306) = 2153.97 (310a) Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] = 38.43 (313) Cooling System Energy Efficiency Ratio Fraction of space heating requirement from secondary system, if not enter 0) = (107) + (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f):	(98)m= 350.35	266.26	197.66	78.97	19.77	0	0						4000.00	7(00)
Sb. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Factor for control and charging method (Table 4c(3)) for community heating system Indicate the station of total space heat from Community heating system Indicate the station of total space heat from Community heating system Fraction of total space heat from Community heating system Indicate the station of total space heat from Community heating system Fraction for control and charging method (Table 4c(3)) for community heating system Fraction of total space heat from Community heating system Fraction of total space heat from Community heating system Fraction of total space heat from Community heating system Fraction of total space heat from Community heating system Fraction of total space heat from Community heating system Fraction of total space heat from Community heating system Fraction of total space heating from Community heating system Fraction of total space heating from Community heating system in (from Table 4a or Appendix E) Fraction of total space heating requirement from secondary/supplementary system in (from Table 4a or Appendix E) Fraction of total space heating requirement from secondary/supplementary system in (from Table 4a or Appendix E) Fraction of total space heating from Community heating system in (from Table 4a or Appendix E) Fraction of total space heating from Fraction of the fraction of the fraction of the fraction of the fraction of the fraction of the fraction of the fraction of the fraction of the fraction of the								lota	l per year	(kWh/yeai	r) = Sum(9	8) _{15,912} =	1608.62	<u> </u> (98)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301) Fraction of space heat from community system 1 – (301) = 1 (302) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump 1 (302) × (303a) = 1 (304a) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (304a) Factor for control and charging method (Table 4c(3)) for community heating system 1 (305) Distribution loss factor (Table 12c) for community heating system 1 (305) Space heating Annual space heating requirement 8 (80 × (304a) × (305) × (306) = 1689.05 (307a) Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308) Space heating Annual water heating requirement (98) × (301) × 100 + (308) = 0 (309) Water heating Annual water heating requirement (98) × (303a) × (305) × (306) = 1 (305) Electricity used for heat distribution 0.01 × ((307a)(307e) + (310a)(310e)] = 38.43 (313) Cooling System Energy Efficiency Ratio 0 (314) Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f):	Space heating	g require	ement in	kWh/m²	/year								22.15	(99)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none [301] Fraction of space heat from community system 1 – (301) = [1] [302] The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump [302] x (303a) = [303] Fraction of total space heat from Community heat pump [302] x (303a) = [303] Fraction of total space heat from Community heat pump [303] Fraction of total space heat from Community heating system [305] Distribution loss factor (Table 12c) for community heating system [306] Space heating Annual space heat from Community heat pump [308] x (304a) x (305) x (306) = [308] Fraction of total space heat from Community heating system [306] Space heating Annual space heating requirement [307a] Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) [307a] Space heating requirement from secondary/supplementary system [307a] Water heating Annual water heating requirement [307a] Mater heating Annual water heating requirement [307a] Electricity used for heat distribution [307a] Cooling System Energy Efficiency Ratio [307a] Electricity for pumps and fans within dwelling (Table 4f):	9b. Energy red	quiremer	nts – Cor	mmunity	heating	scheme								
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The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heat pump Fraction of total space heat from Community heating system Fraction of total space heat from Community heat pump Fraction o	•			-		-	_	(Table T	1) 'U' IT N	one		[0	╡`
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump [302] x (303a) = 1 (304a) Fraction of total space heat from Community heat pump [302] x (303a) = 1 (304a) Factor for control and charging method (Table 4c(3)) for community heating system [1] (305) Distribution loss factor (Table 12c) for community heating system [306] Space heating [307] Annual space heating requirement [308] Space heat from Community heat pump [308] x (304a) x (305) x (306) = 1689.05 (307a) [308] Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) [308] Space heating requirement from secondary/supplementary system [309] Water heating Annual water heating requirement [309] Mater heating requirement [307] Annual water heating requirement [308] Coling System Energy Efficiency Ratio [44) x (303a) x (305) x (306) = 2153.97 (310a) [310a] Electricity used for heat distribution [311] Cooling System Energy Efficiency Ratio [312] Coling System Energy Efficiency Ratio [313] Electricity for pumps and fans within dwelling (Table 4f):	Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
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Annual space heating requirement Space heat from Community heat pump (98) x (304a) x (305) x (306) = 1689.05 (307a) Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = 0 (308) Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2153.97 (310a) Electricity used for heat distribution 0.01 x [(307a)(307e) + (310a)(310e)] = 38.43 (313) Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f):	Distribution los	s factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m				L	1.05	(306)
Space heat from Community heat pump (98) × (304a) × (305) × (306) = 1689.05 (307a) Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) Space heating requirement from secondary/supplementary system (98) × (301) × 100 ÷ (308) = 0 (309) Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community heat pump (64) × (303a) × (305) × (306) = 2153.97 (310a) Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] = 38.43 (313) Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315) Electricity for pumps and fans within dwelling (Table 4f):	Space heating	9										_	kWh/yea	<u>r_</u>
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) O (308) Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) = O (309) Water heating Annual water heating requirement If DHW from community scheme: Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2153.97 (310a) Electricity used for heat distribution 0.01 x [(307a)(307e) + (310a)(310e)] = 38.43 (313) Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) Electricity for pumps and fans within dwelling (Table 4f):	Annual space	heating	requiren	nent									1608.62	
Space heating requirement from secondary/supplementary system $(98) \times (301) \times 100 \div (308) = 0$ (309) Water heating Annual water heating requirement 2051.4 If DHW from community scheme: Water heat from Community heat pump $(64) \times (303a) \times (305) \times (306) = 2153.97$ $(310a)$ Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = 38.43$ (313) Cooling System Energy Efficiency Ratio 0 (314) Space cooling (if there is a fixed cooling system, if not enter 0) 0 0 0 0 0 0 0 0 0 0	Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	= [1689.05	(307a)
Water heating Annual water heating requirement 2051.4 If DHW from community scheme: Water heat from Community heat pump $(64) \times (303a) \times (305) \times (306) =$ 2153.97 $(310a)$ Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] =$ 38.43 (313) Cooling System Energy Efficiency Ratio 0 (314) Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$ 0 (315) Electricity for pumps and fans within dwelling (Table 4f):	Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Water heating2051.4If DHW from community scheme: $(64) \times (303a) \times (305) \times (306) =$ $(310a) \times (305) \times (306) =$ Water heat from Community heat pump $(64) \times (303a) \times (305) \times (306) =$ $(310a) \times (307a) \times$	Space heating	require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =	Ī	0	(309)
Annual water heating requirement If DHW from community scheme: Water heat from Community heat pump $(64) \times (303a) \times (305) \times (306) = 2153.97 (310a)$ Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = 38.43 (313)$ Cooling System Energy Efficiency Ratio $0 (314)$ Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) = 0 (315)$ Electricity for pumps and fans within dwelling (Table 4f):		•			, ,	•	, ,					L		
If DHW from community scheme: Water heat from Community heat pump (64) \times (303a) \times (305) \times (306) = 2153.97 (310a) Electricity used for heat distribution Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) Electricity for pumps and fans within dwelling (Table 4f):			equirem	ent								ſ	2051.4	7
Water heat from Community heat pump $ (64) \times (303a) \times (305) \times (306) = 2153.97 $ (310a) Electricity used for heat distribution $ 0.01 \times [(307a)(307e) + (310a)(310e)] = 38.43 $ (313) Cooling System Energy Efficiency Ratio $ 0 $		_	•									L	2051.4	
Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) = 0$ $= (107) \div (314) = 0$ Electricity for pumps and fans within dwelling (Table 4f):												= [2153.97	(310a)
Cooling System Energy Efficiency Ratio Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) = 0$ $= (107) \div (314) = 0$ Electricity for pumps and fans within dwelling (Table 4f):	Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	310e)] = [38.43	(313)	
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$ 0 (315) Electricity for pumps and fans within dwelling (Table 4f):	<u></u>													Ⅎ`
Electricity for pumps and fans within dwelling (Table 4f):		_	•	•					(4.07)	(04.4)		Ĺ		Ⅎ
	,	,					,		= (107) ÷	(314) =			0	(315)
(350a)								Outeido				Г	177 40	(3302)
	moonamoar ve	iiiialioii	Dalaile	ou, onli	aot of po	, OILI V O II I	pat iroili	Julialue				L	177.43	(0000)

		_
warm air heating system fans	0	(330b)
pump for solar water heating	0	(330g)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) =	177.49	(331)
Energy for lighting (calculated in Appendix L)	320.14	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =	4231.84	(338)
12b. CO2 Emissions – Community heating scheme		
Energy Emission factor	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 =	712.33	(367)
Electrical energy for heat distribution [(313) x 0.52 =	19.95	(372)
Total CO2 associated with community systems (363)(366) + (368)(372) =	732.28	(373)
CO2 associated with space heating (secondary) (309) x 0 =	0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x 0.22 =	0	(375)
Total CO2 associated with space and water heating (373) + (374) + (375) =	732.28	(376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 =	92.12	(378)
CO2 associated with electricity for lighting (332))) x 0.52 =	166.15	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1 0.52 x 0.01 =	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =	934.07	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =	12.86	(384)
El rating (section 14)	89.36	(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:45:04

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: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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)

28.13 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.99 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 - Heat pump

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	12.07m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0.141/217	
Faity Walls O-value	0 W/m²K	

Photovoltaic array

		User D	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	ensions:								
		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 = (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	ins				0	X ·	10 =	0	(7a)
Number of passive vents	3				0	X '	10 =	0	(7b)
Number of flueless gas fi	ires			Γ	0	x 4	40 =	0	(7c)
							A in a h	ongoo nor ba	
lafituation due to altique	fl and fare (Co) (Ch) (70) . (7 b) . ((70)	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, procee			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in the		(),			(3)	(-7		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o resent, use the value corresponding t			•	ruction			0	(11)
deducting areas of openi		o ine great	ier wan are	a (anter					
·	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)		_	+ (15) =		0	(15)
	q50, expressed in cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (18)$	(8), otherw	rise (18) = ((16)				0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.075 x (²	19)] =			0	(19)
Infiltration rate incorporate	ting shelter factor		(21) = (18					0.15	(21)
Infiltration rate modified f								00	` /
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								
<u> </u>	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
` '	1 1 2 2 3 3 3 3	L		L	L		<u> </u>	J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				-	
0.19 Calculate effect	0.19 Ctive air	0.18 Change i	0.16 ate for t	0.16 he appli	0.14 cable ca	0.14 SE	0.14	0.15	0.16	0.17	0.18]	
If mechanica		_										0.5	(23a
If exhaust air h	eat pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23k
If balanced with	n heat reco	overy: effic	ency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(230
a) If balance	ed mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)) ÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(248
b) If balance	ed mecha	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)	ī	,	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n	ouse ex n < 0.5 ×			•					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)n	ventilation			•	•				0.5]			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)		-	-	_	
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(25)
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	re	AXU		k-value	e A	λΧk
	area	(m^2)	' m		A ,r	m²	W/m2	K	(W/I	K)	kJ/m²•	K k	J/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		60	935	.4 (29)
Walls Type2	24.2	24	0		24.24	, x	0.17	= [4.07		60	1454	4.4 (29)
Total area of e	elements	, m²			51.9								(31)
Party wall					31.67	, X	0	= [0		45	1425	i.15 (32)
Party floor					53.96	5					40	2158	3.4 (32
Party ceiling					53.96	5					30	1618	3.8 (32)
Internal wall **	ŧ				95.03	3					9	855.	27 (32
* for windows and						ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragrapi	h 3.2	
** include the area				ls and par	titions		(00) (00)	(20)				_	
Fabric heat los		•	U)				(26)(30)		(00) - (0)	0) - (00-)	(00-)	22.88	(33)
Heat capacity	,	,		TEA) :				***	.(30) + (32)	2) + (32a).	(32e) =	8447.42	(34)
Thermal mass For design assess	•	•		•			ooisoly the	` '	\div (4) =	TMD in T	ahla 1f	156.55	(35)
can be used inste				CONSTRUCT	ion are noi	known pi	ecisely lile	illulcative	values of	TIVIT III I	able II		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						6.04	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he								(33) +	(36) =			28.91	(37)
Ventilation hea	at loss ca	alculated	monthly	/					= 0.33 × ((25)m x (5) T	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	4=
(38)m= 14.77	14.59	14.42	13.53	13.35	12.47	12.47	12.29	12.82	13.35	13.71	14.06]	(38)
Heat transfer of		nt, W/K			·	·			= (37) + (38)m		1	
(39)m= 43.68	43.51	43.33	42.45	42.27	41.38	41.38	41.21	41.74	42.27	42.62	42.98		
									Average =	Sum(39) ₁	12 /12=	42.4	(39)

Heat loss	s parar	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.81	0.81	0.8	0.79	0.78	0.77	0.77	0.76	0.77	0.78	0.79	0.8		
										Average =	Sum(40) ₁	12 /12=	0.79	(40)
Number	of day		nth (Tab	le 1a)			·	ı						
_	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	ng ene	rgy requi	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 (⁻	TFA -13		81		(42)
Annual a Reduce the not more th	e annuai	l average	hot water	usage by	5% if the a	lwelling is	designed t	` ,		se target o		.11		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water u		litres per	day for ea		,		Table 1c x	_	· ·		!			
(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		
										Total = Su	m(44) ₁₁₂ =		925.35	(44)
Energy cor	ntent of I	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= 1	25.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82		
If in atomton		ator booti	na ot noint	of upo (no	, hot water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	- [1213.27	(45)
If instantan				,		, , , , , , , , , , , , , , , , , , ,	·	` '	,	ı	ı	1		(10)
(46)m= Mater sto	18.87 Orage	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27		(46)
Storage	_		includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If commu		` '					_					<u> </u>		(/
Otherwis	-	_			-			' '	ers) ente	er '0' in ((47)			
Water sto	•													
a) If mar	nufactu	ırer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempera	ature fa	ctor fro	m Table	2b								0		(49)
Energy lo			•					(48) x (49)) =		1	10		(50)
b) If marHot wate				-								02		(51)
If commu		-			C 2 (KVV)	ii/iiti C/GC	·y /				0.	02		(31)
Volume f		_									1.	03		(52)
Tempera	ature fa	actor fro	m Table	2b							0	.6		(53)
Energy lo	ost fror	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (5	0) or (54) in (5	55)								1.	03		(55)
Water sto	orage l	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder of	contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary o	circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary		`	,			59)m = ((58) ÷ 36	65 × (41)	m			-		• /
•					,	•	. ,	, ,	cylinde	r thermo	stat)			
(59)m= 2	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	00) + 0	0 7 (41) o	0	0	0	0	1	(61)
		-	-									J · (59)m + (61)m	(- /
(62)m= 181.07	159.94	168.8	152.47	150.25	135.45		142.4	_	158.05	165.67	177.1	1	(62)
Solar DHW input c									ļ]	(-)
(add additional										morrio wan	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from wa	ater heat	ter				1	!	I	!	1	!	1	
(64)m= 181.07	159.94	168.8	152.47	150.25	135.45	131.22	142.4	12 141.68	158.05	165.67	177.1	1	
	'						C	Output from w	ater heat	er (annual)	112	1864.11	(64)
Heat gains fror	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)m] + 0.8	x [(46)m	n + (57)m	+ (59)m		-
(65)m= 86.05	76.52	81.97	75.7	75.8	70.04	69.47	73.2	72.12	78.39	80.1	84.73]	(65)
include (57)r	n in calc	culation of	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is f	from com	munity h	neating	
5. Internal ga			. ,		•						•		
Metabolic gains	s (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.3	4 90.34	90.34	90.34	90.34		(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e 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 gai	ns (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a), a	lso see Ta	ble 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	(calcula	ted in A	opendix	L, equat	ion L15	or L15a), also	see Table	5	•	-	•	
(69)m= 32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.0	3 32.03	32.03	32.03	32.03		(69)
Pumps and far	ns gains	(Table 5	āa)					•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-	-	-	•	
(71)m= -72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.2	7 -72.27	-72.27	-72.27	-72.27		(71)
Water heating	gains (T	able 5)		-		-		-	-	-	-	•	
(72)m= 115.65	113.87	110.17	105.15	101.88	97.28	93.38	98.3	8 100.16	105.37	111.24	113.88		(72)
Total internal	gains =				(60	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 337.3	335.58	325.44	309.18	292.9	277.01	266.54	271.4	9 279.71	296.15	315.03	328.97		(73)
6. Solar gains):												
Solar gains are c	alculated ı	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to the	ne applica	ble orienta	tion.		
Orientation: A		actor	Area			UX		g_ Table 6b	-	FF		Gains	
_	able 6d		m²		- 18	able 6a		Table 6b	_ '	Table 6c		(W)	_
Northeast _{0.9x}	0.77	X	12.	07	x	11.28	X	0.63	x	0.7	=	41.62	(75)
Northeast _{0.9x}	0.77	x	12.	07	х	22.97	X	0.63	x	0.7	=	84.72	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	41.38	X	0.63	x	0.7	=	152.64	(75)
Northeast _{0.9x}	0.77	Х	12.	07	X	67.96	X	0.63	x	0.7	=	250.67	(75)
Northeast _{0.9x}	0.77	X	12.	07	X	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.	07	x	91.1	X		0.63	x	0.7	=	336.05	(75)
Northeast _{0.9x}	0.77	X	12.	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	watts, ca	alculated	for eac	h month	_		(83)m	n = Si	um(74)m .	(82)m	_			
(83)m= 41.62	84.72	152.64	250.67	336.95	359.2	3 336.05	267	7.9	185.99	103.53	52.37	33.99		(83)
Total gains –	internal a	and solar	(84)m =	= (73)m	+ (83)	m , watts						•	•	
(84)m= 378.92	420.3	478.07	559.85	629.86	636.2	4 602.59	539	.39	465.7	399.68	367.4	362.95		(84)
7. Mean inte	rnal temp	perature	(heating	season)									
Temperature	during h	neating p	eriods ir	n the livi	ng are	a from Ta	ble 9	, Th	1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see	Table 9a)								
Jan	Feb	Mar	Apr	May	Jui	n Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 0.98	0.96	0.91	0.79	0.6	0.41	0.3	0.3	35	0.59	0.86	0.96	0.98		(86)
Mean interna	al temner	ature in	living an		llow s	tens 3 to	7 in T	 Table	2 9c)					
(87)m= 20.03	20.19	20.48	20.8	20.95	20.9	_i	2		20.97	20.74	20.34	20		(87)
, ,					-l 113		-1-1- (-0 (00)		1			
Temperature (88)m= 20.25	20.25	20.25	20.26	20.27	20.2	<u> </u>	20.		12 (°C) 20.28	20.27	20.26	20.26		(88)
. ,	ļ			<u> </u>	<u> </u>	!	ļ	20	20.20	20.27	20.20	20.26		(00)
Utilisation fa	 					`	T			1	1	1	1	(2.2)
(89)m= 0.97	0.95	0.9	0.76	0.56	0.37	0.25	0.3	3	0.54	0.83	0.95	0.98		(89)
Mean interna	al temper	ature in	the rest	of dwell	ng T2	(follow ste	eps 3	to 7	7 in Tabl	e 9c)	_			
(90)m= 18.94	19.19	19.59	20.03	20.22	20.2	3 20.28	20.	28	20.25	19.97	19.41	18.92		(90)
									f	LA = Livir	ng area ÷ (4) =	0.47	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) :	= fLA × T1	+ (1	– fL	A) × T2					
(92)m= 19.45	19.66	20.01	20.4	20.57	20.6	2 20.62	20.	62	20.59	20.33	19.85	19.43		(92)
Apply adjust	ment to t	he mean	interna	l temper	ature	from Table	e 4e,	whe	re appro	opriate				
(93)m= 19.45	19.66	20.01	20.4	20.57	20.6	2 20.62	20.	62	20.59	20.33	19.85	19.43		(93)
8. Space hea	ating requ	uirement												
Set Ti to the					ned at	step 11 of	Tabl	le 9b	o, so tha	t Ti,m=	(76)m an	d re-calc	culate	
the utilisation	1			i			Ι,		0	0.1	NI.			
Jan Utilisation fo	Feb	Mar	Apr	May	Jui	n Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation fa	0.95	0.89	0.76	0.57	0.39	0.28	0.3	32	0.56	0.84	0.94	0.97		(94)
Useful gains				<u> </u>	0.50	0.20	0.0	,,,	0.50	0.04	0.54	0.57		(0.)
(95)m= 365.75	`	427.33	427.25	360.81	247.2	2 166.11	173	.41	261.73	334.22	345.95	352.08		(95)
Monthly ave				<u> </u>		1					1		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 loss rat				l .	Lm , \	V =[(39)m]	1	I	I	
(97)m= 661.94		585.42	487.92	374.76	248.9		173		270.77	411.33	543.52	654.55		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Nh/m	$\frac{1}{\text{onth}} = 0.02$	24 x [[(97)	m – (95)m] x (4	1)m		•	
(98)m= 220.37	164.48	117.62	43.69	10.37	0	0	0)	0	57.37	142.25	225.03		
	-				-	•	•			-	•	-	•	

		_		
7	Total per year (kWh/y	ear) = Sum(98) _{15,912} =	981.18	(98)
Space heating requirement in kWh/m²/year			18.18	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating p Fraction of space heat from secondary/supplementary heating (Table		nmunity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =	,	Ī	1	(302)
The community scheme may obtain heat from several sources. The procedure allows	for CHP and up to fo	L ur other heat sources; the	e latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See Approximation of heat from Community heat pump	ppendix C.	Γ	1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	 1	(304a)
Factor for control and charging method (Table 4c(3)) for community h	heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system	3 - 7 - 7	F	1.05	(306)
Space heating		L	kWh/year	
Annual space heating requirement		Γ	981.18	7
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1030.24	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Append	dix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		Г	1864.11	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1957.32	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e)] =	29.88	(313)
Cooling System Energy Efficiency Ratio		Ī	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) :	<u> </u>	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsi	ide		114.79	(330a)
warm air heating system fans		Ī	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	114.79	(331)
Energy for lighting (calculated in Appendix L)		Ī	247.96	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (37	15) + (331) + (33	2)(237b) =	3241.49	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh k	Emissions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two f	fuels repeat (363) to (366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b))] x 100 ÷ (367b) x	0.52 =	553.76	(367)
Electrical energy for heat distribution [(313)	x	0.52 =	15.51	(372)

Total CO2 associated with community s	systems	(363)(366) + (368)(372))	=	569.27	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			569.27	(376)
CO2 associated with electricity for pum	ps and fans within dw	elling (331)) x	0.52	=	59.58	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	128.69	(379)
Energy saving/generation technologies Item 1	(333) to (334) as app		0.52 × 0.0	ı1 – F		7(200)
item i			0.52 × 0.0	' - <u> </u>	-56.48	(380)
Total CO2, kg/year	sum of (376)(382) =				701.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.99	(384)
El rating (section 14)					90.51	(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:44:53

Project Information:

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

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.44m² **Plot Reference:** Site Reference : Highgate Road - GREEN 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 11.65 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 - Heat pump

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:	0.54	
Maximum	1.5	oK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
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 electric heat pump		
Photovoltaic array		

		Lleor	Details:						
A No	Noil look on	USEI		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Contware Hame.	0.101110111		y Address:		31011.		7 01010	71. 110.0.00	
Address :		·	-						
1. Overall dwelling dime	ensions:								
Ground floor		Aı	rea(m²)	(10) ×		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)-	F(1II)	69.44	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	184.02	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of altimospess	heating he	ating		1 _ F			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	0		10 =	0	(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	0		÷ (5) =	0	(8)
•	peen carried out or is intended			ontinue fr			- (3) =	0	(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			•	ruction			0	(11)
deducting areas of openii		maing to the gre	ealer wall are	a (anter					
If suspended wooden f	floor, enter 0.2 (unseale	d) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
ŭ	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	aro avaraged in subject		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic $(18) = (17)$	•	•	•	etre or e	envelope	area	3	(17)
•	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere			, , , , , , , , , , , , , , , , , , , ,	,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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 infiltr	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m				1	
0.19 Calculate effe	0.19	0.18	0.16	0.16 he appli	0.14 Cable ca	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		-	uto 101 t	по арри	ouble ou							0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)		Ī	0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				74.8	(23
a) If balance	d mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(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		(24
c) If whole h if (22b)r				-					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros area	SS	Openin	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m².ł		X k /K
Windows Type		(111)			8.97				11.89		10/111 1	110/	(27
Windows Type					2.92	_	- ` / /[1/(1.4)+	Ļ	3.87	\dashv			(27
Walls Type1	41.5	:1	11.89		29.62	=	0.18		5.33	╡┌	60	1777.2	_
Walls Type2	16.7		0		16.73	_	0.17		2.81	륵 ¦	60	1003.8	= ' '
Total area of e					58.24	=	0.17		2.01			1003.0	(31)
Party wall		,			40.43	=	0		0		45	1819.35	`
Party floor					69.44	=				L	40	2777.6	=
Party ceiling						=				L T		2083.2	=
Internal wall **					69.44	=				L	30		=
* for windows and		owe use s	effective wi	ndow H-vs	136.2		ı formula 1	/[/1/ L.valu	ا ۱۸۵ مراهر	es aiven in	9 naragranh	1225.89	9 (32
** include the area						atou uomg	normala 1	n no vara	10) 10.04] 0	io givori iii	paragrapii	0.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				23.9	(33
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	10687.04	(34
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			153.9	(35
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<					[6.99	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(22)	(20)		ı		¬,,,_
Total fabric he		aloudoto -	l manthi	,					(36) =	(25)m + (F)	\	30.9	(37
Ventilation hea	Feb	Mar			lun	1,,1	۸۰۰۰		= 0.33 × (l	1		
(38)m= Jan (38)m= 19.27	19.04	18.81	Apr 17.67	May 17.44	Jun 16.3	Jul 16.3	Aug 16.08	Sep 16.76	Oct 17.44	17.9	Dec 18.35		(38
19.27		<u> </u>	17.07		10.5	10.0	1 10.00		<u> </u>	<u> </u>	10.00		,00
11													
Heat transfer (39)m= 50.16	49.93	1t, VV/K 49.71	48.57	48.34	47.2	47.2	46.97	(39)m 47.66	= (37) + (37) 48.34	38)m 48.79	49.25		

Heat loss par	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.72	0.72	0.72	0.7	0.7	0.68	0.68	0.68	0.69	0.7	0.7	0.71		
	•	!	<u>. </u>	<u>. </u>		!	!		Average =	Sum(40) ₁ .	12 /12=	0.7	(40)
Number of da	-	1 `	<u> </u>						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)
4. Water hea	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occ if TFA > 13 if TFA £ 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		23		(42)
Annual avera Reduce the annu not more that 12	ual average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								1 - 22		L			
(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		
	1	!	<u> </u>	ļ.		<u> </u>	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1046.65	(44)
Energy content of	of hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(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		
K in a tamba mana a sa			-f (()		havea (40		Total = Su	m(45) ₁₁₂ =	= [1372.32	(45)
If instantaneous		· ·	·	1	,.		, ,	, , , I					
(46)m= 21.34 Water storage	1	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67		(46)
Storage volur) includir	ng anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	` '					_							()
Otherwise if r	•			-			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufac	cturer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fr		•					(48) x (49)) =		1	10		(50)
b) If manufactHot water sto			-								02		(51)
If community	_			0 2 (1111)	1,11ti 0, de	•97				<u> </u>	02		(01)
Volume facto	_									1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fr	om water	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	03		(55)
Water storage	e loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contai	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circu	it loss (ar	nual) fro	m Table								0		(58)
Primary circu	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b				,	•	` '	, ,		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 o	·alculated	for each	month ((61)m –	(60) ÷	365 🗸 (41)m							
(61)m= 0	0	0	0	01)111 =	00) +	1 0))	0	0	0	0	1	(61)
													J · (59)m + (61)m	(-)
(62)m= 197.5		183.69	165.44	162.7	146.19		153	_	153.24	171.52	180.38	193.07	(39)III + (01)IIII]	(62)
Solar DHW inpu				<u> </u>									J	(/
(add addition										i ooniinba	iioii to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	1	(63)
Output from	uwater hea	ter	<u> </u>	<u> </u>		-				l		<u> </u>	J	
(64)m= 197.5		183.69	165.44	162.7	146.19	141.17	153	.84	153.24	171.52	180.38	193.07	1	
		l	l	l		-1		Outp	out from wa	ater heate	r (annual)₁	12	2023.16	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	1)m	1] + 0.8 >	د [(46)m	+ (57)m	+ (59)m]	-
(65)m= 91.53		86.92	80.02	79.94	73.62	72.78	76.	_	75.96	82.87	84.98	90.04]	(65)
include (57	7)m in cal	culation of	of (65)m	only if c	vlinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal			. ,		•							,	<u> </u>	
Metabolic ga	·			,										
Jan	T '	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.6	2 111.62	111.62	111.62	111.62	111.62	111.62	111	.62	111.62	111.62	111.62	111.62		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				-	
(67)m= 18	15.98	13	9.84	7.36	6.21	6.71	8.7	72	11.71	14.87	17.35	18.5]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a),	also	see Ta	ble 5		-	_	
(68)m= 195.9	9 198.02	192.9	181.98	168.21	155.27	146.62	144	.59	149.71	160.62	174.4	187.34]	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L1	or L15a), als	o se	e 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 f	ans gains	(Table	5а)			•							-	
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•				•		•	-	
(71)m= -89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89	0.3	-89.3	-89.3	-89.3	-89.3]	(71)
Water heatin	g gains (T	able 5)	-	-	-					-	-	-	-	
(72)m= 123.0	2 121.01	116.83	111.14	107.44	102.24	97.82	103	.49	105.5	111.39	118.03	121.02]	(72)
Total interna	al gains =				(6	6)m + (67)n	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	-	
(73)m= 393.4	9 391.5	379.21	359.45	339.5	320.21	307.64	313	.29	323.41	343.36	366.27	383.34]	(73)
6. Solar gai	ns:													
Solar gains are	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		_	g_ able 6b	т	FF able 6c		Gains	
						able ba	,	_ '	able ob	_ '	able oc		(W)	,
Northeast 0.9x		X	8.9	97	X	11.28	X		0.63	X	0.7	=	30.93	(75)
Northeast 0.9x	-	X	8.9	97	X	22.97	X		0.63	×	0.7	=	62.96	(75)
Northeast 0.9x	0	X	8.9	97	X	41.38	X	<u> </u>	0.63	×	0.7	=	113.43	(75)
Northeast 0.9x		X	8.9	97	x	67.96	X	<u> </u>	0.63	×	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	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	Х	8.9	97	х	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	Х	2.9	92	x	106.25]	0.63	х	0.7	=	94.82	(79)
Southwest _{0.9x}	0.77	х	2.9	92	х	119.01]	0.63	х	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	х	2.9	92	х	118.15		0.63	х	0.7	=	105.44	(79)
Southwest _{0.9x}	0.77	Х	2.9	92	х	113.91]	0.63	х	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	104.39	j	0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	92.85	Ī	0.63	x	0.7	=	82.86	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x	69.27	Ī	0.63	x	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	х	31.49	Ī	0.63	x	0.7	=	28.1	(79)
Solar gains in	watts, cal	culated	for eac	h month			(83)m	n = 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	138.7	6 78.25	53.36		(83)
]	· /
Total gains –		nd solar	` '	<u> </u>	`					- 1		J 1	
Total gains – i (84)m= 457.26		nd solar 569.17	(84)m = 640.56	= (73)m - 696.12	+ (83)m 692.61		605		482.12		436.7]	(84)
	510.39	569.17	640.56	696.12	692.61		<u> </u>		!]	
(84)m= 457.26	510.39	569.17 erature (640.56 (heating	696.12 season	692.61	659.04	605	.54 544.49	!			21	
(84)m= 457.26 7. Mean inter	510.39 rnal tempe during he	569.17 erature (eating p	640.56 (heating	696.12 season	692.61) ng area	659.04	605	.54 544.49	!			21	(84)
(84)m= 457.26 7. Mean intermediate Temperature	510.39 rnal tempe during he	569.17 erature (eating p	640.56 (heating	696.12 season	692.61) ng area	659.04	605 ble 9	.54 544.49	!	2 444.51		21	(84)
(84)m= 457.26 7. Mean intermediate Temperature Utilisation factors	510.39 rnal tempe during he	erature (eating points for li	640.56 (heating eriods in iving are	season the livinga, h1,m	692.61) ng area (see T	659.04 a from Tal	605 ble 9	.54 544.49 , Th1 (°C) ug Sep	482.12	2 444.51	436.7	21	(84)
(84)m= 457.26 7. Mean intermediate Temperature Utilisation factors and the second sec	510.39 rnal temper during he ctor for gain Feb 0.96	erature (eating poins for limar 0.91	640.56 (heating eriods in iving are Apr	season the livings, h1,m May	692.61) ng area (see T Jun 0.43	a from Tal able 9a) Jul 0.31	605 ble 9	.54 544.49 , Th1 (°C) ug Sep 36 0.59	482.11 Oct	2 444.51 Nov	436.7 Dec	21	(84)
(84)m= 457.26 7. Mean intermediate Temperature Utilisation factors Jan (86)m= 0.98	510.39 rnal temper during he ctor for gain Feb 0.96	erature (eating poins for limar 0.91	640.56 (heating eriods in iving are Apr	season the livings, h1,m May	692.61) ng area (see T Jun 0.43	a from Tal able 9a) Jul 0.31	605 ble 9	.54 544.49 , Th1 (°C) ug Sep 36 0.59	482.11 Oct	2 444.51 Nov	436.7 Dec	21	(84)
(84)m= 457.26 7. Mean interpretation factors Utilisation factors Jan (86)m= 0.98 Mean internations (87)m= 20.14	rnal temper during he ctor for gain Feb 0.96 al temperar 20.31	erature eating perins for lims	640.56 (heating eriods ir iving are 0.8 iving are 20.83	season the living a, h1,m May 0.62 ea T1 (for 20.96	692.61) ng area (see T Jun 0.43 bllow st 20.99	659.04 a from Tal able 9a) Jul 0.31 eps 3 to 7	605 ble 9 A 0.3 7 in T	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98	482.1: Oct 0.85	2 444.51 Nov 0.96	436.7 Dec 0.98	21	(84)
7. Mean internation (84)m= 457.26 7. Mean internation factor (86)m= 0.98 Mean internation	rnal temper during he ctor for gain Feb 0.96 al temperar 20.31	erature eating perins for lims	640.56 (heating eriods ir iving are 0.8 iving are 20.83	season the living a, h1,m May 0.62 ea T1 (for 20.96	692.61) ng area (see T Jun 0.43 bllow st 20.99	659.04 a from Tal able 9a) Jul 0.31 eps 3 to 7	605 ble 9 A 0.3 7 in T	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C)	482.1: Oct 0.85	2 444.51 Nov 0.96	436.7 Dec 0.98	21	(84)
(84)m= 457.26 7. Mean interpretation factors and the second seco	stor for gainer feb 0.96 lt temperar 20.31 during he 20.32	erature (eating prins for limited in land) ture in land) 20.56 eating prins for limited in land)	640.56 (heating eriods in iving are 20.83 eriods ir 20.34	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34	692.61) ng area (see T Jun 0.43 bllow st 20.99 dwellin 20.36	659.04 a from Tal able 9a) Jul 0.31 eps 3 to 7 21 g from Tal 20.36	605 ble 9 A 0.3 7 in T 2 able 9	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C)	Oct 0.85	2 444.51 Nov 0.96	Dec 0.98	21	(84) (85) (86) (87)
(84)m= 457.26 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (84)m= 20.32	stor for gaing during her constant temperate temperate 20.31 during her constant temperate 20.32 during her constant temperate temperate temperate constant temperate	erature eating poins for line Mar 0.91 ture in la 20.56 eating poins for r	640.56 (heating eriods ir iving are 0.8 iving are 20.83 eriods ir 20.34 est of decrease in the control of the c	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 rest of 20.34 welling,	692.61) ng area (see T	659.04 a from Tal able 9a) Jul 0.31 eps 3 to 7 21 g from Tal 20.36	605 ble 9 A 0.3 7 in T 2 able 9 20.	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35	Oct 0.85	2 444.51 Nov 0.96 20.44	Dec 0.98 20.12 20.33	21	(84) (85) (86) (87)
(84)m= 457.26 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97	stor for gain and temperate to the store of	erature eating poins for line 1 20.56 eating poins for reading poi	640.56 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 rest of 20.34 welling, 0.58	692.61) ng area (see T Jun 0.43 bllow st 20.99 dwellin 20.36 h2,m (s	a from Tal Table 9a) Jul 0.31 eps 3 to 7 21 g from Ta 20.36 see Table 0.27	605 ble 9 A 0.3 7 in T 2 able 9 20. 99a) 0.3	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35	Oct 0.85 20.8 20.34	2 444.51 Nov 0.96	Dec 0.98	21	(84) (85) (86) (87) (88)
(84)m= 457.26 7. Mean intermediate Temperature Utilisation factors Jan	stor for gail 20.31 ctor for gail 20.32 ctor for gail 0.95 ctor for gail 1 temperary 20.32 ctor for gail 1 temperary 20.95 ctor for gail 1 temperary 20.95 ctor for gail 1 temperary 20.95 ctor for gail 1 temperary 20.39 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 ctor for gail 1 temperary 20.30 cto	erature (eating prins for line) Mar 0.91 ture in line) 20.56 eating prince 20.33 ins for rine) 0.9	640.56 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 the rest	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling	692.61) ng area (see T	a from Tal Table 9a) Jul 0.31 eps 3 to 7 21 g from Tal 20.36 see Table 0.27 (follow ste	605 ble 9 A 0.3 7 in T 2 able 9 20. 99a) 0.3	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 31 0.54 4 to 7 in Table	Oct 0.85 20.8 20.34 0.83 e 9c)	2 444.51 Nov 0.96 20.44 20.34	Dec 0.98 20.12 20.33	21	(84) (85) (86) (87) (88) (89)
(84)m= 457.26 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97	stor for gain and temperate to the store of	erature eating poins for line 1 20.56 eating poins for reading poi	640.56 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 rest of 20.34 welling, 0.58	692.61) ng area (see T Jun 0.43 bllow st 20.99 dwellin 20.36 h2,m (s	a from Tal Table 9a) Jul 0.31 eps 3 to 7 21 g from Ta 20.36 see Table 0.27	605 ble 9 A 0.3 7 in T 2 able 9 20. 99a) 0.3	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 31 0.54 36 20.33	Oct 0.85 20.8 20.34 0.83 e 9c) 20.11	2 444.51 Nov 0.96 20.44 20.34 0.95	20.12 20.33 0.98		(84) (85) (86) (87) (88) (89)
(84)m= 457.26 7. Mean intermediate Temperature Utilisation face [86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation face (89)m= 0.97 Mean internation (90)m= 19.17	stor for gail 20.32 ctor for gail 19.41	erature eating prins for line 20.56 eating prins for rough ture in the 19.77	640.56 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 the rest 20.14	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling	692.61) ng area (see T Jun 0.43 bllow st 20.99 dwellin 20.36 h2,m (s 0.39 ing T2 (20.35)	659.04 a from Tal rable 9a) Jul 0.31 eps 3 to 7 21 g from Tal 20.36 see Table 0.27 (follow stell 20.36	605 ble 9 A 0.3 7 in 1 2 able 9 20. 9a) 0.3 eps 3	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 31 0.54 36 20.33	Oct 0.85 20.8 20.34 0.83 e 9c) 20.11	2 444.51 Nov 0.96 20.44 20.34	20.12 20.33 0.98	21	(84) (85) (86) (87) (88) (89)
(84)m= 457.26 7. Mean intercontrol Temperature Utilisation fact Jan (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation fact (89)m= 0.97 Mean internation (90)m= 19.17	stor for gail 20.31 ctor for gail 0.95 ctor for gail 19.41 ctor fo	erature eating prins for line (form) Mar 0.91 ture in line (form) ture in time (form)	640.56 (heating eriods in iving are 20.83 eriods ir 20.34 est of do 0.77 the rest 20.14	season the livin ea, h1,m May 0.62 ea T1 (fc 20.96 rest of 20.34 welling, 0.58 of dwelli 20.3	692.61) ng area (see T Jun 0.43 bllow st 20.99 dwellin 20.36 h2,m (s 0.39 ng T2 (20.35)	659.04 a from Tal able 9a) Jul 0.31 eps 3 to 7 21 g from Ta 20.36 see Table 0.27 (follow ste 20.36	605 ble 9 A 0.3 7 in T 2 able 9 20. 99a)	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 31 0.54 36 20.33 - fLA) × T2	Oct 0.85 20.8 20.34 0.83 le 9c) 20.11 FLA = Liv	2 444.51 Nov 0.96 20.44 20.34 0.95 19.61 ving area ÷ (-	Dec 0.98 20.12 20.33 0.98 19.15 4) =		(84) (85) (86) (87) (88) (89) (90) (91)
(84)m= 457.26 7. Mean intermediate Temperature Utilisation face [86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation face (89)m= 0.97 Mean internation (90)m= 19.17	stor for gail 20.32 ctor for gail 19.41 self temperare 19.72	erature eating prins for line 20.56 eating prins for rough ture in the 19.77 e	cheating eriods ir iving are 20.83 eriods ir 20.34 est of dr 0.77 the rest 20.14 er the wh	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling 20.3	692.61) ng area (see T Jun 0.43 bllow st 20.99 dwellin 20.36 h2,m (s 0.39 ing T2 (20.35	659.04 a from Tal able 9a) Jul 0.31 eps 3 to 7 21 g from Tal 20.36 see Table 0.27 (follow stern 20.36) fLA × T1 20.58	605 ble 9 A 0.3 7 in 1 2 20. 9a) 0.3 eps 3 20. + (1 20.	.54 544.49 , Th1 (°C) ug Sep 36 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 31 0.54 36 20.33 - fLA) × T2 58 20.55	Oct 0.85 20.8 20.34 0.83 e 9c) 20.11 fLA = Liv	2 444.51 Nov 0.96 20.44 20.34 0.95 19.61 ving area ÷ (20.12 20.33 0.98		(84) (85) (86) (87) (88) (89)

(93)m= 19.51	19.72	20.04	20.38	20.53	20.57	20.58	20.58	20.55	20.35	19.9	19.48		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac			<u> </u>				5						
(94)m= 0.97	0.94	0.89	0.77	0.59	0.4	0.28	0.32	0.55	0.83	0.94	0.97		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m= 441.94	482.27	508.95	494.78	412.34	280.41	187.58	195.95	300.31	398.27	418.19	424.3		(95)
	Monthly average external temperature from Table 8											ı	
(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		i	· ·		i	- ` 	<u> </u>	<u> </u>				ı	(0)
(97)m= 762.69	740.05	672.95	557.45	426.72	281.99	187.77	196.33	307.58	471.09	624.48	752.71		(97)
Space heatin (98)m= 238.64	g require 173.23	122.02	r each n 45.12	10.7	/Vh/mont	$\frac{10 - 0.02}{0}$	24 x [(97])m – (95 0)m] x (4 54.18	1)m 148.53	244.34		
(98)m= 238.64	173.23	122.02	45.12	10.7	U	0				l .		4000.70	7(00)
							rota	l per year	(kvvn/year) = Sum(9	8)15,912 =	1036.76	(98)
Space heatin	g require	ement in	kWh/m²	/year								14.93	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme								
This part is use										unity sch	neme.		7(204)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none									0	(301)			
Fraction of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.													
Fraction of hea		-			rom powei	r stations.	See Appei	naix C.				1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commı	unity hea	iting sys	tem			1	(305)
Distribution los	s factor	(Table 1	12c) for o	commun	ity heatir	ng syste	m					1.05	(306)
Space heating	3											kWh/yea	- •
Annual space	_	requiren	nent									1036.76	7
Space heat fro	m Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1088.59	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su _l	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	1										!		
Annual water h		equirem	ent									2023.16	1
If DHW from c	ommuni	ty schen	ne:										-
Water heat fro	m Comr	nunity he	eat pump)				(64) x (30	03a) x (30	5) x (306) :	=	2124.32	(310a)
Electricity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	[310e)] =	32.13	(313)	
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											1		¬ .
mechanical ve	ntilation	- balanc	ed, extra	act or po	sitive in	put from	outside					169.72	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		169.72	(331)
Energy for lighting (calculated in Appendix L)				317.84	(332)
Electricity generated by PVs (Appendix M) (negative quantity	')			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3591.65	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second	fuel	280	(367a)
CO2 associated with heat source 1 [(307	(b)+(310b)] x 100 ÷ (367b) x	0.52	=	595.54	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.68	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	612.21	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			612.21	(376)
CO2 associated with electricity for pumps and fans within dw	relling (331)) x	0.52	=	88.09	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	164.96	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	licable	0.52 × 0.01	= [-56.48	(380)
Total CO2, kg/year sum of (376)(382) =			Ē	808.78	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				11.65	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:44:42*

Proiect Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 69.61m²Site Reference:Highgate Road - GREENPlot Reference: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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 24.38 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.70 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 - Heat pump

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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
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 electric heat pump		
Photovoltaic array		

		Hear	Details:						
Access an Name	Nail In ab an	USEL		. Nivera	L		CTDO	010010	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
		Property	Address:		CiGiii				
Address :									
1. Overall dwelling dime	ensions:	<u>.</u>							
Ground floor			ea(m²) 69.61	(1a) x		ight(m) :.65	(2a) =	Volume(m³	(3a)
	a) . (1b) . (1a) . (1d) . (1a) .					.00	(2a) –	104.47	(Ja)
Total floor area TFA = (1	a)+(10)+(10)+(10)+(10)+	(111)	69.61	(4)) . (2-) . (2-	4) . (2 -) .	(2-)		_
Dwelling volume				(3a)+(3b))+(3C)+(3C	d)+(3e)+	.(3h) =	184.47	(5)
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	r
Number of chimneys	heating hea	ating		1 = [40 =		_
Number of chimneys		<u> </u>	0]	0		20 =	0	(6a)
Number of open flues		0 +	0] ⁻	0			0	(6b)
Number of intermittent fa				Ļ	0		10 =	0	(7a)
Number of passive vents				Ļ	0		10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+	·(6b)+(7a)+(7b)+	·(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	peen carried out or is intended,	proceed to (17),	otherwise c	ontinue fr			` ′		`` <i>`</i>
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	.25 for steel or timber fra	me or 0.35 fa	or maconn	v constr	uction	[(9)	-1]x0.1 =	0	$=$ $\frac{(10)}{(11)}$
	resent, use the value correspo			*	uction			0	(11)
deducting areas of openin	• / .	I) 0 4 /I	l\				ı		
If no draught lobby, en	floor, enter 0.2 (unsealed ter 0.05, else enter 0	ı) or u.1 (seai	ea), eise (enter U				0	(12)
• ,	s and doors draught strip	ped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) +	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	-							0.15	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has be	een done or a de	egree air per	meability	is being u	sed	ĺ		7(40)
Shelter factor	cu .		(20) = 1 - [0.075 x (1	9)] =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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		
								1	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		_	rate for t	he appli	cable ca	se					-	· 	7,00
If mechanical If exhaust air h			andiv N (2	3h) - (23a	a) × Emy (e	aguation (1	VSV) other	nwisa (23h) <i>- (</i> 23a)			0.5	(23:
If balanced with		0 11		, ,	, ,	. ,	,, .	,) = (23a)			0.5	(23)
		•	•	_					2h\m . /	00h) [4 (22.5)	74.8	(23
a) If balance (24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	23b) x [0.3	÷ 100] 	(24
b) If balance					<u> </u>	l	l		<u> </u>		0.5		(2
(24b)m= 0		o 0	0	0 0	0	0	0	0	0	0	0]	(24
					ļ	<u> </u>					0		(= .
c) If whole h	n < 0.5 ×			•					5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation 1 , the			•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	•	•	•	•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	at lose r	naramete	or.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e A	X k
	area	-	m		A ,r		W/m2		(W/		kJ/m²·l		
Windows Type	e 1				8.97	х1.	/[1/(1.4)+	0.04] =	11.89				(27
Windows Type	e 2				2.92	x1.	/[1/(1.4)+	0.04] =	3.87				(27
Walls Type1	41.5	59	11.89	9	29.7	x	0.18	=	5.35	<u> </u>	60	1782	(29
Walls Type2	18.4	1	0		18.41	X	0.17	<u> </u>	3.09	₹ i	60	1104.6	(29
Total area of e	elements	, m²			60								 (31
Party wall					38.68	3 x	0		0		45	1740.6	(32
Party floor					69.61						40	2784.4	1 (32
Party ceiling					69.61					[30	2088.3	=
Internal wall **	:				136.2	=					9	1225.8	=
* for windows and					alue calcul		ı formula 1	/[(1/U-valu	ıe)+0.04] á	L as given in			<u> </u>
Fabric heat los				s and pan	inions		(26)(30)	+ (32) =				24.2	(33
Heat capacity		•	0)				, , , ,		(30) + (32	2) + (32a).	(32e) =	10725.79	(34
Thermal mass	•	,	P = Cm -	- TFA) ir	n k.l/m²K			***	÷ (4) =	_, . (0_0,	(020)	154.08	(35
For design assess	sments wh	ere the de	tails of the	•			ecisely the	` '	. ,	TMP in T	able 1f	134.06	
Thermal bridg				usina An	pendix l	<						6.99	(36
if details of therma					-	•						0.99	
Total fabric he			()	(1	,			(33) +	(36) =			31.19	(37
Ventilation 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= 19.31	19.08	18.86	17.71	17.49	16.34	16.34	16.12	16.8	17.49	17.94	18.4		(38
Heat transfer	coefficier	nt, W/K			-	-	-	(39)m	= (37) + (38)m	-	•	
(39)m= 50.5	50.28	50.05	48.91	48.68	47.54	47.54	47.31	47.99	48.68	49.13	49.59		
					<u> </u>				ь			ļ	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.73	0.72	0.72	0.7	0.7	0.68	0.68	0.68	0.69	0.7	0.71	0.71		
	•			ı		ı	ı		Average =	: Sum(40) ₁	12 /12=	0.7	(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	rement:								kWh/ye	ear:	
Assumed occi 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		24		(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		7.32		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								- 1					
(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		
	•								Total = Su	ım(44) ₁₁₂ =		1047.84	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(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		
If instantaneous	vator hooti	na ot noint	of upo (no	hot woto	· otorogol	ontor O in	hayaa (16		Total = Su	ım(45) ₁₁₂ =	• [1373.88	(45)
If instantaneous v			,	ı	, , , , , , , , , , , , , , , , , , ,		, ,	, , , I	1				(40)
(46)m= 21.37 Water storage	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69		(46)
Storage volum) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•			orio not		(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-							0	02		(51)
If community h	-			((((((((((((((((((((,,,,,,	-77				0.	<u> </u>		()
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	loss cal	culated t	or each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	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	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	e 3		<u> </u>	<u> </u>	<u> </u>			0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	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 $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	00) - 0	00 x (+1) 0		0	0	T 0	0	1	(61)
	<u>l</u>			alculated	for eac	h month							J · (59)m + (61)m	` ,
(62)m= 197.7		183.83	165.57	162.82	146.29	141.27	153	_	153.35	171.65	180.52	193.22	1	(62)
Solar DHW inpu			<u> </u>						if no sola		1		1	` ,
(add addition												· · · · · · · · · · · · · · · · · ·		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	1	(63)
Output from	water hea	ter	ı										•	
(64)m= 197.7		183.83	165.57	162.82	146.29	141.27	153	.96	153.35	171.65	180.52	193.22	1	
			ı			1		Outp	out from wa	ater heate	er (annual) ₁	112	2024.72	(64)
Heat gains fi	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	κ [(46)m	+ (57)m	+ (59)m	n]	_
(65)m= 91.58	81.36	86.97	80.06	79.98	73.65	72.81	77.0	03	76	82.92	85.03	90.09]	(65)
include (5	7)m in cald	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):										
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts														
Jan		Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.8	3 111.83	111.83	111.83	111.83	111.83	111.83	111.	.83	111.83	111.83	111.83	111.83]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 d	r L9a), a	lso s	ee ¯	Table 5				_	
(67)m= 18.0 ²	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 of	gains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Ta	ble 5		-	_	
(68)m= 196.3	9 198.42	193.29	182.36	168.55	155.58	146.92	144.	.88	150.02	160.95	174.75	187.72]	(68)
Cooking gair	ns (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 t	ans gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g.	evaporatio	on (nega	tive valu	es) (Tab	le 5)									
(71)m= -89.4	6 -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	ng gains (T	able 5)											_	
(72)m= 123.1	121.08	116.89	111.2	107.5	102.29	97.87	103	.54	105.55	111.45	118.1	121.09]	(72)
Total intern	al gains =				(66	i)m + (67)m	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 394.0	7 392.08	379.76	359.97	339.98	320.65	308.06	313	.71	323.86	343.85	366.79	383.9		(73)
6. Solar gai														
Solar gains ar		•				•	tions 1	to co		e applica		tion.		
Orientation:	Access F Table 6d		Area m²		Fli Ta	ıx ıble 6a		Т	g_ able 6b	Т	FF able 6c		Gains (W)	
Northoast o o							1 1					_	. ,	1,75
Northeast 0.93		X				11.28	X]		0.63	×	0.7	=	30.93	(75)
	<u> </u>	X				22.97	X]		0.63	_	0.7	_ =	62.96	(75)
Northeast 0.9	<u> </u>	X	8.9			41.38	X]		0.63	×	0.7	=	113.43	[(75)
Northeast 0.9		X	8.9		<u> </u>	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)

					_		٦.		_				_
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	х	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	97	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	x	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	x	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	Ī	0.63	×	0.7	=	28.1	(79)
							_						
Solar gains in	watts, cal	lculated	for eac	h month			(83)m	n = 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	138.7	6 78.25	53.36		(83)
												1	
Total gains – i			` '		<u>`</u>					1		1	
Total gains – i (84)m= 457.84		nd solar 569.72	(84)m = 641.07	= (73)m - 696.59	+ (83)r 693.0		605	.97 544.94	482.6	445.04	437.26]	(84)
	510.96	569.72	641.07	696.59	693.0		605	.97 544.94	482.6	445.04	437.26]	(84)
(84)m= 457.84	510.96 rnal tempe	569.72 erature (641.07 (heating	696.59 season	693.05	659.46			482.6	445.04	437.26	21	(84)
(84)m= 457.84 7. Mean inter	510.96 rnal tempe during he	569.72 erature (eating p	641.07 (heating	696.59 season	693.06) ng area	659.46 a from Tal			482.6	445.04	437.26	21	
(84)m= 457.84 7. Mean intermediate Temperature	510.96 rnal tempe during he	569.72 erature (eating p	641.07 (heating	696.59 season	693.06) ng area	659.46 a from Tal able 9a)	ble 9		482.6		437.26 Dec	21	
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors	510.96 rnal tempe during he	erature (eating points for li	641.07 (heating eriods in iving are	season the livinga, h1,m	693.05) ng area (see	659.46 a from Tal able 9a)	ble 9	, Th1 (°C)				21	
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors Jan	510.96 rnal temper during he ctor for gain Feb 0.96	erature (eating poins for limar 0.92	641.07 (heating eriods in iving are Apr 0.8	season the livings, h1,m May	693.08 ng area (see] Jun 0.44	a from Tal Table 9a) Jul 0.32	ble 9	, Th1 (°C) ug Sep 36 0.59	Oct	Nov	Dec	21	(85)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors Jan (86)m= 0.98	510.96 rnal temper during he ctor for gain Feb 0.96	erature (eating poins for limar 0.92	641.07 (heating eriods in iving are Apr 0.8	season the living the May	693.08 ng area (see] Jun 0.44	a from Tal Table 9a) Jul 0.32	ble 9	Th1 (°C) Sep 0.59 Table 9c)	Oct	Nov 0.96	Dec	21	(85)
7. Mean internation (84)m= 457.84 7. Mean internation factor (86)m= 0.98 Mean internation	rnal temper during head to for gain and temperature and temper	erature eating poins for lims	641.07 (heating eriods ir iving are 0.8 iving are 20.83	season the living ea, h1,m May 0.62 ea T1 (for 20.96	693.08) ing area (see 7 Jun 0.44 bllow s 20.99	a from Tal Table 9a) Jul 0.32 teps 3 to 7	ble 9 A 0.3 7 in T	Th1 (°C) Sep 6 0.59 Table 9c) 1 20.98	Oct 0.85	Nov 0.96	Dec 0.98	21	(85)
(84)m= 457.84 7. Mean interconduction factors Utilisation factors Jan (86)m= 0.98 Mean internation (87)m= 20.14	rnal temper during head to for gain and temperature and temper	erature eating poins for lims	641.07 (heating eriods ir iving are 0.8 iving are 20.83	season the living ea, h1,m May 0.62 ea T1 (for 20.96	693.08) ing area (see 7 Jun 0.44 bllow s 20.99	a from Tal a from Tal able 9a) Jul 0.32 teps 3 to 7 21	ble 9 A 0.3 7 in T	Th1 (°C) ug Sep 0.59 able 9c) 1 20.98 9, Th2 (°C)	Oct 0.85	Nov 0.96	Dec 0.98	21	(85)
(84)m= 457.84 7. Mean interpretation factors and the second seco	510.96 rnal temper during here tor for gain Feb 0.96 al tempera 20.3 during here 20.32	erature (eating prins for line) Mar 0.92 Ature in line) 20.55 eating prins for line)	641.07 (heating eriods in iving are 20.83 eriods ir 20.34	season the livin ea, h1,m May 0.62 ea T1 (fc 20.96 n rest of 20.34	693.09 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36	a from Tal a from Tal a le 9a) Jul 0.32 teps 3 to 7 21 ng from Tal 20.36	ble 9 A 0.3 7 in T 2 able 9	Th1 (°C) ug Sep 0.59 Table 9c) 1 20.98 9, Th2 (°C)	Oct 0.85	Nov 0.96	Dec 0.98	21	(85) (86) (87)
(84)m= 457.84 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (84)m= 20.32	stor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.3	erature of eating points for line of the eating points and eating points for response of the eating points f	641.07 (heating eriods ir iving are 0.8 iving are 20.83 eriods ir 20.34 est of decrease of	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling,	693.08) ing area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7)	a from Tal a from Tal a le 9a) Jul 0.32 teps 3 to 7 21 ng from Tal 20.36	ble 9 A 0.3 7 in T 2 able 9 20.	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35	Oct 0.85 20.79 20.34	Nov 0.96 20.44	Dec 0.98 20.12 20.33	21	(85) (86) (87)
(84)m= 457.84 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97	stor for gales at tempera 20.3 during he 20.32 etor for gales 20.95	erature of eating points for in 20.55 eating points for in 20.32 eating points for in 20.9	641.07 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58	693.08 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7)	a from Tal Table 9a) Jul 0.32 teps 3 to 7 21 ng from Ta 20.36 see Table 0.27	ble 9 A 0.3 7 in 1 2 20. 9a) 0.3	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35	Oct 0.85 20.79 20.34	Nov 0.96	Dec 0.98	21	(85) (86) (87) (88)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors	stor for gales and sector for gales are sector for	erature (eating prins for line) Mar 0.92 Atture in line) 20.55 eating prins for ring	641.07 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 the rest	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling	693.09 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7) 0.39 ng T2	a from Tal a from Tal a from Tal a Jul 0.32 teps 3 to 7 21 ag from Ta 20.36 see Table 0.27 (follow ste	A 0.37 in 1 2 20.4 9a) 0.3 eps 3	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 to 7 in Table	Oct 0.85 20.79 20.34 0.83 e 9c)	Nov 0.96 20.44 20.34	Dec 0.98 20.12 20.33	21	(85) (86) (87) (88) (89)
(84)m= 457.84 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97	stor for gales at tempera 20.3 during he 20.32 etor for gales 20.95	erature of eating points for in 20.55 eating points for in 20.32 eating points for in 20.9	641.07 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58	693.08 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7)	a from Tal a from Tal a from Tal a Jul 0.32 teps 3 to 7 21 ag from Ta 20.36 see Table 0.27 (follow ste	ble 9 A 0.3 7 in 1 2 20. 9a) 0.3	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 to 7 in Tabl 36 20.33	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1	Nov 0.96 20.44 20.34 0.95	Dec 0.98 20.12 20.33 0.98		(85) (86) (87) (88) (89) (90)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation face [86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation face (89)m= 0.97 Mean internation (90)m= 19.16	510.96 rnal temper during he ctor for gain sector erature eating poins for line 20.55 eating poins for rough ture in the 19.76	641.07 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 che rest 20.13	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling	693.08 ng area (see 7 Jun 0.44 ollow s 20.99 dwellir 20.36 h2,m (see 7) 0.39 ng T2 20.35	a from Tal Table 9a) Jul 0.32 teps 3 to 7 21 ng from Tal 20.36 see Table 0.27 (follow ste	ble 9 A 0.3 7 in 1 2 20. 9a) 0.3 20.	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 to 7 in Tabl 36 20.33	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1	Nov 0.96 20.44 20.34	Dec 0.98 20.12 20.33 0.98	21	(85) (86) (87) (88) (89)	
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors Jan (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97 Mean internation (90)m= 19.16	510.96 rnal temper during he ctor for gain representation for gain representa	erature eating prins for line at line process of the line at line process of the line at line	641.07 (heating eriods in iving are 20.83 eriods in 20.34 est of do 0.77 the rest 20.13	season the livin ea, h1,m May 0.62 ea T1 (fc 20.96 n rest of 20.34 welling, 0.58 of dwelli 20.3	693.09 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7) 0.39 ng T2 20.35	a from Tal a from Tal a from Tal a Jul 0.32 teps 3 to 7 21 ag from Ta 20.36 see Table 0.27 (follow ste 20.36	bble 9 A 0.3 7 in T 2 abble 9 20. 99a) 0.3 eps 3 20.	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 2, Th2 (°C) 36 20.35 4 to 7 in Table 36 20.33 f - fLA) × T2	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1 LA = Liv	Nov 0.96 20.44 20.34 0.95 19.6 ving area ÷ (-	Dec 0.98 20.12 20.33 0.98 19.14 4) =		(85) (86) (87) (88) (89) (90) (91)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation face [86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation face (89)m= 0.97 Mean internation (90)m= 19.16	stor for gales at tempera 20.3 ctor for gales 20.32 ctor for gales 20.32 ctor for gales 20.32 ctor for gales 20.34 ctor for gales 20.35	erature eating prins for line in the seating print	cheating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 the rest 20.13 er the who 20.4	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling 20.3	693.08 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7) 20.35 lling) = 20.6	a from Tal Table 9a) Jul 0.32 teps 3 to 7 21 ng from Tal 20.36 see Table 0.27 (follow ster 20.36	bble 9 A 0.3 7 in 1 2 20. 9a) 0.3 + (1 20	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 1 to 7 in Tabl 36 20.33 f - fLA) × T2 6 20.58	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1 LA = Liv	Nov 0.96 20.44 20.34 0.95 19.6 ving area ÷ (-	Dec 0.98 20.12 20.33 0.98		(85) (86) (87) (88) (89) (90)

(00)	1 40 74	T 00 00	l	00.55			l	00.50	00.07	10.00	40.54	I	(02)
(93)m= 19.53 8. Space hea	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51		(93)
Set Ti to the				re obtair	ed at ste	ep 11 of	Table 9	b, so tha	t Ti.m=(76)m an	d re-calc	culate	
the utilisation			•										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa		T T	i	i	i	i		i	i	i	i	ı	
(94)m= 0.97	0.95	0.9	0.78	0.6	0.41	0.29	0.33	0.56	0.83	0.94	0.97		(94)
Useful gains	1	$\frac{, VV = (9)}{1}$	4)m x (8 ₄	4)m 415.67	283.37	189.97	198.39	303.11	400.16	419.22	425.1	Ī	(95)
(95)m= 442.81 Monthly ave						169.97	196.39	303.11	400.16	419.22	425.1		(93)
(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	te for me	an interr	ıal tempe	L erature,		L =[(39)m :	x [(93)m	L – (96)m	!]	<u> </u>			, ,
(97)m= 769.26		678.64	562.34	430.79	285.07	190.19	198.8	310.81	475.38	629.94	759.24		(97)
Space heating	ng requir	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		ı	
(98)m= 242.87	176.71	125.05	46.74	11.25	0	0	0	0	55.96	151.71	248.6		
			-	-	-	-	Tota	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1058.9	(98)
Space heating	ng requir	ement in	kWh/m²	² /year								15.21	(99)
9b. Energy re	quireme	nts – Coi	mmunity	heating	scheme	:							
This part is us										unity sch	neme.		_
Fraction of sp	ace heat	from se	condary	/supplen	nentary I	neating ((Table 1	1) '0' if n	one			0	(301)
Fraction of sp	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community s		-							up to four	other heat	sources; t	he latter	
includes boilers, Fraction of he		-			rom powei	r stations.	See Appei	ndix C.				1	(303a)
Fraction of to	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cor	itrol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution lo	ss factor	(Table 1	12c) for (commun	ity heatii	ng syste	m					1.05	(306)
Space heating	ıg										'	kWh/yea	_ r
Annual space	heating	requiren	nent									1058.9	
Space heat fr	om Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1111.84	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	g require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heatin	a												
Annual water	_	requirem	ent									2024.72	
If DHW from o		•											_
Water heat fro	om Comi	munity h	eat pump)				(64) x (30	03a) x (30	5) x (306) :	=	2125.95	(310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = \begin{bmatrix} 0.01 \times [(307a)(307e) + (310a)(310e)] \end{bmatrix}$												32.38	(313)
Cooling Syste	em Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	g (if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for													_
mechanical v	entilation	- baland	ed, extra	act or po	sitive in	put from	outside					170.14	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		170.14	(331)
Energy for lighting (calculated in Appendix L)				318.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity	')			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3617.74	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto		missions g CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second t	fuel	280	(367a)
CO2 associated with heat source 1 [(307	(b)+(310b)] x 100 ÷ (367b) x	0.52	=	600.15	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.8	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	616.95	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			616.95	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	=	88.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	165.36	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	licable	0.52 x 0.01	= [-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				814.14	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				11.7	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:44*:32

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: 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)

28.67 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.11 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 - Heat pump

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 m ³ /m ² h	
Deute, Welle II volve	0.147/217	
Party Walls U-value	0 W/m²K	

Photovoltaic array

		User_[Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					0010943 on: 1.0.5.50	
		Property	Address	: 02 - G					
Address: 1. Overall dwelling dime	pneione:								
1. Overall dwelling diffle	ensions.	Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		.65	(2a) =	134.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	50.62] [(4)					
Dwelling volume		'		J)+(3c)+(3c	1)+(3e)+	(3n) =	40444	7(5)
				(00) (00	71(00)1(00	a)	(011) =	134.14	(5)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating	П + Г	0	7 = F	0	x	40 =	0	(6a)
Number of open flues		<u> </u>		」			20 =		╡``
·		' L	0	┙╶┟	0			0	(6b)
Number of intermittent fa				Ļ	0		10 =	0	(7a)
Number of passive vents				Ĺ	0		10 =	0	(7b)
Number of flueless gas fi	ires				0	X	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+	7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended, proce			continue fi	-		- (0) =	0	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9))-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of openi	resent, use the value corresponding angs); if equal user 0.35	o ine grea	iter wan are	a (aitei					
•	floor, enter 0.2 (unsealed) or ().1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
Percentage of windows Window infiltration	s and doors draught stripped		0.25 - [0.2	2 v (14) ± 4	1001 -			0	(14)
Infiltration rate					100] <i>-</i> 12) + (13) ·	+ (15) =		0	(15)
	q50, expressed in cubic metr	es per h	() ()	. , , ,	, , ,	` '	e area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$	•	•	•				0.15	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	ermeability	is being u	sed			<u>-</u>
Number of sides sheltere	ed		(20) = 1 -	[0 075 v (10\1 -			0	(19)
Shelter factor Infiltration rate incorporate	ting shelter factor		(20) = 13 (21) = (18)	•	19)] =			1	(20)
Infiltration rate modified f	•		(21) = (10) X (20) =				0.15	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	1 .2	1	1	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]	
W. 15 (05)	2)	1	•	•	•	•			
Wind Factor (22a)m = (2.23)m $= 1.27$		0.05	0.00	1	1.00	1 10	1 10	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	

0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe	ctive air	change i	rate for t	he appli	cable ca	se	<u> </u>		ļ		<u>!</u>		
If mechanica												0.5	(2:
If exhaust air h		0		, ,	,	. ,	,, .	`) = (23a)			0.5	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(2
a) If balance						- `	- 	<u> </u>	2b)m + (23b) × [- ` ` `	÷ 100]	
24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b	m = (22)	2b)m + (23b)		Ī	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				_				
<u> </u>	n < 0.5 ×	<u> </u>	· ·	<u> </u>	ŕ	· ` `	É `		`	ŕ	1	1	(0
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilation								0.51				
24d)m= 0	0	0	0	0	0	0	0.5 + [(2	0	0.5]	0	0		(2
Effective air			,			<u> </u>							(_
25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(2
0.31	0.31	0.51	0.29	0.20	0.26	0.20	0.26	0.27	0.20	0.29	0.3		(2
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros	_	Openin		Net Ar		U-val		AXU		k-value		Χk
Caralanna	area	(m²)	m	l ²	A ,r		W/m2		(W/	K)	kJ/m²-l	K kJ	
/indows					8.97	x1	/[1/(1.4)+	0.04] = [11.89	ᆗ,			(2 —
/alls Type1	31.4	4	8.97		22.43	3 X	0.18	= [4.04	!	60	1345.8	3 (2
Valls Type2	22.9	92	0		22.92	2 x	0.17	=	3.85		60	1375.2	2 (2
otal area of e	lements	, m²			54.32	2							(3
arty wall					30.08	3 X	0	=	0		45	1353.6	3 (3
arty floor					50.62	2				[40	2024.8	3 (3
arty ceiling					50.62	2					30	1518.6	3 (3
nternal wall **	:				83.2						9	748.8	(3
for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	n paragraph	n 3.2	
* include the area				ls and par	titions								
abric heat los	3s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				19.78	(3
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	8366.8	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			165.29	(3
or design asses: an be used inste				construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
an be usea inste hermal bridge				ıcina Δr	nandiy l	<i>(</i>						5.00	$\neg_{\prime 2}$
details of therma	•	,			-	`						5.92	(3
otal fabric he		are not kir	OWII (30) =	- 0.00 X (3	'')			(33) +	(36) =			25.7	<u></u> (3
	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × ((25)m x (5)		
	ı	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
entilation hea	l Feb							-	-	 	+		
entilation hea	Feb 13.69	13.52	12.69	12.53	11.7	11.7	11.53	12.03	12.53	12.86	13.19		(3
Jan 8)m= 13.86	13.69	13.52	12.69	12.53	11.7	11.7	11.53		<u> </u>	<u> </u>	13.19		(3
entilation hea	13.69	13.52	12.69	12.53	37.39	37.39	37.23		12.53 = (37) + (38.22	<u> </u>	38.89	1	(3)

Heat loss par	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.78	0.78	0.77	0.76	0.76	0.74	0.74	0.74	0.75	0.76	0.76	0.77		
						l	l		Average =	: Sum(40) ₁	12 /12=	0.76	(40)
Number of da	-	nth (Tab	le 1a)		ı			1	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 hea	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occ 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		71		(42)
Annual avera Reduce the annu not more that 12:	ial 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		1											
(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		
	•								Total = Su	ım(44) ₁₁₂ =	-	897.28	(44)
Energy content of	of hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x C	OTm / 3600) 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		_
If instantaneous	water heat	ing at naint	of upo (no	hot woto	r otorogol	ontor O in	havas (16		Total = Su	ım(45) ₁₁₂ =	= [1176.48	(45)
If instantaneous	1	· ·	·	i	, , , , , , , , , , , , , , , , , , ,		, ,	, , , ,	1		· ·		(40)
(46)m= 18.3 Water storage	16 2 loss:	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72		(46)
Storage volur) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature											0		(49)
Energy lost fr		•			or io not		(48) x (49)) =		1	10		(50)
b) If manufactHot water sto			-							0	02		(51)
If community	•			_ (,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77				0.	.02		(= -)
Volume facto	r from Ta	ble 2a								1.	.03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fr		•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	e loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	it loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar 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 $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	0	0 0	0	П	0	0	0	0	1	(61)
	uired for	water he	eating ca	L	L I for eac	h month	(62)ı	——I m =	0 85 x (′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 177.25		165.36	149.47	147.37	132.96	128.91	139.		139	154.93	162.27	173.4]	(62)
Solar DHW input	calculated u	using App	endix G or	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	J	
(add additiona												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from w	ater heat	er					•	•			•	•	•	
(64)m= 177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.	.78	139	154.93	162.27	173.4]	
	•			•	•	•		Outp	ut from wa	ater heate	er (annual)	12	1827.32	(64)
Heat gains fro	m water l	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	i] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 84.78	75.41	80.82	74.71	74.84	69.22	68.71	72.3	32	71.23	77.36	78.96	83.5]	(65)
include (57)	m in calc	ulation o	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):										
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts														
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 85.42	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 gains	(calculat	ed in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso s	ее Т	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 ga	ins (calcu	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5		_		
(68)m= 148.84	150.39	146.5	138.21	127.75	117.92	111.35	109.	.81	113.7	121.99	132.45	142.28]	(68)
Cooking gains	s (calculat	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 fa	ns gains	(Table 5	5a)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.	33	-68.33	-68.33	-68.33	-68.33		(71)
Water heating	gains (T	able 5)											_	
(72)m= 113.95	112.22	108.64	103.76	100.59	96.14	92.35	97.	2	98.93	103.97	109.67	112.23		(72)
Total interna	l gains =				(66)m + (67)m	n + (68	8)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 325.01	323.3	313.57	298.03	282.52	267.37	257.39	262.	.22	270.09	285.81	303.84	317.1		(73)
6. Solar gain														
Solar gains are		ŭ				•	tions t	to co	nvert to th	e applical		tion.		
Orientation:	Access Fa Table 6d	actor	Area m²		Flu	ıx ble 6a		т.	g_ able 6b	т	FF able 6c		Gains (W)	
-							1 1	1 (1
Northeast 0.9x	0.77	X	8.9		_	11.28	X		0.63	_ ×	0.7	=	30.93	(75)
Northeast 0.9x	0.77	X	8.9			22.97	X		0.63	╛ [╵] ┝	0.7	_ =	62.96	(75)
Northeast 0.9x	0.77	X	8.9			41.38	X		0.63	X	0.7	=	113.43	(75)
Northeast 0.9x	0.77	X	8.9		_	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	X	8.9	97	X S	97.38	x [0.63	x	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	x	8.9	97	х	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	Х	8.9)7	х	72.63	x [0.63	x	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	Х	8.9)7	x t	50.42] x [0.63	х	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	x	8.9	97	x 2	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast _{0.9x}	0.77	x	8.9	97	х	14.2	х	0.63	_ x [0.7	=	38.92	(75)
Northeast 0.9x	0.77	X	8.9)7	х	9.21	x	0.63	x	0.7	=	25.26	(75)
•		<u> </u>											
Solar gains in	watts, ca	alculated	I for eacl	h month			(83)m =	Sum(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	nd solar	(84)m =	= (73)m	+ (83)m	, watts						•	
(84)m= 355.94	386.26	427.01	484.32	532.94	534.34	507.13	461.32	408.31	362.75	342.76	342.36		(84)
7. Mean inte	rnal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	n the livi	ng area	from Tal	ole 9, 1	h1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.98	0.96	0.93	0.82	0.64	0.44	0.32	0.37	0.61	0.87	0.96	0.98		(86)
Mean interna	al temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Ta	ole 9c)		-	•	•	
(87)m= 20.13	20.27	20.52	20.81	20.95	20.99	21	21	20.97	20.77	20.42	20.11		(87)
Temperature	during b	eating n	oriode ir	rost of	dwelling	from To	hla a	Th2 (°C)	<u> </u>	!	!		
(88)m= 20.27	20.27	20.28	20.29	20.29	20.31	20.31	20.31		20.29	20.29	20.28		(88)
` '	<u> </u>			<u> </u>	<u> </u>	<u> </u>							, ,
Utilisation fa					T	1	T	1 0.50	0.04	T 0.05	0.00		(89)
(89)m= 0.97	0.96	0.91	0.79	0.59	0.4	0.27	0.31	0.56	0.84	0.95	0.98		(03)
Mean interna	al temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)		T	Ī	
(90)m= 19.1	19.31	19.66	20.06	20.24	20.3	20.31	20.31		20.03	19.54	19.09		(90)
								1	LA = Livir	ng area ÷ (4) =	0.49	(91)
Mean_interna	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 –	fLA) × T2					
(92)m= 19.61	19.78	20.08	20.43	20.59	20.64	20.65	20.65	20.62	20.39	19.97	19.59		(92)
Apply adjust	ment to the	ne mean	interna	temper	ature fro	m Table	4e, w	here appro	opriate			•	
(93)m= 19.61	19.78	20.08	20.43	20.59	20.64	20.65	20.65	20.62	20.39	19.97	19.59		(93)
8. Space hea	·												
Set Ti to the the utilisation					ned at st	ep 11 of	Table	9b, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa			•	iviay	<u> </u>	<u> </u>	7105	,	000	1407	_ <u></u>		
(94)m= 0.97	0.95	0.91	0.79	0.61	0.42	0.3	0.34	0.58	0.85	0.95	0.97		(94)
Useful gains	, hmGm ,	W = (94	4)m x (84	 4)m	<u>!</u>	!	!	-1	<u>I</u>	<u>!</u>	<u>!</u>		
(95)m= 344.68	367.88	388.24	384.81	326.31	224.34	151.08	157.68	3 238.18	307.45	324.2	332.97		(95)
Monthly ave	rage exte	rnal tem	perature	from T	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 rat	_				Lm , W	=[(39)m	x [(93)	m- (96)m]			•	
(97)m= 605.37		532.59	442.53	339.89	225.9	151.29	158.09		374.26	496.17	598.46		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(9	7)m – (95)m] x (4	1)m		•	
(98)m= 193.95	146.61	107.39	41.56	10.1	0	1 0	l 0	l 0	49.71	123.82	197.53		

		_		_
	Total per year (kWh/	/year) = Sum(98) _{15,912} =	870.67	(98)
Space heating requirement in kWh/m²/year			17.2	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating praction of space heat from secondary/supplementary heating (Tabl		mmunity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =	,	Γ	1	(302)
The community scheme may obtain heat from several sources. The procedure allows	s for CHP and up to f	ے four other heat sources; the	e latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See A Fraction of heat from Community heat pump	Appendix C.	Г	1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system	meaning eyerem		1.05	(306)
Space heating		L	kWh/year	
Annual space heating requirement		Γ	870.67	7
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	914.2	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		Γ	1827.32	7
If DHW from community scheme:		_		⊿ –
Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	1918.69	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	7e) + (310a)(310e)] =	28.33	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outs	side	Ε	107.68	(330a)
warm air heating system fans		Ī	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =	107.68	(331)
Energy for lighting (calculated in Appendix L)		Ī	239.96	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (3	315) + (331) + (33	32)(237b) =	3071.72	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh k	Emissions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	fuels repeat (363) to	(366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b	o)] x 100 ÷ (367b) x	0.52	525.1	(367)
Electrical energy for heat distribution [(313)) x	0.52	14.7	(372)

Total CO2 associated with community sy	stems	(363)(366) + (368)(37	2)	=	539.8	(373)
CO2 associated with space heating (second	ondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion	on heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wa	ter heating	(373) + (374) + (375) =			539.8	(376)
CO2 associated with electricity for pumps	and fans within dwe	lling (331)) x	0.52	=	55.89	(378)
CO2 associated with electricity for lighting	9	(332))) x	0.52	=	124.54	(379)
Energy saving/generation technologies (3 Item 1	333) to (334) as appli	cable	0.52 × 0.01	= _	-56.48	(380)
Total CO2, kg/year	sum of (376)(382) =				663.75	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.11	(384)
El rating (section 14)					90.7	(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:44:23

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.92m² Plot Reference: 02 - 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 25.77 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.51 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 **OK**

Party wall 0.00 (max. 0.20) Floor (no floor)

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

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 **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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	400.007	
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
Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
ased on:		
Overshading:	Average or unknown	
Windows facing: North East	9.56m²	
Windows facing: South East	8.76m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

		Hear	· Details:						
A No	Noil le place	USEI		- NI	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa			010943 on: 1.0.5.50			
Contware Hame.	5110111011		y Address		31011.		7 01010	7.0.0.00	
Address :		·	•						
1. Overall dwelling dime	ensions:								
Ground floor		Aı	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a) .	. (4=)		(1a) x		65	(2a) =	169.39	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1a)+(1e)+	F(1II)	63.92	(4)) (O.) (O.)	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	169.39	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of altimospess	heating he	ating					40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents	ì			L	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	0		÷ (5) =	0	(8)
•	peen carried out or is intended,			continue fr			- (0) =	0	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)
deducting areas of openii		maing to the gre	eater wan are	a (aitei					
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								0	(13)
ŭ	s and doors draught strip	pped						0	(14)
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	aro avaraged in subje		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic	•	•	•	etre or e	envelope	area	3	$= \begin{pmatrix} (17) \\ (48) \end{pmatrix}$
•	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere			,	,	3			0	(19)
Shelter factor			(20) = 1 -	[0.075 x (1	9)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	x (20) =				0.15	(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		
		<u>l</u>			<u> </u>			I	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effective of the control o		•	rate for t	пе арріі	саріе са	se					I	0.5	(238
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)			0.5	(231
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =				75.65	(23)
a) If balance	ed mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (22	2b)m + (23b) × [ا (23c) – 1		`
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3	-	(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		(24
c) If whole h				•					- (00)	`			
	i	(23b), t	· ` `	ŕ		· ` `	ŕ	<u> </u>	· ` `			İ	(0.4
(24c)m= 0	0	0		0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losse	c and he	nat loce r	paramete	or:							•		
S. Fleat losse ELEMENT	S and the Gros		Openin		Net Ar	ea	U-valı	16	AXU		k-value	e A X	X k
	area		m		A ,r		W/m2		(W/I	K)	kJ/m²-ł		
Windows Type	e 1				9.56	x1,	/[1/(1.4)+	0.04] =	12.67				(27
Windows Type	2				8.76	x1,	/[1/(1.4)+	0.04] =	11.61				(27
Walls Type1	61.0)9	18.3	2	42.77	, X	0.18	=	7.7	$\overline{}$ [60	2566.2	(29
Nalls Type2	3.80	6	0		3.86	x	0.17	=	0.65	$\overline{}$	60	231.6	(29
Total area of e	lements	, m²			64.95	5							— (31
Party wall					37.5	x	0		0	\neg [45	1687.5	(32
Party floor					63.92	2					40	2556.8	(32
Party ceiling					63.92	2				Ī	30	1917.6	(32
nternal wall **					113.4	7				Ī	9	1021.23	3 (32
* for windows and					alue calcul		formula 1	/[(1/U-valu	re)+0.04] a	L as given in	paragraph		 `
** include the area				ls and pari	titions		(26)(30)	(22) _			ı		٦,,,,
Fabric heat los		•	U)				(20)(30)		(20) + (2)	2) + (225)	(220) -	32.63	(33)
Heat capacity		,	0 – Cm	TEA) in	\ \ \ \/m2\			***	.(30) + (32) $\div (4) =$	2) + (32a).	(32e) =	9980.93	(34)
Thermal mass For design assess	•	•		,			acisaly the	` '	. ,	TMD in T	ahle 1f	156.15	(35
can be used inste				CONSTRUCT	on are no	. Kirowir pr	colocity tire	maioanvo	values of	11011 111 11	abio II		
Thermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						7.91	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric he									(36) =			40.54	(37
entilation hea	i								= 0.33 × (.		1	
Jan 17.5	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20
(38)m= 17.5	17.29	17.08	16.03	15.82	14.77	14.77	14.56	15.19	15.82	16.24	16.66	l	(38
Heat transfer (39)m= 58.04	57.83	nt, W/K 57.62	56.57	56.36	55.32	55.32	55.11	(39)m 55.73	= (37) + (37)	38)m 56.78	57.2	ı	

Heat loss pa	arameter (HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.9	1 0.9	0.9	0.89	0.88	0.87	0.87	0.86	0.87	0.88	0.89	0.89		
									Average =	Sum(40) ₁ .	12 /12=	0.88	(40)
Number of o	- i	<u> </u>	<u> </u>							·			
Ja	-	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 h	eating ene	rgy requi	irement:								kWh/ye	ar:	
	ccupancy, I3.9, N = 1 I3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		09		(42)
Annual ave Reduce the ar	nual average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.84		(43)
Ja	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usag		r day for ea				Table 1c x	_	<u>'</u>	<u> </u>	!			
(44)m= 92.2	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 conten					190 x Vd,r								
(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 instantaneou	ıs water heat	ing at point	of use (no	o hot water	· storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	- L	1319.1	(45)
(46)m= 20.5		18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87		(46)
Water stora		1 10.01	10.11	10.10	10.01	12.00		1 1.00	10.70	10.20	10.01		(- /
Storage vol	ume (litres) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If communit	y heating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise in		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water stora a) If manuf	_	oclared l	oss fact	or ie kna	wn (k\//k	v/dav/).							(40)
Temperatur				JI 15 KI10	wii (Kvvi	i/uay).					0		(48)
Energy lost				aar			(48) x (49)	١ _			0		(49)
b) If manuf		•			or is not		(40) X (40)	, –		1	10		(50)
Hot water s	torage loss	factor fr	om Tabl	le 2 (kW	h/litre/da	ıy)				0.	02		(51)
If communit			on 4.3										
Volume factoring Temperatur			2h							-	03		(52) (53)
Energy lost				oor			(47) v (51)) x (52) x (52) _		.6		. ,
Enter (50)		•	, KVVII/yt	zai			(47) X (31)) X (JZ) X (33) –		03		(54) (55)
Water stora	` , ` `	,	for each	month			((56)m = ((55) × (41)	m		00		()
(56)m= 32.0		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder cont												×Н	(30)
(57)m= 32.0	01 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
		ļ		<u>l</u>	<u> </u>	<u> </u>	<u> </u>	L			0		(58)
Primary circ	`	,			59)m = ((58) <u>–</u> 36	35 x (41)	ım			o .		(00)
-	by factor f			,		. ,	, ,		r thermo	stat)			
(modilied	e, iacioi i	ioiii iab								,			

Combi loss ca	lculated	for each	month ((61)m –	(60) ± 3	65 v (41	١m						
(61)m= 0	0	0	0	0 0	00) + 3	03 × (41)) 0	0	Ιο	0	0	1	(61)
												J · (59)m + (61)m	(- /
(62)m= 192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.0		167.01	175.46	187.72	1	(62)
Solar DHW input	L											1	()
(add additiona									ar continoc	morrio wan	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter					!		1	Į.	<u> </u>	ı	
(64)m= 192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.0	2 149.37	167.01	175.46	187.72]	
L	1	<u> </u>		ļ		ļ		utput from w	ater heat	_ I er (annual)₁	112	1969.94	(64)
Heat gains fro	m water	heating,	kWh/me	onth 0.2	5 ′ [0.85	5 × (45)m	+ (61)m] + 0.8	x [(46)m	n + (57)m	+ (59)m	 .]	-
(65)m= 89.69	79.71	85.26	78.58	78.55	72.42	71.67	75.7		81.37	83.35	88.26]	(65)
include (57)	m in calc	culation of	of (65)m	only if c	vlinder	is in the	dwellir	ng or hot v	vater is t	from com	munity h	ı neating	
5. Internal ga					,			<u> </u>			,	,	
Metabolic gair	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g 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 gains	(calcula	ted in Ap	pendix	L, equat	on L9 c	r L9a), a	lso se	e Table 5			-	•	
(67)m= 16.29	14.47	11.77	8.91	6.66	5.62	6.07	7.9	10.6	13.46	15.7	16.74]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	lso see Ta	ble 5	-	•	•	
(68)m= 182.71	184.61	179.83	169.66	156.82	144.75	136.69	134.	3 139.57	149.75	162.58	174.65		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	÷ 5	•	-	•	
(69)m= 33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.4	5 33.45	33.45	33.45	33.45		(69)
Pumps and fa	ns gains	(Table 5	ōa)					•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)			•		•	•	•	
(71)m= -83.6	-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	gains (T	able 5)		-		-				-	-	•	
(72)m= 120.56	118.62	114.6	109.13	105.58	100.58	96.34	101.7	8 103.71	109.37	115.76	118.63		(72)
Total internal	gains =				(66)m + (67)m	ı + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 373.91	372.05	360.55	342.05	323.41	305.31	293.45	298.8	308.23	326.92	348.4	364.37		(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	itions to	convert to the	he applica	ble orienta	tion.		
Orientation:			Area		Flu			g_ Table 6b	-	FF		Gains	
_	Table 6d		m²			ble 6a		Table 6b		Table 6c		(W)	,
Northeast _{0.9x}	0.77	Х	9.5	56	x	11.28	x	0.63	x [0.7	=	32.96	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	22.97	X	0.63	×	0.7	=	67.1	(75)
Northeast 0.9x	0.77	X	9.5	56	х	41.38	X	0.63	x [0.7	=	120.89	(75)
Northeast 0.9x	0.77	Х	9.5	56	x	67.96	X	0.63	x	0.7	=	198.54	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	91.35	X	0.63	X	0.7	=	266.88	(75)

N1464 -		_					, ,						– ,
Northeast _{0.9x}	0.77	X	9.5	56	X	97.38	X	0.63	×	0.7	=	284.52	(75)
Northeast _{0.9x}	0.77	X	9.5	56	Х	91.1	X	0.63	×	0.7	=	266.17	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	72.63	X	0.63	×	0.7	=	212.19	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	50.42	X	0.63	x	0.7	=	147.31	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	28.07	X	0.63	X	0.7	=	82	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	14.2	X	0.63	X	0.7	=	41.48	(75)
Northeast 0.9x	0.77	X	9.5	56	X	9.21	x	0.63	X	0.7	=	26.92	(75)
Southeast 0.9x	0.77	X	8.7	' 6	x :	36.79	x	0.63	x	0.7	=	98.5	(77)
Southeast 0.9x	0.77	X	8.7	7 6	X	62.67	x	0.63	x	0.7	=	167.79	(77)
Southeast 0.9x	0.77	X	8.7	' 6	X	85.75	x	0.63	x	0.7	=	229.57	(77)
Southeast _{0.9x}	0.77	X	8.7	' 6	x 1	06.25	x	0.63	X	0.7	=	284.45	(77)
Southeast _{0.9x}	0.77	X	8.7	76	x 1	19.01	x	0.63	x	0.7	=	318.61	(77)
Southeast _{0.9x}	0.77	x	8.7	7 6	x 1	18.15	x	0.63	×	0.7	-	316.31	(77)
Southeast 0.9x	0.77	x	8.7	' 6	x 1	13.91	х	0.63	x	0.7		304.95	(77)
Southeast 0.9x	0.77	x	8.7	' 6	x 1	04.39	x	0.63	x	0.7	=	279.47	(77)
Southeast 0.9x	0.77	x	8.7	' 6	x	92.85	j x	0.63	- x	0.7	=	248.58	(77)
Southeast 0.9x	0.77	x	8.7	' 6	х	69.27	X	0.63	x	0.7		185.44	(77)
Southeast _{0.9x}	0.77	x	8.7	' 6	x	44.07	X	0.63	×	0.7	=	117.98	(77)
Southeast 0.9x	0.77	X	8.7	······································	x	31.49] _x	0.63	- x	0.7	_ =	84.3	(77)
_					<u> </u>								
Solar gains in	watts, calc	culated	for eac	h month			(83)m	n = Sum(74)m	(82)m				
(83)m= 131.47		350.47	483	585.49	600.83	571.12	491		267.44	159.46	111.22		(83)
Total gains – i	nternal and	d solar	(84)m =	= (73)m	+ (83)m	, watts	•						
(84)m= 505.38	606.94	711.02	825.05	908.91	906.14	864.57	790	.48 704.13	594.37	507.86	475.59		(84)
7. Mean inter	nal tempe	rature ((heating	season)								
Temperature			`		•	from Tal	ble 9.	Th1 (°C)				21	(85)
Utilisation fac	_	•			•		,	, ,					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aı	ug Sep	Oct	Nov	Dec		
(86)m= 0.97	0.94	0.87	0.73	0.55	0.39	0.28	0.3		0.8	0.94	0.97		(86)
Mean interna	l tomporat	uro in l	ivina or	00 T1 /f/	llow etc	nc 2 to -	7 in T	able 0e)	<u> </u>		•		
(87)m= 19.93	r	20.51	20.81	20.95	20.99	21	2		20.76	20.3	19.89		(87)
` ′	<u> </u>			!		!					10.00		, ,
Temperature	 -				`		1	` 	T 20.40	20.40	00.47		(88)
(88)m= 20.16	20.16	20.17	20.18	20.18	20.2	20.2	20.	.2 20.19	20.18	20.18	20.17		(00)
Utilisation fac	_ <u> </u>				h2,m (s	i	9a)					Ī	
(89)m= 0.96	0.92	0.85	0.69	0.51	0.34	0.23	0.2	26 0.47	0.77	0.93	0.97		(89)
Mean_interna	l temperat	ure in t	he rest	of dwell	ing T2 (t	follow ste	eps 3	to 7 in Tab	le 9c)				
(90)m= 18.74	19.11	19.56	19.97	20.13	20.19	20.2	20.	.2 20.17	19.91	19.29	18.69		(90)
										ina oroo . /	4) _		(91)
	<u> </u>								fLA = Liv	ing area ÷ (4) =	0.38	(91)
Mean interna	l temperat	ure (fo	r the wh	ole dwe	lling) = 1	LA × T1	+ (1			ing area - (4) =	0.38	(91)
Mean interna	 	ure (fo	r the wh	ole dwe	lling) = 1	LA × T1	+ (1	– fLA) × T2		19.67	19.14	0.38	(92)
	19.52	19.92	20.29	20.44	20.5	20.5	20.	– fLA) × T2 .5 20.47	20.23	_		0.38	

(93)m= 19.19	19.52	19.92	20.29	20.44	20.5	20.5	20.5	20.47	20.23	19.67	19.14		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		ļ					19						
(94)m= 0.95	0.91	0.84	0.7	0.52	0.36	0.25	0.29	0.49	0.77	0.92	0.96		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m		•	•						
(95)m= 481.7	555.07	597.49	576.76	475.72	323.61	215.39	225.34	345.69	458.98	466.53	457.07		(95)
Monthly avera		1	. 	r	T T								
(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		1	644.22	erature, 492.83	i	- ` 	<u> </u>	<u>`</u>		740.00	054.77		(07)
(97)m= 864.4	845.57	773.35			326.09	215.79	226.04	355.11	542.96	713.83	854.77		(97)
Space heatin (98)m= 284.73	195.21	130.84	48.57	12.73	0	0.02	0	0	62.48	178.05	295.89		
(50)= 254.75	100.21	100.04	40.07	12.70				l per year			<u> </u>	1208.5	(98)
Casas bootin	a roquir	omont in	I4\A/b/m2	2/voor			rota	ii poi youi	(KVVIII y Cal) = Gam(o	O)15,912 —		닠``
Space heatin	•										l	18.91	(99)
9b. Energy rec	•		The state of the s	Ĭ									
This part is use Fraction of spa			• .		•		.	•		unity scr	neme.	0	(301)
Fraction of spa			-		•	_		, -			[[1	(302)
·			•	•	•	•	allows for	CUD and	un to forus	other boot		-	(302)
The community so includes boilers, h									ир во тоиг	otner neat	sources, ir	ie iallei	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	0			(3	02) x (303	a) =	1	(304a)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem		Ì	1	(305)
Distribution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space heating		`	,		·	0 ,					L	kWh/yea	 r
Annual space	_	requiren	nent									1208.5	
Space heat fro	m Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	- [1268.93	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	a 4a or A	ppendix	E)	[0	(308
Space heating	,		•	_	•	,			· · 01) x 100 ·	,	[[0	(309)
			0000	,,,	- p. o	itali y cyc			,	,	l		` ′
Water heating Annual water h		equirem	ent								[1969.94	7
If DHW from c	_	-									l	1000.04	
Water heat fro)				(64) x (30	03a) x (30	5) x (306) :	= [2068.44	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	33.37	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	a svsten	n. if not e	enter 0)		= (107) ÷	(314) =		[0	(315)
Electricity for p	,			•		,		•	•		Į		
mechanical ve							outside					135.98	(330a)
											L	i	

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		135.98	(331)
Energy for lighting (calculated in Appendix L)				287.67	(332)
Electricity generated by PVs (Appendix M) (negative quantity	')			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3652.2	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto		nissions CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second f	uel	280	(367a)
CO2 associated with heat source 1 [(307	(b)+(310b)] x 100 ÷ (367b) x	0.52	=	618.6	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	17.32	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	635.93	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			635.93	(376)
CO2 associated with electricity for pumps and fans within dw	relling (331)) x	0.52	=	70.57	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	149.3	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	licable	0.52 x 0.01	= [-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				799.32	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				12.51	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:44:14

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 60.34m² Site Reference : Highgate Road - GREEN

Plot 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 12.53 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 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 - Heat pump

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	10.070	<u> </u>
Continuous supply and extract system		
	0.47	
Specific fan power:	• • • • • • • • • • • • • • • • • • • •	214
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	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	
ventilation rate.	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	O 11/111 IX	
Photovoltaic array		

		l Iser 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	: 02 - I					
1. Overall dwelling dime	ensions:								
3		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	<u> </u>	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				0	x ′	10 =	0	(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)+(aantinua fi	0		÷ (5) =	0	(8)
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	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 pu deducting areas of openir	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 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	3	(17)
•	es if a pressurisation test has been do				is being u	sed		0.15	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.15	(21)
Infiltration rate modified for	- 1 	1	Δ	0	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	
(<u></u> /	5.0	1	1	<u> </u>	I	I	l	J	
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	te (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe If mechanic		•	rate ior t	пе арріі	саріе са	se						0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	h heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h	ı) =				75.65	(23
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (I	ЛV) (24b	o)m = (22	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r		tract ver × (23b), t		•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)		•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)					
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losse	s and he	eat loss	paramet	er:									
LEMENT	Gros area		Openin m	=	Net Ar A ,r		U-val W/m2		A X U (W/I	〈)	k-value kJ/m²-l		
Windows Type	e 1				4.7	x1	/[1/(1.4)+	0.04] =	6.23				(27
Windows Type	e 2				6.09	x1	/[1/(1.4)+	0.04] =	8.07				(27
Windows Type	e 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		60	2345.4	(29
Walls Type2	27.3	31	0		27.3′	X	0.17	=	4.59		60	1638.6	(29
otal area of e	elements	s, m²			80.11								(31
Party wall					16.88	3 x	0	=	0		45	759.6	(32
Party floor					60.34	1					40	2413.6	(32
Party ceiling					60.34	1					30	1810.2	(32
nternal wall **	•				107.9	1					9	971.190	1 (32
for windows and it include the are						ated using	formula 1	l/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	3.2	
abric heat lo				o ana pan			(26)(30) + (32) =				29.8	(33
Heat capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	9938.59) (34
hermal mass		. ,	= Cm +	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			164.71	(35
For design asses can be used inste				construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in Te	able 1f		
Thermal bridg	es : S (L	. x Y) cal	culated (using Ap	pendix l	<						7.62	(36
f details of therm		are not kn	own (36) =	= 0.05 x (3	11)						,		_
Total fabric he									(36) =			37.42	(37
entilation hea		1	·		1 .		l .		= 0.33 × (l	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	

(38)m= 16.52	16.32	16.12	15.13	14.93	13.94	13.94	13.75	14.34	14.93	15.33	15.72		(38)
` ′		<u> </u>	13.13	14.93	13.94	13.94	13.73			l	15.72		(30)
Heat transfer		53.54	52.55	52.35	51.36	51.36	51.16	51.76	= (37) + (3 52.35	52.75	53.14		
(00)111= 00.00	1 00	00.01	02.00	02.00	01.00	01.00	01.10			Sum(39) ₁		52.5	(39)
Heat loss pa	ameter (I	HLP), W	m²K						= (39)m ÷		,		_
(40)m= 0.89	0.89	0.89	0.87	0.87	0.85	0.85	0.85	0.86	0.87	0.87	0.88		_
Number of da	avs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.87	(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 requ	irement:								kWh/ye	ear:	
Assumed so	NIDODOV	NI											(40)
Assumed occi if TFA > 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.		.99		(42)
if TFA £ 13 Annual avera	•	ater usad	ae in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		81	.49		(43)
Reduce the ann	ual average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.40		(10)
not more that 12	- 	· ·				<u> </u>							
Jan Hot water usage	Feb	Mar r day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
(44)m= 89.64	-	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64		
(44)111= 09.04	00.38	03.12	79.00	70.0	73.34	73.34	70.0			m(44) ₁₁₂ =	L	977.9	(44)
Energy content	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,n	n x nm x E	OTm / 3600			. ,			(```
(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		
If instantaneous	water heati	ng of point	of upo (no	hot water	: otorogo)	ontor O in	hayaa (16		Γotal = Su	m(45) ₁₁₂ =	=	1282.18	(45)
If instantaneous			·			1		` '	40.00	17.70	1001		(46)
(46)m= 19.94 Water storag		18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31		(46)
Storage volu) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storag a) If manufa		eclared I	oss facto	or is kno	wn (kWh	n/day).					0		(48)
Temperature				01 10 1410	("uay).					0		(49)
Energy lost f				ear			(48) x (49)) =			10		(50)
b) If manufa	cturer's d	eclared o	cylinder l	loss fact									,
Hot water sto	•			le 2 (kW	h/litre/da	ıy)				0.	.02		(51)
If community Volume factor	•		011 4.3							1	.03		(52)
Temperature			2b							—	1.6		(53)
Energy lost f	om wate	r storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) o	(54) in (5	55)								1.	.03		(55)
Water storag	e loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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	хН	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) fr	om Table 3			0		(58)
Primary circuit loss calculated		(58) ÷ 365 × (41)m			
(modified by factor from Tab	ole H5 if there is solar wa	ater heating and	a cylinder 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 2	23.26	(59)
Combi loss calculated for each	n month (61)m = (60) ÷ 3	365 × (41)m				
(61)m= 0 0 0	0 0 0	0 0	0 0	0	0	(61)
Total heat required for water h	neating calculated for ea	ch month (62)m :	= 0.85 × (45)m +	(46)m + (5	 7)m + (59)m + (61)m	
(62)m= 188.21 166.19 175.25	158.09 155.64 140.1	135.53 147.37	146.69 163.88	ì í	184.02	(62)
Solar DHW input calculated using App			I I D' if no solar contribut	ļļ_	l neating)	
(add additional lines if FGHRS	· · · · · ·					
(63)m = 0 0 0	0 0 0	0 0	0 0	0	0	(63)
Output from water heater		<u> </u>	1	ļl		
(64)m= 188.21 166.19 175.25	158.09 155.64 140.1	135.53 147.37	146.69 163.88	172.05 1	184.02	
(0.7)	1	-	put from water heate			(64)
Heat gains from water heating	ı kWh/month 0 25 ´ [0 8], ,
(65)m= 88.42 78.6 84.11	77.57 77.59 71.59	70.91 74.84	73.78 80.33		87.03	(65)
` '	 			<u> </u>		(00)
include (57)m in calculation	. ,	is in the aweiling	or not water is if	om commu	unity neating	
5. Internal gains (see Table	,					
Metabolic gains (Table 5), Wa		1 1 .				
Jan Feb Mar	Apr May Jun	Jul Aug	Sep Oct	Nov	Dec	(0.0)
(66)m= 99.56 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 A	`` 	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 1	15.93	(67)
Appliances gains (calculated in	n Appendix L, equation I	L13 or L13a), als	o see Table 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 1	166.13	(68)
Cooking gains (calculated in A	ppendix L, equation L15	5 or L15a), also s	ee Table 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	32.96	(69)
Pumps and fans gains (Table	5a)	•				
(70)m= 0 0 0	0 0 0	0 0	0 0	0	0	(70)
Losses e.g. evaporation (nega	ative 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	-79.65	(71)
Water heating gains (Table 5)	.1 1		! !	<u> </u>		
(72)m= 118.85 116.96 113.06	107.74 104.29 99.43	95.3 100.59	102.47 107.97	114.19 1	116.97	(72)
Total internal gains =	 	<u> </u>	+ (69)m + (70)m + (7	<u> </u>		
(73)m= 361.01 359.2 348.18	, , , , , , , , , , , , , , , , , , , 	, , , , , , , , , , , , , , , , , , , 	298.19 316.08	<u> </u>	351.9	(73)
6. Solar gains:	9:210: 200:0	200.00	200.10	000.00	50.10	
Solar gains are calculated using sola	ar flux from Table 6a and asso	ciated equations to c	onvert to the applicat	ole orientation	1.	
Orientation: Access Factor		ux	g_	FF	Gains	
Table 6d				able 6c	(W)	
Southeast 0.9x 0.77 x	6.09 ×	36.79 ×	0.63 ×	0.7	= 68.48	(77)
Southeast 0.9x 0.77 x		62.67 X	0.63 x	0.7	= 116.65](77)
0.11		<u></u> "		0.7		7, ,

Jan	Feb	Mar	Apr	May	Jur		A	ug Sep	0	et Nov	Dec]	
Temperature of Utilisation fact	•	• .			•		ble 9,	Th1 (°C)				21	(85)
7. Mean intern													
(84)m= 492.41	586.37	667.88	741.48	786.63	771.8	6 740.9	698	.24 649.37	7 569.	55 494.64	463.96]	(84)
Total gains – in	ternal ar	nd solai	(84)m =	(73)m -	+ (83)	m , watts				•		-	
(83)m= 131.4	227.17	319.7		473.96	476.5	1 456.92	409				112.06]	(83)
Solar gains in v	vatts, ca	lculated	I for each	month			(83)m	ı = Sum(74)n	n(82)ı	n			
Northwest 0.9x	0.77	X	2.92		х	9.21	X	0.63	X	0.7	=	8.22	(81)
Northwest o. 9x	0.77	×	2.92		×	14.2	X	0.63	×		=	12.67	(81)
Northwest 0.9x	0.77	×	2.92		x	28.07	X	0.63	×		=	25.05	(81)
Northwest 0.9x	0.77	×	2.92	_	x	50.42	X	0.63	×		=	44.99	(81)
Northwest 0.9x	0.77	x	2.92		х	72.63	X	0.63	x	0.7	=	64.81	(81)
Northwest _{0.9x}	0.77	×	2.92		x	91.1	x	0.63	×	0.7	=	81.3	(81)
Northwest 0.9x	0.77	x	2.92		x	97.38	x	0.63	х	0.7	=	86.9	(81)
Northwest 0.9x	0.77	X	2.92		X	91.35	x	0.63	X	0.7	=	81.52	(81)
Northwest _{0.9x}	0.77	x	2.92		х	67.96	x	0.63	x	0.7	=	60.64	(81)
Northwest _{0.9x}	0.77	x	2.92		х 🗌	41.38	x	0.63	x	0.7	=	36.93	(81)
Northwest _{0.9x}	0.77	x	2.92		х 📃	22.97	x	0.63	x	0.7	=	20.5	(81)
Northwest 0.9x	0.77	x	2.92		x	11.28	x	0.63	x	0.7	=	10.07	(81)
Southwest _{0.9x}	0.77	×	4.7		х 🗔	31.49]	0.63	×	0.7	=	45.23	(79)
Southwest _{0.9x}	0.77	×	4.7		х 🗀	44.07]	0.63	×	0.7	=	63.3	(79)
Southwest _{0.9x}	0.77	x	4.7		x	69.27		0.63	×	0.7	=	99.49	(79)
Southwest _{0.9x}	0.77	x	4.7		x 🗀	92.85]	0.63	x	0.7	=	133.37	(79)
Southwest _{0.9x}	0.77	x	4.7		x	104.39	j	0.63	×	0.7	=	149.94	(79)
Southwest _{0.9x}	0.77	×	4.7		х	113.91	<u>ו</u>	0.63	x		=	163.62	(79)
Southwest _{0.9x}	0.77	x	4.7	_	х	118.15	์ โ	0.63	x		=	169.71	(79)
Southwest _{0.9x}	0.77	×	4.7		x 🗀	119.01]	0.63	×		= =	170.94	(79)
Southwest _{0.9x}	0.77	$=$ $\stackrel{\wedge}{}$	4.7	_	^ <u> </u>	106.25]	0.63	^ ^			152.62	(79)
Southwest _{0.9x}	0.77	$=$ \hat{x}	4.7	=	^ <u> </u>	85.75]]	0.63	$=$ $\hat{}$		-	123.17	(79)
Southwest _{0.9x}	0.77	x	4.7		x L	36.79 62.67]]	0.63	x		╡ -	52.85 90.02	(79)
Southwest _{0.9x}	0.77	×	6.09		×	31.49]	0.63	×		=	58.6	(77)
Southeast 0.9x	0.77	×	6.09	_	x	44.07] X]	0.63	×		_ =	82.02	(77)
Southeast 0.9x	0.77	x	6.09	=	х <u>Г</u>	69.27]	0.63	×		=	128.92	$= \frac{(77)}{(77)}$
Southeast 0.9x	0.77	×	6.09		×	92.85] X]	0.63	×		_ =	172.81	= (77) - (77)
Southeast 0.9x	0.77	X	6.09		×	104.39	X	0.63	X		=	194.29	(77)
Southeast 0.9x	0.77	×	6.09	_	x	113.91	X	0.63	×		=	212.01	(77)
Southeast 0.9x	0.77	×	6.09		X L	118.15	X	0.63	×		=	219.9	(77)
Southeast 0.9x	0.77	X	6.09		x	119.01	X	0.63	×		=	221.5	(77)
Southeast 0.9x	0.77	X	6.09		x	106.25	X	0.63	X	0.7	=	197.75	(77)
~ · · · ·					=		7 i		=		==		=

(86)m= 0.97 0.93 0.87 0.75 0.59 0.42 0.3 0.34 0.53 0.8 0.94 0.97]	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_	
(87)m= 20.03 20.28 20.56 20.82 20.95 20.99 21 21 20.97 20.8 20.38 19.99]	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_	
(88)m= 20.17 20.18 20.18 20.19 20.2 20.21 20.21 20.21 20.2 20.2 20.19 20.18]	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	_	
(89)m= 0.96 0.92 0.85 0.72 0.55 0.37 0.25 0.28 0.48 0.76 0.92 0.97]	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 18.9 19.24 19.63 19.99 20.14 20.2 20.21 20.21 20.18 19.97 19.41 18.84]	(90)
$fLA = Living area \div (4) =$	0.44	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		
(92)m= 19.4 19.7 20.04 20.35 20.5 20.55 20.56 20.56 20.53 20.34 19.84 19.35]	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	-	
(93)m= 19.4 19.7 20.04 20.35 20.5 20.55 20.56 20.56 20.53 20.34 19.84 19.35	J	(93)
8. Space heating requirement	. 1-1-	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-cale the utilisation factor for gains using Table 9a	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	1	
Utilisation factor for gains, hm:	_	
(94)m= 0.95 0.92 0.85 0.72 0.56 0.39 0.27 0.3 0.5 0.77 0.92 0.96]	(94)
Useful gains, hmGm , W = (94)m x (84)m	7	
(95)m= 469.79 536.92 566.33 537.01 442.7 303.05 202.92 212.18 325.06 438.84 454.12 446.31]	(95)
Monthly average external temperature from Table 8	٦	(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	J	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 814.42 795.35 725.02 601.93 460.68 305.71 203.32 212.81 333 509.67 672 805.28	1	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m	J	(- /
(98)m= 256.41 173.67 118.07 46.74 13.38 0 0 0 0 52.7 156.87 267.08	1	
Total per year (kWh/year) = Sum(98) _{15,912} =	1084.92	(98)
Space heating requirement in kWh/m²/year	17.98	(99)
9b. Energy requirements – Community heating scheme		J
This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources;	the latter	•
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		1,,,,,,,,
Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	-
Annual space heating requirement	1084.92]

				_
Space heat from Community heat pump	(98) x (304	(a) x (305) x (306) =	1139.16	(307a)
Efficiency of secondary/supplementary heating system	n in % (from Table 4a or Ap	pendix E)	0	(308
Space heating requirement from secondary/supplement	ntary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1933.02]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303	3a) x (305) x (306) =	2029.67	(310a)
Electricity used for heat distribution	0.01 × [(307a)	(307e) + (310a)(310e)] =	31.69] (313)
Cooling System Energy Efficiency Ratio			0] (314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4 mechanical ventilation - balanced, extract or positive i	,		128.36	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	128.36	(331)		
Energy for lighting (calculated in Appendix L)			273.64	(332)
Electricity generated by PVs (Appendix M) (negative of	juantity)		-108.82	(333)
				_
Total delivered energy for all uses (307) + (309) + (31	0) + (312) + (315) + (331) +	· (332)(237b) =	3462.02	(338)
Total delivered energy for all uses (307) + (309) + (31 12b. CO2 Emissions – Community heating scheme	0) + (312) + (315) + (331) +	· (332)(237b) =	3462.02	(338)
	0) + (312) + (315) + (331) + Energy kWh/year	Emission factor		(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (Energy kWh/year not CHP)	Emission factor kg CO2/kWh 3) to (366) for the second fuel	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (Efficiency of heat source 1 (%)	Energy kWh/year not CHP) is CHP using two fuels repeat (363	Emission factor kg CO2/kWh 3) to (366) for the second fuel	Emissions kg CO2/year](367a)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (Efficiency of heat source 1 (%) CO2 associated with heat source 1	Energy kWh/year not CHP) is CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b)	Emission factor kg CO2/kWh 3) to (366) for the second fuel 0.52 =	280 587.37	(367a) (367)
CO2 from other sources of space and water heating (Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	Energy kWh/year not CHP) is CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) [(313) x	Emission factor kg CO2/kWh 3) to (366) for the second fuel 0.52 =	280 587.37 16.45 603.81	(367a) (367) (372)
CO2 from other sources of space and water heating (Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year not CHP) is CHP using two fuels repeat (363 [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368) (309) x	Emission factor kg CO2/kWh 3) to (366) for the second fuel 0.52 = 0.52	280 587.37 16.45 603.81	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary)	Energy kWh/year not CHP) is CHP using two fuels repeat (363 [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368) (309) x	Emission factor kg CO2/kWh 3) to (366) for the second fuel 0 x	280 587.37 16.45 603.81	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or in	Energy kWh/year not CHP) is CHP using two fuels repeat (363 [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368) (309) x nstantaneous heater (312)	Emission factor kg CO2/kWh 3) to (366) for the second fuel 0 x	280 587.37 16.45 603.81 0 603.81	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or interest of the control of	Energy kWh/year not CHP) is CHP using two fuels repeat (363 [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368) (309) x nstantaneous heater (312)	Emission factor kg CO2/kWh 3) to (366) for the second fuel 0 x	280 280 587.37 16.45 603.81 0 603.81 66.62	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans with the community systems CO2 associated with space and water heating	Energy kWh/year not CHP) is CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368) (309) x nstantaneous heater (312) (373) + (374) + (375) sthin dwelling (331)) x (332))) x	Emission factor kg CO2/kWh 3) to (366) for the second fuel 0.52 = 0.52	280 280 587.37 16.45 603.81 0 603.81 66.62	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans with co2 associated with electricity for lighting Energy saving/generation technologies (333) to (334)	Energy kWh/year not CHP) is CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368) (309) x Instantaneous heater (312) (373) + (374) + (375) sthin dwelling (331)) x (332))) x as applicable	Emission factor kg CO2/kWh 3) to (366) for the second fuel 1) x	280 280 587.37 16.45 603.81 0 603.81 66.62 142.02	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans with co2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) litem 1	Energy kWh/year not CHP) is CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) [(313) x (363)(366) + (368) (309) x Instantaneous heater (312) (373) + (374) + (375) sthin dwelling (331)) x (332))) x as applicable	Emission factor kg CO2/kWh 3) to (366) for the second fuel 1) x	280 280 587.37 16.45 603.81 0 603.81 66.62 142.02	(367a) (367) (372) (373) (374) (375) (376) (378) (379) (380)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:44:06*

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

Plot Reference: 03 - 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 28.11 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.06 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 - Heat pump

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	5.45m ²	
Windows facing: South East	6.09m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m ³ /m ² h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

		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.	01101110111 2012		y Address:		31011.		V 01010	7.0.0.00	
Address :		·	·						
1. Overall dwelling dime	ensions:								
Ground floor		Ar	rea(m²)	(10) ×		eight(m)	(2a) =	Volume(m³	(3a)
	-\ . (4 - \ . (4 -\ . (4 - \ . (4 -\ .	. (4.5)		(1a) x	2	2.65	(2a) =	129.74	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1a)+(1e)+	F(1II)	48.96	(4)	\	n (o)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	129.74	(5)
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	r
Number of altimospess	heating he	ating		,			40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				L	0		10 =	0	(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)+(7b))+(7c) =	Г	0		÷ (5) =	0	(8)
•	peen carried out or is intended,			ontinue fr			- (0) =	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			•	ruction			0	(11)
deducting areas of openii		inding 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								0	(13)
ŭ	s and doors draught strip	oped						0	(14)
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	arron avance and in authio		(8) + (10)	, , ,	, , ,	, ,	0.00	0	(16)
If based on air permeabil	q50, expressed in cubic $(18) = (17)$	•	•	•	etre or e	envelope	area	3	$= \begin{pmatrix} (17) \\ (48) \end{pmatrix}$
•	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere			,	,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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		I	

Adjusted infiltr	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
Calculate effec					l -						1	<u> </u>	
If mechanica	al ventila	ition:										0.5	(23a)
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced with	n heat reco	overy: effici	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(23c)
a) If balance	ed mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	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)n		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)n		on or when (24d)			•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-			
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	ue	ΑXU		k-value	e A	Χk
	area	(m²)	m	Ž	A ,r	n²	W/m2	ιK	(W/	K)	kJ/m²-l	K kJ	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)
Walls Type1	35.	3	11.54	4	23.76	S X	0.18	=	4.28		60	1425.	6 (29)
Walls Type2	35.9	9	0		35.99) X	0.17	=	6.04		60	2159.	4 (29)
Total area of e	elements	, m²			71.29)							(31)
Party wall					14.89) X	0	= [0	\Box [45	670.0	5 (32)
Party floor					48.96	3				[40	1958.	4 (32a)
Party ceiling					48.96	3				[30	1468.	8 (32b)
Internal wall **					96.46	3				Ī	9	868.1	4 (32c)
* for windows and ** include the area						ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	1 3.2	
Fabric heat los	ss, W/K	= S (A x	U)				(26)(30)	+ (32) =				25.62	(33)
Heat capacity	Cm = S	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	8550.39	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	-TFA) ir	n kJ/m²K			= (34)	÷ (4) =			174.64	(35)
For design assess can be used inste				constructi	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						6.09	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			31.71	(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= 13.4	13.24	13.08	12.28	12.12	11.31	11.31	11.15	11.64	12.12	12.44	12.76		(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (38)m		_	
(39)m= 45.11	44.95	44.79	43.99	43.83	43.03	43.03	42.87	43.35	43.83	44.15	44.47		
Stroma FSAP 201	2 Version	1.0.5.50 (SAP 9.92)	- http://wv	ww.stroma	.com			Average =	Sum(39) ₁	12 /12=	43.9 5 age	2 0 (349)

	ı ÷ (4)			
(40)m= 0.92 0.92 0.91 0.9 0.9 0.88 0.88 0.88 0.89 0.9	0.9	0.91		
•	= Sum(40)	112 /12=	0.9	(40)
Number of days in month (Table 1a)	—			
Jan Feb Mar Apr May Jun Jul Aug Sep Oct (41)m= 31 28 31 30 31 30 31 30 31	+	Dec		(41)
(41)m= 31 28 31 30 31 30 31 30 31	30	31		(41)
4. Water heating energy requirement:		kWh/ye	ar:	
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 -1 if TFA £ 13.9, N = 1		.66		(42)
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 targe not more that 125 litres per person per day (all water use, hot and cold)		3.61		(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov	Dec		
Hot water usage in litres per day for each month $Vd,m = factor from Table 1c \times (43)$	1			
(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		
	Sum(44) ₁₁₂	L	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		116.29		— ,
Total = 5 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	Sum(45) ₁₁₂	= [1158.23	(45)
(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:	10.00	17.44		(10)
Storage volume (litres) including any solar or WWHRS storage within same vessel		0		(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	n (47)			
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day):		0		(48)
Temperature factor from Table 2b		0		(49)
Energy lost from water storage, kWh/year (48) × (49) =		110		(50)
b) If manufacturer's declared cylinder loss factor is not known:		110		(30)
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	0.02		(51)
If community heating see section 4.3				(==)
Volume factor from Table 2a Temperature factor from Table 2b	-	0.6		(52) (53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$. ,
Enter (50) or (54) in (55)		.03		(54) (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m)$				` ,
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 32.01 30.98 32.01	30.98	32.01		(56)
If cylinder contains dedicated solar storage, (57) m = (56) m x $[(50)$ – $(H11)]$ ÷ (50) , else (57) m = (56) m when			хН	()
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 32.01 30.98 32.01	30.98	32.01		(57)
				(58)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	L	0		(50)
(modified by factor from Table H5 if there is solar water heating and a cylinder thern	nostat)			
	22.51	23.26		(59)

Combi loss calculated for each month (61) m = $(60) \div 365 \times (41)$ m (61) m $= (61)$ m														
(61)m= 0	0	0	0	0	00) -	0) 0		0	0	T 0	0	1	(61)
Total heat requi													[(50)m + (61)m	(- /
	154.95	163.65	147.98	145.94	131.7		138.	_	137.68	153.38	` 	171.57	(59)III + (61)IIII]	(62)
Solar DHW input ca	Į												I	(- /
(add additional											mon to wat	or modung)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0]	(63)
Output from wat	ter heat	:er				I					-1			
· -	154.95	163.65	147.98	145.94	131.7	3 127.77	138.	.47	137.68	153.38	160.59	171.57]	
	'						. (Outp	out from wa	ater heat	er (annual)₁	12	1809.07	(64)
Heat gains from	n water l	heating,	kWh/m	onth 0.2	5 ´[0.	85 × (45)m	ı + (6	1)m	n] + 0.8 x	c [(46)m	n + (57)m	+ (59)m]	_
(65)m= 84.15	74.86	80.26	74.21	74.37	68.8	1 68.33	71.8	88	70.79	76.84	78.4	82.89]	(65)
include (57)m	in calc	ulation	of (65)m	only if c	ylinde	r is in the	dwelli	ing	or hot w	ater is	from com	munity h	neating	
5. Internal gai				•	-							•		
Metabolic gains	(Table	5), Wat	ts											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec														
(66)m= 82.98	82.98	82.98	82.98	82.98	82.9	82.98	82.9	98	82.98	82.98	82.98	82.98		(66)
Lighting gains (calculat	ed in Ap	pendix	L, equati	ion L9	or L9a), a	lso s	ee 7	Table 5					
(67)m= 12.89	11.44	9.31	7.05	5.27	4.45	4.8	6.2	:5	8.38	10.64	12.42	13.24		(67)
Appliances gain	ns (calcu	ulated in	Append	dix L, eq	uatior	L13 or L1	3a), a	also	see Tal	ble 5	-	-		
(68)m= 144.53	146.03	142.25	134.21	124.05	114.5	108.13	106.	.63	110.41	118.45	128.61	138.16		(68)
Cooking gains (calculat	ted in Ap	pendix	L, equat	ion L	15 or L15a), also	o se	e 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	s gains	(Table 5	ia)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g. eva	poratio	n (negat	ive valu	es) (Tab	le 5)							-		
(71)m= -66.38	-66.38	-66.38	-66.38	-66.38	-66.3	8 -66.38	-66.	38	-66.38	-66.38	-66.38	-66.38		(71)
Water heating g	gains (T	able 5)									-	-		
(72)m= 113.1	111.4	107.87	103.07	99.95	95.5	7 91.84	96.6	62	98.31	103.28	108.89	111.41		(72)
Total internal g	gains =					66)m + (67)n	า + (68	3)m +	+ (69)m + ((70)m + (71)m + (72))m		
(73)m= 318.42	316.77	307.33	292.22	277.17	262.4	1 252.66	257.	.38	265	280.27	297.82	310.7		(73)
6. Solar gains:														
Solar gains are ca		ŭ	r flux from	Table 6a		•	tions t	to co	nvert to th	e applica		tion.		
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)														
	able ou		m ²		_	able ba	, ,	- 1	able ob	_ ,	Table 6c		(W)	7
Southeast 0.9x	0.77	X	6.0	9	×	36.79	X		0.63	x [0.7	=	68.48	(77)
Southeast 0.9x	0.77	X	6.0	9	X _	62.67	X		0.63	x [0.7	=	116.65	(77)
Southeast 0.9x	0.77	X	6.0	9	X _	85.75	X		0.63	×	0.7	=	159.6	(77)
Southeast 0.9x	0.77	×	6.0	9	X _	106.25	X		0.63	x [0.7	=	197.75	(77)
Southeast 0.9x	0.77	X	6.0	9	x	119.01	X		0.63	X	0.7	=	221.5	(77)

		_					, ,		_				_
Southeast 0.9x	0.77	X	6.0)9	X 1	18.15	X	0.63	X	0.7	=	219.9	(77)
Southeast 0.9x	0.77	X	6.0)9	x 1	13.91	X	0.63	X	0.7	=	212.01	(77)
Southeast 0.9x	0.77	X	6.0)9	X 1	04.39	X	0.63	X	0.7	=	194.29	(77)
Southeast 0.9x	0.77	X	6.0)9	x g	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	х	0.7	=	58.6	(77)
Southwest _{0.9x}	0.77	x	5.4	15	x :	36.79		0.63	х	0.7	=	61.28	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x (62.67		0.63	х	0.7	=	104.39	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 8	85.75		0.63	х	0.7	=	142.83	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	06.25		0.63	x	0.7	=	176.97	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	19.01		0.63	x	0.7	=	198.22	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	18.15		0.63	x	0.7	=	196.79	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	13.91]	0.63	x	0.7	_ =	189.73	(79)
Southwest _{0.9x}	0.77	x	5.4	15	x 1	04.39		0.63	x	0.7	=	173.87	(79)
Southwest _{0.9x}	0.77	×	5.4	15	x .	92.85	֓֞֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֓֡֓֓֡	0.63	x	0.7	=	154.65	(79)
Southwest _{0.9x}	0.77	×	5.4	ļ5	x (69.27	j	0.63	x	0.7	=	115.37	(79)
Southwest _{0.9x}	0.77	×	5.4	15	x Z	44.07	j	0.63	x	0.7	=	73.4	(79)
Southwest _{0.9x}	0.77	×	5.4	ļ5	x :	31.49	֓֞֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֓֡֓֓֡	0.63	x	0.7	=	52.45	(79)
Solar gains in (83)m= 129.76 Total gains – i (84)m= 448.18	221.04 30 nternal and	02.43	374.73	419.72	416.69	401.73 , watts 654.39	(83)m 368 625		244.29 524.50	9 155.43	111.05 421.75]	(83) (84)
7. Mean inter	nal temper	ature	(heating	season)								
Temperature	during hea	ting p	eriods ir	n the livii	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac				ea, h1,m	(see Ta	able 9a)						7	
Jan		Mar	Apr	May	Jun	Jul	 	ug Sep	Oct		Dec	1	
(86)m= 0.96	0.92	0.84	0.72	0.56	0.4	0.29	0.3	0.49	0.76	0.92	0.97]	(86)
Mean interna	l temperatu	ıre in I	iving are	ea T1 (fo	ollow ste	ps 3 to 7	7 in T	able 9c)				-	
(87)m= 20.14	20.38 2	0.64	20.86	20.96	20.99	21	2	1 20.98	20.85	20.47	20.09		(87)
Temperature	during hea	ting p	eriods ir	n rest of	dwelling	g from Ta	able 9	9, Th2 (°C)					
(88)m= 20.15	20.15 2	0.15	20.17	20.17	20.19	20.19	20.	19 20.18	20.17	20.17	20.16]	(88)
Utilisation fac	tor for gain	s for r	est of d	wellina.	h2.m (se	ee Table	9a)			-	•	_	
(89)m= 0.95		0.82	0.68	0.52	0.35	0.24	0.2	0.44	0.72	0.9	0.96]	(89)
Mean interna	l temperati	ıre in 1	the rest	of dwelli	ing T2 (f	follow ste	ne 3	to 7 in Tahl	L a_9c)			J	
(90)m= 19.02		9.72	20.01	20.13	20.18	20.19	20.		20.01	19.51	18.97	1	(90)
. ,	<u> </u>				<u> </u>					/ing area ÷ (ļ	0.5	(91)
Maara la terr	l tower seed			ا- مام	II:\ ′	1 A	. /4	41 A) . TO		`			 ` ′
Mean interna (92)m= 19.58	· ·	`				i	Ť		00.40	1 10 00	10.50	1	(02)
134111= 1 19.08							100						
Apply adjustr		0.18 mean	20.43	20.54	20.58	20.59	20.		20.42		19.53]	(92)

												•	
(93)m= 19.58	19.87	20.18	20.43	20.54	20.58	20.59	20.59	20.57	20.42	19.99	19.53		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l				<u> </u>								
(94)m= 0.94	0.9	0.82	0.69	0.54	0.38	0.26	0.29	0.47	0.73	0.9	0.95		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m								•	
(95)m= 423.35	482.65	500.76	463.26	375.66	255.76	171.39	179.24	275.91	384.24	408.09	402.4		(95)
Monthly avera			i 			ī	·				i	ı	
(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	·	i	· ·		i	=[(39)m : 171.63	· · ·	<u> </u>		569.04	004.54	1	(07)
(97)m= 689.14 Space heatin	673.12	612.61	507.26	387.6	257.47		179.6	280.53	430.55		681.54		(97)
(98)m= 197.75	127.99	83.22	31.68	8.88	0	0.02	0	0	34.46	115.88	207.69		
(66)=	127.00	00.22	01.00	0.00				l per year			<u> </u>	807.54	(98)
Space heatin	a roquir	omont in	. le\A/b/m2	2/voor			7010	i poi youi	(mm) you) = Ga m(G	O)15,912 —		=
Space heatin	• .											16.49	(99)
9b. Energy red			· ·	Ĭ						., ,			
This part is use Fraction of spa										unity scr	neme.	0	(301)
													(302)
·			•	•	,	•	- 11	0110 1	((- (b b)		1	(302)
The community so includes boilers, h									up to tour	otner neat	sources; ti	ne latter	
Fraction of hea		-			•							1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting syst	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for (commun	ity heatii	ng syste	m					1.05	(306)
Space heating	a											kWh/yea	- r
Annual space	_	requiren	nent									807.54	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	847.92	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	1												
Annual water h		equirem	ent									1809.07	
If DHW from c													<u> </u>
Water heat fro		•)				(64) x (30	03a) x (30	5) x (306) :	=	1899.52	(310a)
Electricity used							0.01	× [(307a).	(307e) +	(310a)((310e)] =	27.47	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											i		7(005.)
mechanical ve	ntilation	- baland	cea, extra	act or po	sitive in	put from	outside					104.15	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	104.15	(331)
Energy for lighting (calculated in Appendix L)			227.56	(332)
Electricity generated by PVs (Appendix M) (negative quantity	y)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	312) + (315) + (331) + (33	32)(237b) =	2970.34	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)	IP) using two fuels repeat (363) to	(366) for the second fu	el 280	(367a)
CO2 associated with heat source 1 [(30	7b)+(310b)] x 100 ÷ (367b) x	0.52	509.26	(367)
Electrical energy for heat distribution	[(313) x	0.52	14.26	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	523.52	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instant	taneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		523.52	(376)
CO2 associated with electricity for pumps and fans within dv	velling (331)) x	0.52	= 54.06	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= 118.1	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	plicable	0.52 x 0.01 =	-56.48] (380)
Total CO2, kg/year sum of (376)(382) =			639.2	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			13.06	(384)

El rating (section 14)

(385)

90.88

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:59

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 26.29 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.28 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

42.5 kWh/m²

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 - Heat pump

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	OK
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 electric heat pump		
Photovoltaic array		

		l lser-l	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50	
Address :	· ·	Property	Address	: 03 - 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	10 =	0	(6a)
Number of open flues	0 + 0	+ [0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				0	x 1	10 =	0	(7a)
Number of passive vents	3			Ē	0	x 1	10 =	0	(7b)
Number of flueless gas fi	ires			F	0	x 4	10 =	0	(7c)
				L					
							Air ch	anges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				0		÷ (5) =	0	(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	ine arraining (ine)					[(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)
if both types of wall are p deducting areas of openi	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	,	`	,,					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)					0	(16)
•	q50, expressed in cubic metro		•	•	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$ es if a pressurisation test has been do				is boing u	sod		0.15	(18)
Number of sides sheltere		ne or a de	gree an pe	ппеаышу	is being u	seu		0	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			1	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18) x (20) =				0.15	(21)
Infiltration rate modified f	for monthly wind speed								<u> </u>
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								
<u> </u>	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
								ı	

djusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
<i>alculate effe</i> If mechanic		•	rate for t	he appli	cable ca	se	-		-				—
If exhaust air h			endix N (2	3h) = (23a	a) × Fmv (e	equation (N	NS)) other	wise (23h) = (23a)			0.5	=
If balanced with		0		, ,	,	. `	,, .	`) = (20a)			0.5	=
		-	•	_					2h\ma . /	00h) [4 (22-)	75.65	(2
a) If balance 4a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	230) × [0.29	0.3	÷ 100]]	(2
,	<u> </u>	<u> </u>			<u> </u>		<u> </u>				0.3	İ	(2
b) If balance	ea mech	anicai ve	entilation 0	without	neat red	overy (i	0 (24b	0 = (22)	2b)m + (. 0	23b) ₀	0	1	(2
	<u> </u>	<u> </u>							0	0	0		(2
c) If whole h			then (24	•	•				.5 × (23b	o)		_	
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r			ole hous m = (22		•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				I	
5)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(:
									1	1		ı	
3. Heat losse LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		X k /K
indows Type		` ,			9.56	x1.	/[1/(1.4)+	0.04] =	12.67	<u></u>			(
indows Type	2				3.98	x ₁ ,	/[1/(1.4)+	0.04] =	5.28	一			(
/alls Type1	40.0	14	13.54	1	26.5	x	0.18		4.77	=	60	1590) (:
alls Type2	12.1		0		12.16	=	0.17	-	2.04	북 ¦	60	729.6	=
otal area of e					52.2	' ^	0.17		2.04	[729.0	`\ (
arty wall	, ioi i ioi i io	,				=							`
-					27.88		0	= [0		45	1254.6	=
arty floor					53.46	_				Ĺ	70	3742.2	=
arty ceiling					53.46					Į	30	1603.8	3(
ternal wall **					102.0					Ĺ	9	918.27	7(
or windows and include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	1 3.2	
bric heat lo				o ana pan			(26)(30)	+ (32) =				24.76	
eat capacity		•	-,					((28)	(30) + (32	2) + (32a).	(32e) =	9838.47	\exists
nermal mass		,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			** *	÷ (4) =	, (,	(= = 7	184.03	\exists
r design asses n be used inste	sments wh	ere the de	tails of the	•			ecisely the	` '		TMP in Ta	able 1f	104.03	
ermal bridg				usina An	pendix k	<						6.09	
details of therma					-							0.00	`
otal fabric he			, ,	·	,			(33) +	(36) =			30.85	
entilation hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
3)m= 14.63	14.46	14.28	13.41	13.23	12.35	12.35	12.18	12.7	13.23	13.58	13.93		(
eat transfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
		-											
9)m= 45.49	45.31	45.14	44.26	44.08	43.21	43.21	43.03	43.56	44.08	44.43	44.78		

Author	Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(40)m= 0.85	0.85	0.84	0.83	0.82	0.81	0.81	0.8	0.81	0.82	0.83	0.84		
A.		!	!							Average =	Sum(40) ₁	12 /12=	0.83	(40)
4. Water heating energy requirement. **RWh/year:** Assumed occupancy, N if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA a 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) Annual average not value use transported by for each month Vd,m = factor from Table 2 to x (43) (44)me 84.44 81.37 78.3 75.23 72.16 89.09 89.09 72.16 75.23 78.3 81.37 84.44 Energy content of not water used - calculated monthly = 4.190 x Vd,m x nm x DTm /3000 kWh/hooth (sea Tables 18, 1c, 1d) (45)me 125.22 199.62 113.01 98.53 94.54 81.58 75.6 86.75 87.78 102.3 111.67 121.27 Total = Sum(45), x = 1 121.27 Total = Sum(45), x = 1 121.27 If it it is a 1.75 18.18		<u> </u>							-			T _ 1		
### 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 ### Annual average had water usage in litres per day Vd.average = (25 x N) + 36 ### Reduce the annual varage had value 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, hor and cold) ### Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (44) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (44) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 1c x (43) ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water storage loss: ### Hot water usage in litres per day for each month Vol.m = factor from Table 2b ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calculated for each month ### Hot water storage loss calc		-	_	<u> </u>	– –		-	Ť		-	 	\vdash		
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 E 13.9, N = 1	(41)m= 31	28	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 E 13.9, N = 1														
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 in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd, average a contained to a chieve a water use target or not more that 125 litres per persons per day (if water us, hot and colors) Jan	4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		79		(42)
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (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 = Sum(44), vo = 921.15 (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) (46)m = 125.22 109.52 113.01 88.63 94.54 81.58 75.6 86.75 87.78 102.3 111.67 121.27 Total = Sum(45), vo = 120.778 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)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 (46)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 (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): Chemisse if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2b Energy lost from water storage, kWh/year (48) x (49) = 110 (50) (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51) If community heating see section 4.3 Volume factor from Table 2b (52) 1.03 (52) Temperature factor from Table 2b (53) 1.03 (52) Temperature factor from Table 2b (54) 1.03 (52) Temperature factor from Table 2b (55) (41)m (56)m = (55) x (41)m (56)m = (32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 10.99 32.01 30.98 32.01	Annual averag	ge hot wa al average	hot water	usage by	5% if the α	lwelling is	designed i	` ,		se target o		5.76		(43)
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(45)me	` '		l .				l .	<u> </u>		I Total = Su	ım(44) ₁₁₂ =	=	921.15	(44)
Total = Sum(45) 1	Energy content of	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
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Storage volume (litres) including any solar or WWHRS storage within same vessel	` '		16.95	14.78	14.18	12.24	11.34	13.01	13.17	15.35	16.75	18.19		(46)
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Temperature factor from Table 2b	Water storage	loss:		`					,		,			
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Volume factor from Table 2a		•			e Z (KVV	n/litre/da	ly)				0.	.02		(51)
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Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (58) Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	•		_	,							-			
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 $(57)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (57)$ Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
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 $(57)m = 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 (57)$ Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$ (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
Primary circuit loss (annual) from Table 3 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 thermostat)	` '												хН	. ,
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 thermostat)	(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
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 thermostat)		loca (ar	nual\ fra	m Toble	. 2		ı	ı		ı		<u> </u>		(58)
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	•	,	,			59)m = 4	(58) ± 36	35 × (41)	ım			·		(50)
	-				,	•	` '	, ,		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 (61) m = (61) m													
(61)m= 0	0	0	0	0	0	0	0	0	0	То	0	1	(61)
	 auired for	water h	eating ca	L	L I for eac	h month	(62)n	n = 0.85 x	 (45)m +	(46)m +	(57)m +	ו - (59)m + (61)m	
(62)m= 180.5	-	168.29	152.02	149.82	135.07		142.0		157.58	165.17	176.55]	(62)
Solar DHW inpu	it calculated	using App	endix G oı	· Appendix	H (nega	tive quantity	y) (ente	r '0' if no sola	ar contribu	tion to wate	r heating)) T	
(add addition											•		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from	water hea	ter				•	•	•	•	•	•	•	
(64)m= 180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.0	2 141.28	157.58	165.17	176.55]	
				•	•	•		Output from w	ater heate	er (annual)	l12	1858.62	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	ı]	
(65)m= 85.86	76.36	81.8	75.56	75.66	69.92	69.36	73.0	7 71.98	78.24	79.93	84.54]	(65)
include (57	7)m in calc	culation	of (65)m	only if c	ylinder	is in the	dwelli	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):									
Metabolic gains (Table 5), Watts													
Jan		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.6	1 89.61	89.61	89.61	89.61]	(66)
Lighting gain	s (calculat	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	ılso se	e Table 5				-	
(67)m= 13.93	12.37	10.06	7.62	5.69	4.81	5.19	6.75	9.06	11.5	13.43	14.31]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	lso see Ta	ble 5		-	-	
(68)m= 156.2°	1 157.83	153.74	145.05	134.07	123.75	116.86	115.2	24 119.33	128.02	139	149.32]	(68)
Cooking gain	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	e 5		-	_	
(69)m= 31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.9	6 31.96	31.96	31.96	31.96]	(69)
Pumps and fa	ans gains	(Table 5	āa)										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. e	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -71.68	3 -71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.6	8 -71.68	-71.68	-71.68	-71.68]	(71)
Water heatin	g gains (T	able 5)										_	
(72)m= 115.4	113.63	109.94	104.94	101.69	97.11	93.22	98.2	1 99.98	105.16	111.01	113.63]	(72)
Total interna	al gains =				(66	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 335.42	2 333.71	323.63	307.48	291.33	275.55	265.16	270.0	08 278.24	294.57	313.32	327.14]	(73)
6. Solar gai													
Solar gains are		ŭ					ations to		ne applica		tion.		
Orientation:	Access F Table 6d	actor	Area m²			ux able 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Couthwoots							1 -					. ,	7,
Southweston		X	9.5		-	36.79] <u> </u>	0.63	×	0.7	=	107.5	[(79)
Southwesters	<u> </u>	X	9.5			62.67	ļ ļ	0.63	×	0.7	=	183.11	<u></u> (79)
Southwesto o	<u> </u>	X	9.5			85.75]	0.63	×	0.7	=	250.54	」 (79)
Southweston		X	9.5	_		106.25] <u> </u>	0.63	×	0.7	=	310.43	」 (79)
Southwest _{0.9x}	0.77	X	9.5	56	X	119.01	J L	0.63	Х	0.7	=	347.71	(79)

								_		_				
Southwest _{0.9x}	0.77	X	9.5	66	X	1	18.15	_	0.63	X	0.7	=	345.19	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	1	13.91]	0.63	X	0.7	=	332.8	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	1	04.39		0.63	X	0.7	=	304.99	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	9	92.85]	0.63	Х	0.7	=	271.28	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	6	9.27]	0.63	X	0.7	=	202.38	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	4	14.07]	0.63	X	0.7	=	128.76	(79)
Southwest _{0.9x}	0.77	X	9.5	56	X	3	31.49]	0.63	X	0.7	=	92	(79)
Northwest 0.9x	0.77	X	3.9	8	X	1	1.28	X	0.63	х	0.7	=	13.72	(81)
Northwest 0.9x	0.77	X	3.9	8	X	2	22.97	X	0.63	х	0.7	=	27.94	(81)
Northwest 0.9x	0.77	X	3.9	8	X	4	11.38	X	0.63	х	0.7	=	50.33	(81)
Northwest 0.9x	0.77	X	3.9	98	X	ε	67.96	X	0.63	х	0.7	=	82.66	(81)
Northwest 0.9x	0.77	X	3.9	98	X	9	91.35	X	0.63	х	0.7	=	111.11	(81)
Northwest 0.9x	0.77	X	3.9	8	x	9	97.38	X	0.63	x	0.7	=	118.45	(81)
Northwest 0.9x	0.77	X	3.9	98	x		91.1	X	0.63	x	0.7	=	110.81	(81)
Northwest 0.9x	0.77	X	3.9	8	x	7	72.63	X	0.63	x	0.7		88.34	(81)
Northwest _{0.9x}	0.77	X	3.9	8	X	5	50.42	x	0.63	x	0.7	=	61.33	(81)
Northwest _{0.9x}	0.77	X	3.9	98	X	2	28.07	x	0.63	x	0.7		34.14	(81)
Northwest 0.9x	0.77	X	3.9	98	x		14.2	X	0.63	x	0.7	=	17.27	(81)
Northwest _{0.9x}	0.77	X	3.9	8	X		9.21	x	0.63	x	0.7	=	11.21	(81)
Solar gains in							1	Ϋ́	n = Sum(74)m				1	(00)
(83)m= 121.22	211.05	300.87	393.09	458.82		63.65	443.61	393	.33 332.61	236.5	2 146.03	103.2]	(83)
Total gains – i					`			1 000	44 040.05	T 504.0	0 450 04	100.05	1	(0.4)
(84)m= 456.64	544.75	624.5	700.57	750.15	<u>L</u>	'39.2	708.77	663	.41 610.85	531.0	8 459.34	430.35	J	(84)
7. Mean inte	rnal tempe	erature	(heating	seasor	า)									_
Temperature	during he	eating p	eriods ir	the liv	ing	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisation fac	 				n (s	ee Ta	ible 9a)						1	
Jan	Feb	Mar	Apr	May	_	Jun	Jul	 	ug Sep	Oc	+	Dec	_	
(86)m= 0.97	0.93	0.85	0.71	0.54		0.37	0.27	0.	3 0.49	0.77	0.93	0.97]	(86)
Mean interna	al tempera	ture in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)				-	
(87)m= 20.24	20.47	20.71	20.91	20.98		21	21	2	1 20.99	20.88	20.55	20.2		(87)
Temperature	during he	eating p	eriods ir	rest of	dw	elling	from Ta	able 9	9, Th2 (°C)					
(88)m= 20.21	20.21	20.22	20.23	20.23	2	20.25	20.25	20.	25 20.24	20.23	3 20.23	20.22		(88)
Utilisation fac	ctor for ga	ins for r	est of d	welling,	h2	,m (se	ee Table	9a)						
(89)m= 0.96	0.92	0.83	0.67	0.49		0.33	0.22	0.2	25 0.43	0.73	0.92	0.97		(89)
Mean interna	al tempera	ature in t	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7 in Tab	ole 9c)			_	
(90)m= 19.21	19.53	19.86	20.13	20.21	Ť	20.24	20.25	20.	T T	20.1	19.66	19.17]	(90)
					-				<u>'</u>	fLA = Li	ving area ÷ (4) =	0.45	(91)
Mean interna	al temnera	nture (fo	r the wh	റില പ്യം	ماالد	a) – f	I Δ ∨ Τ1	+ (1	_ fl Δ\ ∨ Τα)				
(92)m= 19.68	19.95	20.25	20.48	20.56	$\overline{}$	9) – 1 20.58	20.59	20.	- 1	20.46	20.06	19.63	1	(92)
Apply adjusti								l					J	. ,
117 22,000		··		F				-,						

(93)m= 19.68	19.95	20.25	20.48	20.56	20.58	20.59	20.59	20.57	20.46	20.06	19.63		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	I	l					[· · · · · · · · · · · · · · · · · · ·						
(94)m= 0.96	0.91	0.83	0.68	0.51	0.35	0.24	0.27	0.46	0.74	0.91	0.96		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 436.32	496.94	519.33	479.81	383.83	257.86	172.14	180.05	279.24	394.63	420.13	414.76		(95)
Monthly aver		T T	·	r	r e	ī				ī			
(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	1	1			i	-``	- ` 	``		F7F 0F	C04.04		(07)
(97)m= 699.49	682.13	620.42	512.39	390.52	258.56	172.22	180.19	282.03	434.44	575.85	691.24		(97)
Space heatin (98)m= 195.8	124.45	75.21	23.46	4.97	0	0.02	0	0 0	29.62	112.12	205.7		
(55)1112 156.5	124.40	10.21	20.40	4.07				l per year		<u> </u>	└──┤	771.33	(98)
Casas bootin	a roquir	omant in	L(\A/b/m2	2/voor			rota	ii poi youi	(IKVVIII) year) = Gam(o	O)15,912 —		=
Space heatin	•											14.43	(99)
9b. Energy red			The state of the s	Ĭ									
This part is use Fraction of spa					•		• .	•		unity scr	neme.	0	(301)
Fraction of spa			•		-	_		, -			[[1	(302)
·			•	•	,	,	allows for	CUD and	un to form	other boot			(302)
The community so includes boilers, h		-							ир то тоиг с	otner neat	sources, ir	ie ialler	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for conf	trol and	charging	method	(Table	4c(3)) fo	r commi	unity hea	ting sys	tem		Ì	1	(305)
Distribution los	ss factor	(Table 1	12c) for c	commun	ity heatii	ng syste	m				[1.05	(306)
Space heating		`	,		,	5 ,					L	kWh/yea	
Annual space	-	requiren	nent								[771.33	<u>'</u>
Space heat fro	•	•		р				(98) x (30)4a) x (30	5) x (306) :	_ _ [809.9	(307a)
Efficiency of se	econdar	v/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)	[0	(308
Space heating			•	_	•	,			· · 01) x 100 -	,		0	(309)
	•			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		, ,					L		
Water heating Annual water h		requirem	ent								ſ	1858.62	
If DHW from c	_	-									L	1000.02	
Water heat fro)				(64) x (30	03a) x (30	5) x (306) :	= [1951.55	(310a)
Electricity use	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	27.61	(313)
Cooling System	m Energ	y Efficie	ncy Ratio	0							Ì	0	(314)
Cooling System	=9										L		
Space cooling	_	-	•	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Space cooling	(if there	is a fixe	d cooling	•		,		= (107) ÷	(314) =			0	(315)
	if there) oumps a	is a fixe	ed cooling	velling (T	Γable 4f)	:	outside	= (107) ÷	(314) =]	113.73	(315) (330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		113.73	(331)
Energy for lighting (calculated in Appendix L)				245.94	(332)
Electricity generated by PVs (Appendix M) (negative quantity	<i>'</i>)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3012.29	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second	fuel	280	(367a)
CO2 associated with heat source 1 [(307	'b)+(310b)] x 100 ÷ (367b) x	0.52	=	511.85	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	14.33	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	526.18	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			526.18	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	=	59.02	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	127.64	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	olicable	0.52 × 0.01	=	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				656.38	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				12.28	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:43:52*

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: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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 27.06 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

12.86 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 - Heat pump

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 electric heat pump		
Photovoltaic array		

		User_[Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					0010943 on: 1.0.5.50	
		Property	Address	: 03 - C					
Address: 1. Overall dwelling dime	oneione:								
1. Overall dwelling diffle	511510115.	Are	a(m²)		Av. He	ight(m)		Volume(m³	·)
Ground floor				(1a) x		2.65	(2a) =	192.44	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) -	72.62] [(4)			J		
Dwelling volume	-, (-, (-, (-, (-, (-, (-, (-, (′	2.02	J)+(3c)+(3c	d)+(3e)+	(3n) =	102.44	(5)
				(00) (00	, . (oo) . (oo	2) ((00)	(0)	192.44	(5)
2. Ventilation rate:	main seconda	ary	other		total			m³ per hou	r
Number of chimneys	heating heating	_ +	0	7 = F	0	x	40 =	0	(6a)
Number of open flues		-		」			20 =		╡` `
·			0	J [⁻] L	0			0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents					0		10 =	0	(7b)
Number of flueless gas fi	ires				0	X	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+	(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended, proce			continue fi	-		÷ (5) =	0	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	2.25 for steel or timber frame of			•	ruction			0	(11)
deducting areas of openi	resent, use the value corresponding ngs); if equal user 0.35	io ine grea	ter wan are	a (aner					
If suspended wooden to	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
-	s and doors draught stripped		0.25 [0.2) v (4.4) · 4	1001 -			0	(14)
Window infiltration Infiltration rate			0.25 - [0.2] (8) + (10)			+ (15) =		0	(15)
	q50, expressed in cubic metr	es per h	, , , ,	, , , ,	, , ,		area	3	(17)
•	lity value, then $(18) = [(17) \div 20] +$	•	•	•			- u. u	0.15	(18)
Air permeability value applie	es if a pressurisation test has been d	one or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere	ed		(20) = 1 -	[0.07E v./	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) =				0.15	(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		1 000	1101	1 200	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	<u> </u>	1	1	1	J	
Wind Factor $(22a)m = (2a)m =$		1 -	1 -	ı	Ι.	1.	Ι.	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	elter an	d wind s	peed) =	(21a) x	(22a)m	_	_			
0.19 Calculate effe	0.19	0.18	0.16	0.16 he appli	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		•	ale for t	пе арри	cable ca	30						0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				74.8	(23)
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	_
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(24
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		(24
c) If whole h if (22b)r		tract ver (23b), t		-					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]			1	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		•		•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		
Windows Type		(111)		l	12.71				16.85		NO/III I	(10)	(27
Windows Type					3.46	_	/[1/(1.4)+	Ļ	4.59	\dashv			(27
Walls Type1	72.6	2	16.1	7	56.45	=	0.18	= [10.16	╡┌	60	3387	(29)
Walls Type1	17.7		0			=			2.99	륵 ¦		1066.8	= '
Total area of e					17.78	3 ×	0.17	[2.99		60		(31)
Party wall	, ioi i ioi i io	,			90.4						AF	1264.4	`
Party floor					30.32	=	0	[0	L	45	1364.4	=
Party ceiling					72.62	=				L	40	2904.8	=
Internal wall **					72.62	=				Ĺ	30	2178.6	= `
internal wall * for windows and		014/0 1100 0	effootivo wi	ndow II v	146.1		formula 1	/[/1/ L.volu	(0) (0 (04) (l So givon in	9 norograph	1315.53	3 (32
** include the area						ateu using	i ioiiiiuia i	/[(1/ O- valu	1 0)+0.04] a	is giveri iii	i parayrapri	1 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				34.58	(33
Heat capacity	Cm = S	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	12217.13	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			168.23	(35)
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		_
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						7.11	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(22)	(20)				¬,
Total fabric he		alouloto -	l manthi	,					(36) =	(25)m + (F)	\	41.69	(37
Ventilation hea	Feb				lun	Jul	۸۰۰۰		= 0.33 × (l	1	1	
(38)m= 20.15	19.91	Mar 19.67	Apr 18.48	May 18.24	Jun 17.05	Jui 17.05	Aug 16.81	Sep 17.53	Oct 18.24	Nov 18.72	Dec 19.19		(38
(VV) - LULIO	1 .5.91	10.07	10.40	10.24	17.00	. 7.00	10.01	17.00	10.24	10.72	13.13	1	,50
								/ 	(6-)	0.01			
Heat transfer (39)m= 61.84	coefficier	nt, W/K 61.36	60.17	59.93	58.74	58.74	58.51	(39)m 59.22	= (37) + (38)m 60.41	60.89	1	

eat loss pa	rameter (HLP), W	m²K			1	1	(40)m	= (39)m ÷	· (4)			
0.85 O.85	0.85	0.84	0.83	0.83	0.81	0.81	0.81	0.82	0.83	0.83	0.84		_
umber of d	ave in mo	onth (Tah	le 1a)						Average =	Sum(40) ₁	12 /12=	0.83	(4
Jar	<u> </u>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
<u> </u>													
. Water he	ating ene	rgy requi	irement:								kWh/yea	ar:	
sumed oc	cupancy	N									04		()
if TFA > 1	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (TFA -13		31		(4
if TFA £ 13 inual aver	•	ator usar	na in litra	s nar da	v Vd av	orano –	(25 v NI)	± 36			.00		(4
duce the anı	nual average	hot water	usage by	5% if the a	welling is	designed t			se target o		0.02		(-
t more that 1.	25 litres per	person per	day (all w	ater use, l	not and co	ld)			,				
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usag						1	· <i>'</i>			•			
)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		— ,
ergy content	of hot water	r used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D)Tm / 3600			m(44) ₁₁₂		1068.18	(4
)m= 145.2		131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63		
,	. 1	101.00	111.20	100.00	0 1.0	07.00	100.00		<u> </u>	m(45) ₁₁₂ =	<u> </u>	1400.56	(4
nstantaneous	s water heat	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(10)112	L		`
)m= 21.78	19.05	19.66	17.14	16.44	14.19	13.15	15.09	15.27	17.8	19.42	21.09		(4
ater storaç													
orage volu	•	•	•			_		ame ves	sel		0		(4
community herwise if	•			-			' '	ora) ant	or 'O' in <i>(</i>	17 \			
ater storaç		not wate	וו פוווט) ול	iciuues i	IIStaiitai	ieous co	ווטט וטוווי	ers) erik	ei U iii (47)			
If manufa		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(4
mperature	factor fro	om Table	2b								0		(4
ergy lost f	rom wate	r storage	, kWh/ye	ear			(48) x (49)) =		1	10		(5
If manufa			-										
ot water st	•			e 2 (kW	h/litre/da	ıy)				0.	02		(5
community Jume facto	_		011 4.3							1	03		(!
mperature			2b								.6		(!
ergy lost f	rom wate	r storage	. kWh/ve	ear			(47) x (51)) x (52) x ((53) =		.03		(!
nter (50) o		_	,								.03		(5
ater storaç	ge loss ca	lculated t	for each	month			((56)m = ((55) × (41)	m				
)m= 32.0°	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
ylinder conta		ed 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	Н	
7)m= 32.0°	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
mary circ	uit loss (a	nnual) fro	m Table	. 3				•	•		0		(!
mary circ	•	•			59)m = ((58) ÷ 36	65 × (41)	ım					,
modified				,		. ,	, ,		r thermo	stat)			

Combi loss calculate	d for each	month (′61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0 0	0	0	0	0	0	0		0	0	0	0	1	(61)
Total heat required for	r water he	eating ca	L	L I for eac	h month	(62)r	—— n =	0.85 × (45)m +	. (46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 200.48 176.93		167.75	164.91	148.1	142.94	155.	_	155.29	173.91	182.99	195.9]	(62)
Solar DHW input calculate	d using App	endix G oı	· Appendix	: H (negati	ve quantity	/) (ente	er '0'	if no sola	r contribu	tion to wate	er heating)		
(add additional lines											-		
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water he	ater				•	•				•	•	•	
(64)m= 200.48 176.93	186.33	167.75	164.91	148.1	142.94	155.	.87	155.29	173.91	182.99	195.9	1	
			•	•	•		Outp	ut from wa	ater heate	er (annual)	112	2051.4	(64)
Heat gains from water	r heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	ı] + 0.8 x	(46)m	n + (57)m	+ (59)m	١]	
(65)m= 92.5 82.17	87.8	80.78	80.67	74.25	73.37	77.6	67	76.64	83.67	85.85	90.98]	(65)
include (57)m in ca	lculation	of (65)m	only if c	ylinder i	s in the	dwelli	ing (or hot w	ater is f	from com	munity h	neating	
5. Internal gains (se	e Table 5	and 5a):										
Metabolic gains (Tab	le 5), Wat	ts											
Jan Feb		Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 115.4 115.4	115.4	115.4	115.4	115.4	115.4	115	.4	115.4	115.4	115.4	115.4	1	(66)
Lighting gains (calcul	ated in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5			-	-	
(67)m= 18.13 16.1	13.09	9.91	7.41	6.26	6.76	8.7	9	11.79	14.97	17.48	18.63]	(67)
Appliances gains (ca	culated in	Append	dix L, eq	uation L	13 or L1	3a), a	also	see Tal	ole 5	-	•	•	
(68)m= 203.33 205.44	200.13	188.81	174.52	161.09	152.12	150.	.01	155.32	166.64	180.93	194.36]	(68)
Cooking gains (calcu	ated in A	opendix	L, equat	ion L15	or L15a), also	o se	e Table	5	•	•	•	
(69)m= 34.54 34.54	34.54	34.54	34.54	34.54	34.54	34.5	54	34.54	34.54	34.54	34.54]	(69)
Pumps and fans gair	s (Table 5	āa)			•	•	•			•	•	•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evaporat	ion (negat	ive valu	es) (Tab	le 5)	-					-	-	-	
(71)m= -92.32 -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 gains	Table 5)				•		•			•		•	
(72)m= 124.33 122.28	118.01	112.2	108.43	103.13	98.61	104.	.39	106.45	112.46	119.24	122.28]	(72)
Total internal gains	=			(66))m + (67)m	ı + (68)m +	- (69)m + (70)m + (71)m + (72))m	•	
(73)m= 403.41 401.44	388.85	368.54	347.98	328.09	315.11	320.	.81	331.19	351.69	375.27	392.9]	(73)
6. Solar gains:													
Solar gains are calculate	•	r flux from	Table 6a		•	itions t	0 CO	nvert to th	e applica		tion.		
Orientation: Access Table 6		Area m²		Flu	ıx ble 6a		т.	g_ able 6b	-	FF Table 6c		Gains (W)	
						1 1	1 (_ '				1
Northeast 0.9x 0.7	7 ×	12.	71	X	11.28	X		0.63	_ ×	0.7	=	43.83	(75)
Northeast 0.9x 0.7		12.			22.97	X		0.63	x	0.7	=	89.21	(75)
Northeast 0.9x 0.7		12.		-	41.38	X		0.63	x	0.7	=	160.73	(75)
Northeast 0.9x 0.7		12.	71	-	67.96	X		0.63	x [0.7	=	263.96	(75)
Northeast 0.9x 0.7	7 ×	12.	71	x (91.35	x		0.63	X	0.7	=	354.82	(75)

Nawth a a a 4		_			_		٦ .		_			Γ	– ,,
Northeast _{0.9x}	0.77	×	12.	71	× L	97.38	X	0.63	X	0.7	=	378.27	(75)
Northeast _{0.9x}	0.77	X	12.	71	× L	91.1	X	0.63	X	0.7	=	353.87	(75)
Northeast _{0.9x}	0.77	X	12.	71	× L	72.63	X	0.63	X	0.7	=	282.11	(75)
Northeast _{0.9x}	0.77	X	12.	71	x _	50.42	×	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	×	0.63	X	0.7	=	35.79	(75)
Northwest _{0.9x}	0.77	X	3.4	ŀ6	x	11.28	x	0.63	X	0.7	=	11.93	(81)
Northwest _{0.9x}	0.77	X	3.4	ŀ6	x	22.97	x	0.63	X	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.4	ŀ6	x	41.38	x	0.63	X	0.7	=	43.75	(81)
Northwest _{0.9x}	0.77	х	3.4	16	x	67.96	x	0.63	x	0.7	=	71.86	(81)
Northwest _{0.9x}	0.77	x	3.4	16	х	91.35	×	0.63	x	0.7		96.59	(81)
Northwest _{0.9x}	0.77	x	3.4	ŀ6	x	97.38	Īx	0.63	×	0.7	<u> </u>	102.98	(81)
Northwest _{0.9x}	0.77	x	3.4	ŀ6	х	91.1	Ī×	0.63	x	0.7	=	96.33	(81)
Northwest _{0.9x}	0.77	x	3.4	16	x $$	72.63	T x	0.63	x	0.7		76.8	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x Γ	50.42	Ī×	0.63	×	0.7		53.32	(81)
Northwest 0.9x	0.77	×	3.4	16	х	28.07	i x	0.63	×	0.7	=	29.68	(81)
Northwest 0.9x	0.77	×	3.4	ŀ6	х	14.2	X	0.63	×	0.7	=	15.01	(81)
Northwest 0.9x	0.77	×	3.4	16	x F	9.21	i x	0.63	×	0.7		9.74	(81)
							_						
Solar gains in	watts. calcu	ulated	for eacl	h month	1		(83)m	n = Sum(74)m .	(82)m				
(83)m= 55.76		04.48	335.82	451.41	481	.25 450.2	358		138.7	70.16	45.53		(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m	+ (83)m , watts	-	· ·		!	ļ.	ı	
(84)m= 459.17	514.94 59	93.33	704.36	799.39	809	.34 765.31	679	.71 580.35	490.4	445.43	438.43		(84)
7. Mean inter	nal temper	ature (heating	seasor	1)	-		•					
Temperature					<i>'</i>	ea from Ta	ble 9.	, Th1 (°C)				21	(85)
Utilisation fac	•	•			-		•	, , ,					`
Jan	 -	Mar	Apr	May	Ť	ın Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	 	0.94	0.84	0.65	0.4	_	0.3		0.91	0.98	0.99		(86)
Mean interna	l tomporati	ıre in li	ivina ar	 22 T1 /f	ماامس	etone 3 to	7 in T	able 9c)			<u>l</u>		
(87)m= 19.91		20.38	20.74	20.93	20.	i	2		20.66	20.23	19.89		(87)
` ′	<u> </u>							I			10.00		, ,
Temperature					_	_ `	1	 	20.00	1 20 22	00.00	1	(88)
(88)m= 20.21	20.21 2	20.21	20.23	20.23	20.	25 20.25	20.	25 20.24	20.23	20.23	20.22		(00)
Utilisation fac		- 1			h2,m	(see Table	9a)				1	1	
(89)m= 0.98	0.97	0.93	0.81	0.61	0.4	1 0.28	0.3	33 0.6	0.89	0.97	0.99		(89)
Mean interna	l temperatu	ıre in t	he rest	of dwell	ing T	2 (follow sto	eps 3	to 7 in Tabl	e 9c)			-	
(90)m= 18.74	18.99 1	9.42	19.93	20.17	20.	24 20.24	20.	25 20.2	19.84	19.23	18.72		(90)
								1	LA = Liv	ving area ÷ (4) =	0.38	(91)
													_
Mean interna	l temperatu	ıre (for	the wh	ole dwe	elling)	= fLA × T1	+ (1	– fLA) × T2					
Mean interna (92)m= 19.19		ıre (foi	the wh	ole dwe	elling)		+ (1	- '	20.15	19.61	19.17		(92)
	19.41 1	9.79	20.24	20.46	20.	53 20.53	20.	54 20.49			19.17		(92)

Same 18-18 19-41 19-79 20-24 20-46 20-53 20-53 20-54 20-46 20-15 19-61 19-77 (93)							•							
Set 11 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			L		20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17		(93)
the utilisation Factor for gains using Table 9a	•													
Same Teb Mar Apr May Jun Jul Aug Sep Oct Nov Dec				•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)ms 0.98 0.97 0.93 0.81 0.62 0.43 0.3 0.35 0.62 0.88 0.96 0.98														
Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (84)m Useful gains, hmGm, W = (94)m x (95)m Useful gains, hmGm, W = (94)m x (95)m Useful gains, hmGm, W = (94)m x (95)m Useful gains, hmGm, W = (94)m x (95)m Useful gains, hmGm, W = (94)m x (95)m Useful gains, hmGm, W = (95)m Useful gains, hmGm, hm			l	<u> </u>				7.0.9	Oop					
(95) (449.99 497.58 549.78 572.64 488.55 344.88 230.65 240.9 360.02 433.61 429.81 431.1 (95)	(94)m= 0.98	0.97	0.93	0.81	0.62	0.43	0.3	0.35	0.62	0.88	0.96	0.98		(94)
Monthly average external temperature from Table 8 (86)m	Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (97) (98) (98) (98) (98) (98) (98) (98) (97) (98)	(95)m= 449.99	497.58	549.78	572.64	498.55	344.88	230.65	240.9	360.02	433.61	429.81	431.1		(95)
Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	Monthly avera	age exte	rnal tem	perature	from Ta	able 8								
Space heating requirement for each month, kWh/month = 0.024 x [(97) m - (95)m] x (41) m (98)m Space heating requirement for each month, kWh/month = 0.024 x [(97) m - (95)m] x (41) m (98)m Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirements — Community heating scheme Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from several sources. The procedure allows for CHP and up to four other heat sources: the latter includes boliers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of total space heat from Community heat pump Space heat from community heat pump Space heat from community heat pump Space heat from secondary/supplementary heating system Space heating requirement											7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 350.35 266.26 197.66 78.97 19.77 0 0 0 0 103.45 234.84 357.33 (98) (98)						i	-``	· · ·	<u> </u>					
Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirement in kWh/m²/year Space heating requirements Space heating space heating space heating space heating frable 11) '0' if none Space heat from secondary/supplementary heating (Table 11) '0' if none Space heat from community system Space heating (Table 11) '0' if none Space heat from community system Space heating (Table 11) '0' if none Space heating heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	` '						<u> </u>	l				911.39		(97)
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Electricity for pumps and fans within dwelling (Table 4f):		_	•	•					(407)	(04.4)		Ĺ		Ⅎ
	,	,					,		= (107) ÷	(314) =			0	(315)
(350a)								Outeido				Г	177 40	(3302)
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		_
warm air heating system fans	0	(330b)
pump for solar water heating	0	(330g)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) =	177.49	(331)
Energy for lighting (calculated in Appendix L)	320.14	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =	4231.84	(338)
12b. CO2 Emissions – Community heating scheme		
Energy Emission factor	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 =	712.33	(367)
Electrical energy for heat distribution [(313) x 0.52 =	19.95	(372)
Total CO2 associated with community systems (363)(366) + (368)(372) =	732.28	(373)
CO2 associated with space heating (secondary) (309) x 0 =	0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x 0.22 =	0	(375)
Total CO2 associated with space and water heating (373) + (374) + (375) =	732.28	(376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52 =	92.12	(378)
CO2 associated with electricity for lighting (332))) x 0.52 =	166.15	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1 0.52 x 0.01 =	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =	934.07	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =	12.86	(384)
El rating (section 14)	89.36	(385)

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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: 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 28.13 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.99 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 - Heat pump

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	12.07m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0.141/217	
Faity Walls O-value	0 W/m²K	

Photovoltaic array

		User D	Details:										
Assessor Name: Software Name:	Software Name: Stroma FSAP 2012 Software Version: Version												
Address :	F	Property	Address	03 - D									
Overall dwelling dime	ensions:												
		Are	a(m²)		Av. He	ight(m)	_	Volume(m ³	3)				
Ground floor			53.96	(1a) x	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	0	x	10 =	0	(7a)				
Number of passive vents	;			Ī	0	x -	10 =	0	(7b)				
Number of flueless gas fi	res			Ė	0	x 4	40 =	0	(7c)				
				_									
							Air ch	nanges per ho	our —				
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$			[0		÷ (5) =	0	(8)				
Number of storeys in the	een carried out or is intended, procee he dwelling (ns)	ea to (17),	otnerwise (continue tr	om (9) to	(16)		0	(9)				
Additional infiltration	a					[(9)	-1]x0.1 =	0	(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 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 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	50		(8) + (10)					0	(16)				
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] + (18)$	•		•	etre of e	envelope	area	3	(17)				
· ·	es if a pressurisation test has been do				is being u	sed		0.15	(18)				
Number of sides sheltere	ed							0	(19)				
Shelter factor			(20) = 1 -		19)] =			1	(20)				
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.15	(21)				
Infiltration rate modified for	- 1 	1	Ι,		<u> </u>	<u> </u>		1					
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind sp (22)m= 5.1 5	peed 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 4.7 4.3 3.0	1 3.0	J 3.1	4	4.3	<u> </u>	<u> </u>	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						

Aujusteu IIIIIII	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19 Calculate effect	0.19 Ctive air	0.18 Change i	0.16 rate for t	0.16 he appli	0.14 cable ca	0.14 SE	0.14	0.15	0.16	0.17	0.18		
If mechanica		_										0.5	(23a
If exhaust air he	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23k
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(230
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(248
b) If balance	d mecha	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)	r	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n				•					5 × (23b	o)			
(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	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-		
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	re	AXU		k-value	e Al	Χk
	area	(m²)	m		A ,r		W/m2		(W/I		kJ/m²•		
Windows					12.07	χ1,	/[1/(1.4)+	0.04] =	16				(27)
Walls Type1	27.6	66	12.0	7	15.59) X	0.18	= [2.81		60	935.4	(29)
Walls Type2	24.2	24	0		24.24	, x	0.17	= [4.07		60	1454.4	(29)
Total area of e	lements	, m²			51.9								(31)
Party wall					31.67	, X	0	= [0		45	1425.1	5 (32)
Party floor					53.96	5					40	2158.4	(32
Party ceiling					53.96	5				Ī	30	1618.8	3 (32)
Internal wall **					95.03	3					9	855.27	(32)
* for windows and						ated using	ı formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	1 3.2	_
** include the area				ls and pari	titions		(26)(30)	ı ± (32) =					7(22)
Fabric heat los Heat capacity		•	U)				(20)(30)		.(30) + (32	2) + (222)	(220) -	22.88	(33)
Thermal mass	•	,) – Cm ·	TEA) ir	k I/m2k			***	$\div (4) =$	z) + (32a).	(326) =	8447.42	(34)
For design assess	•	•		•			ecisely the	` '	. ,	TMP in T	able 1f	156.55	(35)
can be used instead				construct	017 470 770	. rarowr pr	oolooly till	marodavo	values of		abio 11		
Thermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						6.04	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(0.0)	(2.5)				_
	at loss								(36) =			28.91	(37)
								(38)m	$= 0.33 \times ($	(25)m x (5)		
Ventilation hea									<u> </u>	N.I		1	
Ventilation hea	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	(20)
(38)m= 14.77	Feb 14.59	Mar 14.42			Jun 12.47	Jul 12.47	Aug 12.29	Sep 12.82	13.35	13.71	Dec 14.06		(38)
Ventilation hea	Feb 14.59	Mar 14.42	Apr	May			Ť	Sep 12.82		13.71	 		(38)

Heat loss	s parar	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.81	0.81	0.8	0.79	0.78	0.77	0.77	0.76	0.77	0.78	0.79	0.8		
_										Average =	Sum(40) ₁	12 /12=	0.79	(40)
Number	of day		nth (Tab	le 1a)				ı	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. Wate	r heati	ng ene	gy requi	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 (⁻	TFA -13		81		(42)
Annual a Reduce the not more th	e annua	l average	hot water	usage by	5% if the a	lwelling is	designed t	` ,		se target o		.11		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water ι					,			_	'	!				
(44)m= 8	84.82	81.74	78.65	75.57	72.49	69.4	69.4	72.49	75.57	78.65	81.74	84.82		
<u> </u>										Total = Su	m(44) ₁₁₂ =	=	925.35	(44)
Energy cor	ntent of I	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= 1	25.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82		
If in atomton		ator booti	na ot noint	of upo (no	, hat water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	-	1213.27	(45)
If instantan			· ·	,		, , , , , , , , , , , , , , , , , , ,	·	` '	. , ,	ı	ı	1		(10)
(46)m= 1 Water sto	18.87 Orage	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27		(46)
Storage	_		includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If commu		` '					_							(/
Otherwis	-	_			-			' '	ers) ente	er '0' in ((47)			
Water sto	•													
a) If mar	nufactu	ırer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempera	iture fa	actor fro	m Table	2b								0		(49)
Energy lo			•					(48) x (49)) =		1	10		(50)
b) If marHot wate				-								02		(51)
If commu		-			C 2 (KVV)	ii/iiti C/GC	·y /				0.	02		(31)
Volume f	-	_									1.	03		(52)
Tempera	ture fa	actor fro	m Table	2b							0	.6		(53)
Energy lo	ost fror	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (5	0) or (54) in (5	55)								1.	03		(55)
Water sto	orage l	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 3	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder of	contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 3	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary o	circuit	loss (ar	nual) fro	m Table	. 3							0		(58)
Primary		`	,			59)m = ((58) ÷ 36	65 × (41)	m					` '
-					,	•	. ,	, ,	cylinde	r thermo	stat)			
(59)m= 2	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	00) + 0	0 7 (41) o	0	0	0	0	1	(61)
		-										J · (59)m + (61)m	(- /
(62)m= 181.07	159.94	168.8	152.47	150.25	135.45		142.4		158.05	165.67	177.1	1	(62)
Solar DHW input c									ļ]	(- /
(add additional										morrio wan	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from wa	ater heat	ter				1	·	I	!	-1	!	1	
(64)m= 181.07 159.94 168.8 152.47 150.25 135.45 131.22 142.42 141.68 158.05 165.67 177.1													
	'						C	Output from w	ater heat	er (annual)	112	1864.11	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]										-			
(65)m= 86.05	76.52	81.97	75.7	75.8	70.04	69.47	73.2	72.12	78.39	80.1	84.73]	(65)
include (57)r	n in calc	culation of	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is f	from com	munity h	neating	
5. Internal ga					•						•		
Metabolic gains	s (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.3	4 90.34	90.34	90.34	90.34		(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e 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 gai	ns (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a), a	lso see Ta	ble 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	(calcula	ted in A	opendix	L, equat	ion L15	or L15a), also	see Table	5	•	-	•	
(69)m= 32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.0	3 32.03	32.03	32.03	32.03		(69)
Pumps and far	ns gains	(Table 5	āa)					•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-	-	-	•	
(71)m= -72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.2	7 -72.27	-72.27	-72.27	-72.27		(71)
Water heating	gains (T	able 5)		-		-				-	-	•	
(72)m= 115.65	113.87	110.17	105.15	101.88	97.28	93.38	98.3	8 100.16	105.37	111.24	113.88		(72)
Total internal	gains =				(60	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 337.3	335.58	325.44	309.18	292.9	277.01	266.54	271.4	9 279.71	296.15	315.03	328.97		(73)
6. Solar gains):												
Solar gains are c	alculated ı	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to the	ne applica	ble orienta	tion.		
Orientation: A		actor	Area			UX		g_ Table 6b	-	FF		Gains	
_	able 6d		m²		- 18	able 6a		Table 6b	_ '	Table 6c		(W)	_
Northeast _{0.9x}	0.77	X	12.	07	x	11.28	X	0.63	x	0.7	=	41.62	(75)
Northeast _{0.9x}	0.77	x	12.	07	x	22.97	X	0.63	x	0.7	=	84.72	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	41.38	X	0.63	x	0.7	=	152.64	(75)
Northeast _{0.9x}	0.77	Х	12.	07	X	67.96	X	0.63	x	0.7	=	250.67	(75)
Northeast _{0.9x}	0.77	X	12.	07	X	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.	07	x	91.1	x		0.63	x	0.7	=	336.05	(75)
Northeast _{0.9x}	0.77	x	12.	07	x	72.63	X		0.63	х	0.7	=	267.9	(75)
Northeast _{0.9x}	0.77	x	12.	07	x	50.42	x		0.63	х	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	х	12.	07	x	9.21	x		0.63	x	0.7	=	33.99	(75)
Solar gains in	watts, ca	alculated	I for eac	h month			(83)m	ı = Sı	um(74)m .	(82)m				
(83)m= 41.62	84.72	152.64	250.67	336.95	359.2	3 336.05	267	7.9	185.99	103.53	52.37	33.99		(83)
Total gains –	internal a	and solar	(84)m =	= (73)m	+ (83)	m , watts							•	
(84)m= 378.92	420.3	478.07	559.85	629.86	636.2	4 602.59	539	.39	465.7	399.68	367.4	362.95		(84)
7. Mean inte	rnal temp	perature	(heating	season)									
Temperature	during h	neating p	eriods ir	n the livi	ng are	a from Ta	ble 9,	, Th	1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see	Table 9a)								
Jan	Feb	Mar	Apr	May	Jui	n Jul	Aı	ug	Sep	Oct	Nov	Dec		
(86)m= 0.98	0.96	0.91	0.79	0.6	0.41	0.3	0.3	35	0.59	0.86	0.96	0.98		(86)
Mean interna	el temper	ature in	livina ar	22 T1 (f	llow s	tone 3 to	7 in T	-ahla	2 9c)					
(87)m= 20.03	20.19	20.48	20.8	20.95	20.9	_i	2		20.97	20.74	20.34	20		(87)
	ļ			<u> </u>	<u> </u>	_!								, ,
Temperature (88)m= 20.25	20.25	eating p		ı	20.2	<u> </u>	Т		` ,	20.27	20.26	20.26	Ī	(88)
(88)m= 20.25	20.25	20.25	20.26	20.27	20.2	3 20.28	20.2	20	20.28	20.27	20.26	20.26		(00)
Utilisation fa	 	ains for i		welling,	h2,m	see Table	9a)						Ī	
(89)m= 0.97	0.95	0.9	0.76	0.56	0.37	0.25	0.0	3	0.54	0.83	0.95	0.98		(89)
Mean_interna	al temper	ature in	the rest	of dwell	ng T2	(follow ste	eps 3	to 7	in Tabl	e 9c)				
(90)m= 18.94	19.19	19.59	20.03	20.22	20.2	3 20.28	20.2	28	20.25	19.97	19.41	18.92		(90)
									f	LA = Livir	ng area ÷ (4) =	0.47	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) =	= fLA × T1	+ (1	– fL	A) × T2					
(92)m= 19.45	19.66	20.01	20.4	20.57	20.6	2 20.62	20.0	62	20.59	20.33	19.85	19.43		(92)
Apply adjust	ment to t	he mean	interna	l temper	ature	from Table	e 4e,	whe	re appro	priate		•		
(93)m= 19.45	19.66	20.01	20.4	20.57	20.6	2 20.62	20.0	62	20.59	20.33	19.85	19.43		(93)
8. Space hea	ating requ	uirement												
Set Ti to the					ed at	step 11 of	Tabl	le 9b	o, so tha	t Ti,m=(76)m an	d re-cald	culate	
the utilisation	1			i	г.		Ι.					-	l	
Jan	Feb	Mar	Apr	May	Ju	n Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation factors (94)m= 0.97	0.95	0.89	0.76	0.57	0.39	0.28	0.3	22	0.56	0.84	0.94	0.97		(94)
Useful gains				<u> </u>	0.38	0.20	0.5)2	0.50	0.04	0.94	0.97		(04)
(95)m= 365.75	`	427.33	427.25	360.81	247.2	2 166.11	173.	41	261.73	334.22	345.95	352.08		(95)
Monthly ave				l		_ 100.11	1 .,,		_51.70	331.22	1 5 10.00	1 332.00	1	(-5)
(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				l .							<u> </u>	<u> </u>		
(97)m= 661.94		585.42	487.92	374.76	248.9		173	_	270.77	411.33	543.52	654.55		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Wh/m	onth = 0.02	24 x [[(97)	m – (95)m] x (4	1)m		1	
(98)m= 220.37	Ť	117.62	43.69	10.37	0	0	0	Ó	0	57.37	142.25	225.03		
						•	•						1	

		_		
7	Total per year (kWh/	year) = Sum(98) _{15,912} =	981.18	(98)
Space heating requirement in kWh/m²/year			18.18	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating p Fraction of space heat from secondary/supplementary heating (Table		mmunity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =			1	(302)
The community scheme may obtain heat from several sources. The procedure allows	for CHP and up to f	ــ our other heat sources; th	e latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See Approximation of heat from Community heat pump	ppendix C.	Г	1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =		(304a)
Factor for control and charging method (Table 4c(3)) for community h	heating system		 1	(305)
Distribution loss factor (Table 12c) for community heating system		L T	1.05	(306)
Space heating		L	kWh/yeaı	」 ```
Annual space heating requirement		Г	981.18	7
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1030.24	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	0	(308		
Space heating requirement from secondary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		Г	1864.11	٦
If DHW from community scheme:	(0.4) (0.00.)	(225) (222) F		」 □(0,000)
Water heat from Community heat pump		$(305) \times (306) =$	1957.32	(310a)
•	0.01 × [(307a)(307	7e) + (310a)(310e)] =	29.88	(313)
Cooling System Energy Efficiency Ratio		Ĺ	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsi	ide	[114.79	(330a)
warm air heating system fans		Γ	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =	114.79	(331)
Energy for lighting (calculated in Appendix L)			247.96	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (320)	15) + (331) + (33	32)(237b) =	3241.49	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh k	Emissions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two forms	fuels repeat (363) to	(366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b))] x 100 ÷ (367b) x	0.52	553.76	(367)
Electrical energy for heat distribution [(313)	x	0.52 =	15.51	(372)

Total CO2 associated with community s	systems	(363)(366) + (368)(372))	=	569.27	(373)			
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)			
CO2 associated with water from immers	sion heater or instanta	aneous heater (312) x	0.22	=	0	(375)			
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			569.27	(376)			
CO2 associated with electricity for pumps and fans within dwelling (331)) x = 0.52									
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	128.69	(379)			
Energy saving/generation technologies Item 1	(333) to (334) as app		0.52 X 0.0	n1 – 🗀		7(200)			
item i			0.52 X 0.0		-56.48	(380)			
Total CO2, kg/year	sum of (376)(382) =				701.06	(383)			
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.99	(384)			
El rating (section 14)					90.51	(385)			

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:43:41*

Proiect Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 69.44m²Site Reference:Highgate Road - GREENPlot 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 24.25 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

11.65 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 - Heat pump

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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
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 electric heat pump		
Photovoltaic array		

		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: 03 - E Address:											
1. Overall dwelling dime	ensions:										
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)		
Ground floor			69.44	(1a) x	2	.65	(2a) =	184.02	(3a)		
Total floor area TFA = (1	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	0	x 1	10 =	0	(7a)		
Number of passive vents	;			Ī	0	x 1	10 =	0	(7b)		
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)		
				<u>L</u>				_			
				_			Air ch	nanges per ho	our —		
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$ een carried out or is intended, proceed			oontinuo fi	0		÷ (5) =	0	(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	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	arron annotation and in an abis an atm		(8) + (10)					0	(16)		
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] +$		•	•	ietre oi e	envelope	area	3	(17)		
· ·	es if a pressurisation test has been do				is being u	sed		0.15	(10)		
Number of sides sheltere	ed							0	(19)		
Shelter factor			(20) = 1 -		19)] =			1	(20)		
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.15	(21)		
Infiltration rate modified f	- 1 	1	Δ	0	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]			
()	1 4.0 0.0	<u> </u>	1	<u> </u>	I	1 7.0	1 7.7	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	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19 Calculate effe	0.19	0.18	0.16	0.16 he appli	0.14 Cable ca	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		•	ato for t	пс арри	oabio oa	00					[0.5	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)		Ì	0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =			Ì	74.8	(230
a) If balance	d mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	_
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(24
b) If balance	d mech	anical ve	ntilation	without	heat red	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 h if (22b)r		tract ver (23b), t		•					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-			
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	eat loss r	paramete	ėr.									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	K)	k-value kJ/m².k		X k
Windows Type		(111-)	11	_	8.97		۷۷/۱۱۱۷ +(1.4)/[]/		11.89		KJ/III-•I	KU/	(27
Windows Type					2.92	_	/[1/(1.4)+	Ļ		=			(27
Walls Type1			44.0	$\overline{}$		=		— ;	3.87	북 ,			
Walls Type1	41.5		11.89		29.62	_	0.18	=	5.33	륵 ¦	60	1777.2	=
Total area of e	16.7		0		16.73	=	0.17	= [2.81		60	1003.8	
Party wall	icilicilis	, 111-			58.24	=							(31)
					40.43	=	0	=	0		45	1819.35	=
Party floor					69.44					Ĺ	40	2777.6	=
Party ceiling					69.44					Ĺ	30	2083.2	=
Internal wall **					136.2			<i>r</i>		. L	9	1225.89	9 (32
* for windows and ** include the area						ated using	i tormula 1.	/[(1/U-valu	ie)+0.04] a	is given in	paragraph	3.2	
Fabric heat los	s, W/K :	= S (A x	U)	,			(26)(30)	+ (32) =				23.9	(33
Heat capacity		•	,					((28)	.(30) + (32	2) + (32a).	(32e) =	10687.04	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =		[153.9	(35
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<					[6.99	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)				,·		r		_
Total fabric he		-l-: !-:							(36) =	(E)		30.9	(37
Ventilation hea					1	1, .1	Α		= 0.33 × (.			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38
(38)m= 19.27	19.04	18.81	17.67	17.44	16.3	16.3	16.08	16.76	17.44	17.9	18.35		(30
Heat transfer o	nofficiar	at \///K						(20)m	= (37) + (37)	38/m			
39)m= 50.16	49.93	49.71	48.57	48.34	47.2	47.2	46.97	47.66	48.34	48.79	49.25		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.72	0.72	0.72	0.7	0.7	0.68	0.68	0.68	0.69	0.7	0.7	0.71		
		!		<u>. </u>		!	!		Average =	Sum(40) ₁	12 /12=	0.7	(40)
Number of da	`	1 ·	· ·						l _				
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	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ 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.		23		(42)
Annual average Reduce the annual not more that 125	ial average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								1 - 22		1			
(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		
	!	!	<u> </u>	ļ.		<u> </u>	<u> </u>		Total = Su	m(44) ₁₁₂ =	=	1046.65	(44)
Energy content o	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(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		
If instantaneous			-f /		()		havea (40		Total = Su	m(45) ₁₁₂ =	= [1372.32	(45)
If instantaneous		· ·	·	1	,.		, ,	, , , I		1			
(46)m= 21.34 Water storage	18.67	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67		(46)
Storage volun) includir	ng anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	` '					_							()
Otherwise if n	_			-			, ,	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-								02		(51)
If community	•			0 2 (1111)	1,11ti 0, de	•97				0.	02		(01)
Volume factor	•									1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost from	om watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	03		(55)
Water storage	e loss cal	culated t	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circui	t loss (ar	nnual) fro	m Table	3							0		(58)
Primary circui	,	,			59)m = ((58) ÷ 36	65 × (41)	m					
(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 o	·alculated	for each	month ((61)m –	(60) ÷	365 🗸 (41)m							
(61)m= 0	0	0	0	0 1)111 =	00) +	1 0))	0	0	0	0	1	(61)
													J · (59)m + (61)m	(-)
(62)m= 197.5		183.69	165.44	162.7	146.19		153	_	153.24	171.52	180.38	193.07	(39)III + (01)IIII]	(62)
Solar DHW inpu													J	(/
(add addition										i ooninba	iion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	1	(63)
Output from	uwater hea	ter	<u> </u>			-				l		<u> </u>	J	
(64)m= 197.5		183.69	165.44	162.7	146.19	141.17	153	.84	153.24	171.52	180.38	193.07	1	
		I	<u> </u>	ļ	<u> </u>	1		Outp	out from wa	ater heate	r (annual)₁	12	2023.16	(64)
Heat gains fr	om water	heating.	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	(1)m	1] + 0.8 >	د [(46)m	+ (57)m	+ (59)m	 n]	-
(65)m= 91.53		86.92	80.02	79.94	73.62	72.78	76.	_	75.96	82.87	84.98	90.04]	(65)
include (57	7)m in cal	culation of	of (65)m	only if c	vlinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal			. ,		•							,	<u> </u>	
Metabolic ga	·													
Jan	T '	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.6	2 111.62	111.62	111.62	111.62	111.62	111.62	111	.62	111.62	111.62	111.62	111.62		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				-	
(67)m= 18	15.98	13	9.84	7.36	6.21	6.71	8.7	72	11.71	14.87	17.35	18.5]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a),	also	see Ta	ble 5		-	_	
(68)m= 195.9	9 198.02	192.9	181.98	168.21	155.27	146.62	144	.59	149.71	160.62	174.4	187.34]	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L1	or L15a), als	o se	e 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 f	ans gains	(Table	5а)			•							-	
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•				•		•	-	
(71)m= -89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89	0.3	-89.3	-89.3	-89.3	-89.3]	(71)
Water heatin	g gains (T	able 5)	-	-	-					-	-	-	_	
(72)m= 123.0	2 121.01	116.83	111.14	107.44	102.24	97.82	103	.49	105.5	111.39	118.03	121.02]	(72)
Total interna	al gains =				(6	6)m + (67)n	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	-	
(73)m= 393.4	9 391.5	379.21	359.45	339.5	320.21	307.64	313	.29	323.41	343.36	366.27	383.34]	(73)
6. Solar gai	ns:													
Solar gains are	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		_	g_ able 6b	т	FF able 6c		Gains	
						able ba	,	_ '	able ob	_ '	able oc		(W)	,
Northeast 0.9x		X	8.9)7	X	11.28	X		0.63	X	0.7	=	30.93	(75)
Northeast 0.9x		X	8.9	7	X	22.97	X		0.63	×	0.7	=	62.96	(75)
Northeast 0.9x	0	X	8.9	97	X	41.38	X	<u> </u>	0.63	×	0.7	=	113.43	(75)
Northeast 0.9x		X	8.9	7	x	67.96	X	<u> </u>	0.63	×	0.7	=	186.29	(75)
Northeast 0.9x	0.77	X	8.9	7	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	×	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	X	8.9	97	х	91.1	X	0.63	X	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	X	8.9	97	х	72.63	X	0.63	X	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	X	8.9	97	х ,	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	Х	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 1	06.25		0.63	x	0.7	=	94.82	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x 1	19.01		0.63	x	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x 1	18.15]	0.63	x	0.7	=	105.44	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x 1	13.91		0.63	x	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x 1	04.39		0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	x	2.9	92	x .	92.85]	0.63	×	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	×	2.9	92	x =	31.49	Ī	0.63	×	0.7	=	28.1	(79)
Solar gains in						1	`	n = Sum(74)m.		1		7	(00)
(83)m= 63.76		89.96	281.11	356.62	372.4	351.39	292	.25 221.08	138.7	6 78.25	53.36]	(83)
Total gains – i $(84)m = 457.26$		50iai 69.17	640.56	696.12	692.61	659.04	605	.54 544.49	482.1	2 444.51	436.7	1	(84)
` '	LL				L	039.04	003	.54 544.49	402.17	2 444.51	430.7]	(04)
7. Mean inter	•		`		/								
Temperature	Ū	٠.			Ū		ble 9	, Th1 (°C)				21	(85)
Utilisation fac					` 					1		7	
Jan	 	Mar	Apr	May	Jun	Jul	 	ug Sep	Oct	+	Dec		(00)
(86)m= 0.98	0.96	0.91	8.0	0.62	0.43	0.31	0.3	36 0.59	0.85	0.96	0.98]	(86)
Mean interna	 	T		· `	1	eps 3 to 7	7 in T	able 9c)				7	
(87)m= 20.14	20.31 2	0.56	20.83	20.96	20.99	21	2	1 20.98	20.8	20.44	20.12]	(87)
Temperature	during hea	ting p	eriods ir	rest of	dwelling	g from Ta	able 9	9, Th2 (°C)		_		_	
(88)m= 20.32	20.32 2	0.33	20.34	20.34	20.36	20.36	20.	36 20.35	20.34	20.34	20.33		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,m (s	ee Table	9a)						
(89)m= 0.97	0.95	0.9	0.77	0.58	0.39	0.27	0.3	31 0.54	0.83	0.95	0.98		(89)
Mean interna	l temperatu	ıre in t	the rest	of dwelli	ina T2 (1	ollow ste	eps 3	to 7 in Tabl	e 9c)	-	•	_	
(90)m= 19.17		9.77	20.14	20.3	20.35	20.36	20.		20.11	19.61	19.15]	(90)
				!	!	!		1	LA = Liv	ving area ÷ (4) =	0.34	(91)
Mean interna	l temperatu	ıro (fo	r tha wh	ماه طسم	lling) – f	: Δ ∪ T 1	 /1	_ fl ∧\ ∨ T≎					
(92)m= 19.51	 	`				1	`	- i 	00.05	. 1 40 0	10.40	1	(02)
	1 19.77 1 7	().()4	20.38	20.53	20.57	20.58	20	58 20.55	20.35	199	19.48		(92)
Apply adjustr		mean	20.38 interna	20.53 temper	20.57 ature fro	20.58 om Table	20. e 4e.		20.35 opriate		19.48]	(92)

(93)m= 19.51	19.72	20.04	20.38	20.53	20.57	20.58	20.58	20.55	20.35	19.9	19.48		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l		<u> </u>				5						
(94)m= 0.97	0.94	0.89	0.77	0.59	0.4	0.28	0.32	0.55	0.83	0.94	0.97		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m= 441.94	482.27	508.95	494.78	412.34	280.41	187.58	195.95	300.31	398.27	418.19	424.3		(95)
Monthly average		1	-	from T	1	·	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 loss rate	i	i	· ·		ì	- ` 	<u> </u>	<u> </u>			i		(0-)
(97)m= 762.69	740.05	672.95	557.45	426.72	281.99	187.77	196.33	307.58	471.09	624.48	752.71		(97)
Space heatin (98)m= 238.64	g require 173.23	122.02	r each n 45.12	10.7	Wh/mon	$\frac{10 - 0.02}{0}$	24 x [(97])m – (95 0)m] x (4 54.18	1)m 148.53	244.34		
(98)m= 238.64	173.23	122.02	45.12	10.7	0	U				l .		4000.70	7(00)
							rota	l per year	(kvvn/year) = Sum(9	8)15,912 =	1036.76	(98)
Space heatin	g requir	ement in	kWh/m²	/year								14.93	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme								
This part is use Fraction of spa										unity sch	neme.		7(204)
·			•		•	_	(Table T	1) 0 11 11	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so									up to four	other heat	sources; ti	he latter	
includes boilers, here		-			rom powei	r stations.	See Appei	naix C.				1	(303a)
Fraction of total				•	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cont	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for d	commun	ity heatii	ng syste	m					1.05	(306)
Space heating	a										!	kWh/yea	
Annual space	_	requiren	nent									1036.76	7
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1088.59	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/suլ	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	7												
Annual water h		equirem	ent									2023.16	
If DHW from c													-
Water heat fro		•)						5) x (306) :		2124.32	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)([310e)] =	32.13	(313)
Cooling Syster	_	•	•									0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											i		7,000
mechanical ve	ntilation	- baland	ed, extr	act or po	sitive in	put from	outside					169.72	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =		169.72	(331)
Energy for lighting (calculated in Appendix L)				317.84	(332)
Electricity generated by PVs (Appendix M) (negative quantity	y)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3591.65	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	IP) using two fuels repeat (363) to	(366) for the second	fuel	280	(367a)
CO2 associated with heat source 1 [(307	7b)+(310b)] x 100 ÷ (367b) x	0.52	=	595.54	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.68	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	612.21	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instant	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			612.21	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	=	88.09	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	164.96	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	olicable	0.52 × 0.01	-	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				808.78	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				11.65	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:36

Proiect 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: 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER)

24.38 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

11.70 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 - Heat pump

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:	0.54	
Maximum	1.5	oK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
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 electric heat pump		
Photovoltaic array		

		Heor	Details:						
Access an Name .	Nail la ala ara	USEI		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
		Property	Address:		CICIII				
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor		Are	ea(m²) 69.61	(1a) x		ight(m) .65	(2a) =	Volume(m³	(3a)
	a) . (1b) . (1a) . (1d) . (1a) .	(1p)				.00	(2a) –	104.47	(Ja)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(111)	69.61	(4)) . (2-) . (2-	1) . (2 -) .	(2-)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	l)+(3e)+	.(3h) =	184.47	(5)
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	r
Number of chimneys	heating hea	ating		1 = [40 =		_
Number of chimneys		<u> </u>	0]	0		20 =	0	(6a)
Number of open flues		0 +	0] ⁻	0			0	(6b)
Number of intermittent fa				Ļ	0		10 =	0	(7a)
Number of passive vents				Ļ	0		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	ys, flues and fans = (6a)+	+(6b)+(7a)+(7b)+	-(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	peen carried out or is intended,	proceed to (17),	otherwise c	ontinue fr			` ′		`` <i>`</i>
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	.25 for steel or timber fra	uma or 0.35 fo	or maconr	v constr	ruction	[(9)	-1]x0.1 =	0	$=$ $\frac{(10)}{(11)}$
	resent, use the value correspo			•	uction			0	(11)
deducting areas of openin	• /	1) 0 4 (ماد الحال				ı		
If no draught lobby, en	floor, enter 0.2 (unsealed ter 0.05, else enter 0	a) or 0.1 (sea	ea), eise	enter U				0	(12)
• •	s and doors draught strip	ped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	•							0.15	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has b	een done or a de	egree air per	meability	is being u	sed	İ		7(40)
Shelter factor	tu		(20) = 1 - [0.075 x (1	19)] =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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>							

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		-	rate for t	he appli	cable ca	se					-	· 	7,00
If mechanical If exhaust air h			andiv N (2	3h) - (23a	a) × Emy (e	aguation (1	VSV) other	nwisa (23h) <i>- (</i> 23a)			0.5	(23:
If balanced with		0 11		, ,	, ,	. ,	,, .	,) = (23a)			0.5	(23)
		•	•	_					2h\m . /	00h) [4 (22.5)	74.8	(23
a) If balance (24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	230) x [0.3	÷ 100] 	(24
b) If balance					<u> </u>	l	l				0.5		(2
(24b)m= 0		o 0	0	0 0	0	0	0	0	0	0	0]	(24
					ļ	<u> </u>					0		(= .
c) If whole h	n < 0.5 ×			•					5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation 1 , the			•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	•	•	•	•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	at lose r	naramete	or.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e A	X k
	area	-	m		A ,r		W/m2		(W/		kJ/m²·l		
Windows Type	e 1				8.97	х1.	/[1/(1.4)+	0.04] =	11.89				(27
Windows Type	e 2				2.92	x1.	/[1/(1.4)+	0.04] =	3.87				(27
Walls Type1	41.5	59	11.89	9	29.7	x	0.18	=	5.35	<u> </u>	60	1782	(29
Walls Type2	18.4	1	0		18.41	X	0.17	<u> </u>	3.09	₹ i	60	1104.6	(29
Total area of e	elements	, m²			60								 (31
Party wall					38.68	3 x	0		0		45	1740.6	(32
Party floor					69.61						40	2784.4	1 (32
Party ceiling					69.61					[30	2088.3	=
Internal wall **	:				136.2	=					9	1225.8	=
* for windows and					alue calcul		ı formula 1	/[(1/U-valu	ıe)+0.04] á	L as given in			<u> </u>
Fabric heat los				s and pan	inions		(26)(30)	+ (32) =				24.2	(33
Heat capacity		•	0)				, , , ,		(30) + (32	2) + (32a).	(32e) =	10725.79	(34
Thermal mass	•	,	P = Cm -	- TFA) ir	n k.l/m²K			***	÷ (4) =	_, (0_0,	(020)	154.08	(35
For design assess	sments wh	ere the de	tails of the	•			ecisely the	` '	. ,	TMP in T	able 1f	134.06	
Thermal bridg				usina An	pendix l	<						6.99	(36
if details of therma					-	•						0.99	
Total fabric he			()	(1	,			(33) +	(36) =			31.19	(37
Ventilation 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= 19.31	19.08	18.86	17.71	17.49	16.34	16.34	16.12	16.8	17.49	17.94	18.4		(38
Heat transfer	coefficier	nt, W/K			-	-	-	(39)m	= (37) + (38)m	-	•	
(39)m= 50.5	50.28	50.05	48.91	48.68	47.54	47.54	47.31	47.99	48.68	49.13	49.59		
					<u> </u>				ь			ļ	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.73	0.72	0.72	0.7	0.7	0.68	0.68	0.68	0.69	0.7	0.71	0.71		
	•			ı		ı	ı		Average =	: Sum(40) ₁	12 /12=	0.7	(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	rement:								kWh/ye	ear:	
Assumed occi 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		24		(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		7.32		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								- 1					
(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		
	•								Total = Su	ım(44) ₁₁₂ =		1047.84	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(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		
If instantaneous	vator hooti	na ot noint	of upo (no	hot woto	· otorogol	ontor O in	hayaa (16		Total = Su	ım(45) ₁₁₂ =	• [1373.88	(45)
If instantaneous v			,	ı	, , , , , , , , , , , , , , , , , , ,		, ,	, , , I	1				(40)
(46)m= 21.37 Water storage	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69		(46)
Storage volum) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•			orio not		(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-							0	02		(51)
If community h	-			((((((((((((((((((((,,,,,,	-77				0.	<u> </u>		()
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	loss cal	culated t	or each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	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	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	e 3		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	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 o	ralculated	for each	month ((61)m –	(60) ± 3	65 v (41)m							
(61)m= 0	0	0	0	0	00) - 0	00 x (+1) 0		0	0	T 0	0	1	(61)
	<u>l</u>			alculated	for eac	h month							J · (59)m + (61)m	` ,
(62)m= 197.7		183.83	165.57	162.82	146.29	141.27	153	_	153.35	171.65	180.52	193.22	1	(62)
Solar DHW inpu			<u> </u>						if no sola		1		1	` ,
(add addition												· · · · · · · · · · · · · · · · · ·		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	1	(63)
Output from	water hea	ter	ı										•	
(64)m= 197.7		183.83	165.57	162.82	146.29	141.27	153	.96	153.35	171.65	180.52	193.22	1	
			ı			1		Outp	out from wa	ater heate	er (annual) ₁	112	2024.72	(64)
Heat gains fi	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	n]	_
(65)m= 91.58	81.36	86.97	80.06	79.98	73.65	72.81	77.0	03	76	82.92	85.03	90.09]	(65)
include (5	7)m in cald	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	ins (Table	e 5), Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.8	3 111.83	111.83	111.83	111.83	111.83	111.83	111.	.83	111.83	111.83	111.83	111.83]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 d	r L9a), a	lso s	ee ¯	Table 5				_	
(67)m= 18.0 ²	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 of	gains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Ta	ble 5		-	_	
(68)m= 196.3	9 198.42	193.29	182.36	168.55	155.58	146.92	144.	.88	150.02	160.95	174.75	187.72]	(68)
Cooking gair	ns (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 t	ans gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g.	evaporatio	on (nega	tive valu	es) (Tab	le 5)									
(71)m= -89.4	6 -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	ng gains (T	able 5)											_	
(72)m= 123.1	121.08	116.89	111.2	107.5	102.29	97.87	103	.54	105.55	111.45	118.1	121.09]	(72)
Total intern	al gains =				(66	i)m + (67)m	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 394.0	7 392.08	379.76	359.97	339.98	320.65	308.06	313	.71	323.86	343.85	366.79	383.9		(73)
6. Solar gai														
Solar gains ar		•				•	tions 1	to co		e applica		tion.		
Orientation:	Access F Table 6d		Area m²		Fli Ta	ıx ıble 6a		Т	g_ able 6b	Т	FF able 6c		Gains (W)	
Northoast o o							1 1					_	. ,	1,75
Northeast 0.93		X				11.28	X]		0.63	×	0.7	=	30.93	(75)
	<u> </u>	X				22.97	X]		0.63	_	0.7	_ =	62.96	(75)
Northeast 0.9	<u> </u>	X	8.9			41.38	X]		0.63	×	0.7	=	113.43	[(75)
Northeast 0.9		X	8.9		<u> </u>	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)

					_		٦.		_				_
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	Х	8.9	7	х	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	97	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	x	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	x	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	Ī	0.63	×	0.7	=	28.1	(79)
							_						
Solar gains in	watts, cal	culated	for eac	h month			(83)m	n = 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	138.7	6 78.25	53.36		(83)
												1	
Total gains – i			` '		<u>`</u>					1		1	
Total gains – i (84)m= 457.84		nd solar 569.72	(84)m = 641.07	= (73)m - 696.59	+ (83)r 693.0		605	.97 544.94	482.6	445.04	437.26]	(84)
	510.96	569.72	641.07	696.59	693.0		605	.97 544.94	482.6	445.04	437.26]	(84)
(84)m= 457.84	510.96 rnal tempe	569.72 erature (641.07 (heating	696.59 season	693.05	659.46			482.6	445.04	437.26	21	(84)
(84)m= 457.84 7. Mean inter	510.96 rnal tempe during he	569.72 erature (eating p	641.07 (heating	696.59 season	693.06) ng area	659.46 a from Tal			482.6	445.04	437.26	21	
(84)m= 457.84 7. Mean intermediate Temperature	510.96 rnal tempe during he	569.72 erature (eating p	641.07 (heating	696.59 season	693.06) ng area	659.46 a from Tal able 9a)	ble 9		482.6		437.26 Dec	21	
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors	510.96 rnal tempe during he	erature (eating points for li	641.07 (heating eriods in iving are	season the livinga, h1,m	693.05) ng area (see	659.46 a from Tal able 9a)	ble 9	, Th1 (°C)				21	
(84)m= 457.84 7. Mean interpreture Temperature Utilisation factors Jan	510.96 rnal temper during he ctor for gain Feb 0.96	erature (eating poins for limated) Mar 0.92	641.07 (heating eriods in iving are Apr 0.8	season the livings, h1,m May	693.08 ng area (see] Jun 0.44	a from Tal Table 9a) Jul 0.32	ble 9	, Th1 (°C) ug Sep 36 0.59	Oct	Nov	Dec	21	(85)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors Jan (86)m= 0.98	510.96 rnal temper during he ctor for gain Feb 0.96	erature (eating poins for limated) Mar 0.92	641.07 (heating eriods in iving are Apr 0.8	season the livings, h1,m May	693.08 ng area (see] Jun 0.44	a from Tal Table 9a) Jul 0.32	ble 9	Th1 (°C) Sep 0.59 Table 9c)	Oct	Nov 0.96	Dec	21	(85)
7. Mean internation (84)m= 457.84 7. Mean internation factor (86)m= 0.98 Mean internation	rnal temper during head to for gain and temperature and temper	erature eating poins for lims	641.07 (heating eriods ir iving are 0.8 iving are 20.83	season the living the living the sea, h1,m May 0.62 the sea T1 (for 20.96)	693.08) ing area (see 7 Jun 0.44 bllow s 20.99	a from Tal Table 9a) Jul 0.32 teps 3 to 7	ble 9 A 0.3 7 in T	Th1 (°C) Sep 6 0.59 Table 9c) 1 20.98	Oct 0.85	Nov 0.96	Dec 0.98	21	(85)
(84)m= 457.84 7. Mean interconduction factors Utilisation factors Jan (86)m= 0.98 Mean internation (87)m= 20.14	rnal temper during head to for gain and temperature and temper	erature eating poins for lims	641.07 (heating eriods ir iving are 0.8 iving are 20.83	season the living the living the sea, h1,m May 0.62 the sea T1 (for 20.96)	693.08) ing area (see 7 Jun 0.44 bllow s 20.99	a from Tal a from Tal able 9a) Jul 0.32 teps 3 to 7 21	ble 9 A 0.3 7 in T	Th1 (°C) ug Sep 0.59 able 9c) 1 20.98 9, Th2 (°C)	Oct 0.85	Nov 0.96	Dec 0.98	21	(85)
(84)m= 457.84 7. Mean interpretation factors and the second seco	510.96 rnal temper during here tor for gain Feb 0.96 al tempera 20.3 during here 20.32	erature (eating prins for line) Mar 0.92 Ature in line) 20.55 eating prins for line)	641.07 (heating eriods in iving are 20.83 eriods ir 20.34	season the livin ea, h1,m May 0.62 ea T1 (fc 20.96 n rest of 20.34	693.09 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36	a from Tal a from Tal a le 9a) Jul 0.32 teps 3 to 7 21 ng from Tal 20.36	ble 9 A 0.3 7 in T 2 able 9	Th1 (°C) ug Sep 0.59 Table 9c) 1 20.98 9, Th2 (°C)	Oct 0.85	Nov 0.96	Dec 0.98	21	(85) (86) (87)
(84)m= 457.84 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (84)m= 20.32	stor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.32 etor for gales at tempera 20.3 during he 20.3	erature of eating points for line of the eating points and eating points for response of the eating points f	641.07 (heating eriods ir iving are 0.8 iving are 20.83 eriods ir 20.34 est of decrease of	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling,	693.08) ing area (see 7 Jun 0.44 pllow si 20.99 dwellir 20.36 h2,m (see 7)	a from Tal a from Tal a le 9a) Jul 0.32 teps 3 to 7 21 ng from Tal 20.36	ble 9 A 0.3 7 in T 2 able 9 20.	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35	Oct 0.85 20.79 20.34	Nov 0.96 20.44	Dec 0.98 20.12 20.33	21	(85) (86) (87)
(84)m= 457.84 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97	stor for gales at tempera 20.3 during he 20.32 etor for gales 20.95	erature of eating points for in 20.55 eating points for in 20.32 eating points for in 20.9	641.07 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58	693.08 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7)	a from Tal Table 9a) Jul 0.32 teps 3 to 7 21 ng from Ta 20.36 see Table 0.27	ble 9 A 0.3 7 in 1 2 20. 9a) 0.3	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35	Oct 0.85 20.79 20.34	Nov 0.96	Dec 0.98	21	(85) (86) (87) (88)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors	stor for gales and sector for gales are sector for	erature (eating prins for line) Mar 0.92 Atture in line) 20.55 eating prins for ring	641.07 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 the rest	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling	693.09 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7) 0.39 ng T2	a from Tal a from Tal a from Tal a Jul 0.32 teps 3 to 7 21 ag from Ta 20.36 see Table 0.27 (follow ste	A 0.37 in 1 2 20.4 9a) 0.3 eps 3	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 to 7 in Table	Oct 0.85 20.79 20.34 0.83 e 9c)	Nov 0.96 20.44 20.34	Dec 0.98 20.12 20.33	21	(85) (86) (87) (88) (89)
(84)m= 457.84 7. Mean interpretation factors (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97	stor for gales at tempera 20.3 during he 20.32 etor for gales 20.95	erature of eating points for in 20.55 eating points for in 20.32 eating points for in 20.9	641.07 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58	693.08 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7)	a from Tal a from Tal a from Tal a Jul 0.32 teps 3 to 7 21 ag from Ta 20.36 see Table 0.27 (follow ste	ble 9 A 0.3 7 in 1 2 20. 9a) 0.3	Th1 (°C) ug Sep 66 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 to 7 in Tabl 36 20.33	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1	Nov 0.96 20.44 20.34 0.95	Dec 0.98 20.12 20.33 0.98		(85) (86) (87) (88) (89) (90)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation face [86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation face (89)m= 0.97 Mean internation (90)m= 19.16	510.96 rnal temper during he ctor for gain se	erature eating poins for line 20.55 eating poins for rough ture in the 19.76	641.07 (heating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 che rest 20.13	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling	693.08 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7) 0.39 ng T2 20.35	a from Tal Table 9a) Jul 0.32 teps 3 to 7 21 ng from Tal 20.36 see Table 0.27 (follow ste	ble 9 A 0.3 7 in 1 2 20. 9a) 0.3 20.	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 to 7 in Tabl 36 20.33	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1	Nov 0.96 20.44 20.34	Dec 0.98 20.12 20.33 0.98	21	(85) (86) (87) (88) (89)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation factors Jan (86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation factors (89)m= 0.97 Mean internation (90)m= 19.16	510.96 rnal temper during he ctor for gain	erature eating prins for line at line process of the line at l	641.07 (heating eriods in iving are 20.83 eriods in 20.34 est of do 0.77 the rest 20.13	season the livin ea, h1,m May 0.62 ea T1 (fc 20.96 n rest of 20.34 welling, 0.58 of dwelli 20.3	693.09 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7) 0.39 ng T2 20.35	a from Tal a from Tal a from Tal a Jul 0.32 teps 3 to 7 21 ag from Ta 20.36 see Table 0.27 (follow ste 20.36	bble 9 A 0.3 7 in T 2 abble 9 20. 99a) 0.3 eps 3 20.	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 2, Th2 (°C) 36 20.35 4 to 7 in Table 36 20.33 f - fLA) × T2	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1 LA = Liv	Nov 0.96 20.44 20.34 0.95 19.6 ving area ÷ (-	Dec 0.98 20.12 20.33 0.98 19.14 4) =		(85) (86) (87) (88) (89) (90) (91)
(84)m= 457.84 7. Mean intermediate Temperature Utilisation face [86)m= 0.98 Mean internation (87)m= 20.14 Temperature (88)m= 20.32 Utilisation face (89)m= 0.97 Mean internation (90)m= 19.16	stor for gales at tempera 20.3 ctor for gales 20.32 ctor for gales 20.32 ctor for gales 20.32 ctor for gales 20.34 ctor for gales 20.35	erature eating prins for line in the seating print	cheating eriods ir iving are 20.83 eriods ir 20.34 est of do 0.77 the rest 20.13 er the who 20.4	season the livin ea, h1,m May 0.62 ea T1 (for 20.96 n rest of 20.34 welling, 0.58 of dwelling 20.3	693.08 ng area (see 7 Jun 0.44 bllow s 20.99 dwellir 20.36 h2,m (see 7) 20.35 lling) = 20.6	a from Tal Table 9a) Jul 0.32 teps 3 to 7 21 ag from Tal 20.36 see Table 0.27 (follow ster 20.36 fLA × T1 20.6	bble 9 A 0.3 7 in 1 2 20. 9a) 0.3 + (1 20	Th1 (°C) ug Sep 6 0.59 Table 9c) 1 20.98 9, Th2 (°C) 36 20.35 1 0.54 1 to 7 in Tabl 36 20.33 f - fLA) × T2 6 20.58	Oct 0.85 20.79 20.34 0.83 e 9c) 20.1 LA = Liv	Nov 0.96 20.44 20.34 0.95 19.6 ving area ÷ (-	Dec 0.98 20.12 20.33 0.98		(85) (86) (87) (88) (89) (90)

(00)	1 40 74	T 00 00	l	00.55			l	00.50	00.07	10.00	40.54	I	(02)	
(93)m= 19.53 8. Space hea	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51		(93)	
Set Ti to the				re obtair	ed at ste	ep 11 of	Table 9	b, so tha	t Ti.m=(76)m an	d re-calc	culate		
the utilisation			•											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation fa		T T	i	i	i	i		i	i	i	i	ı		
(94)m= 0.97	0.95	0.9	0.78	0.6	0.41	0.29	0.33	0.56	0.83	0.94	0.97		(94)	
	Useful gains, hmGm , W = (94)m x (84)m (95)m=													
Monthly ave						169.97	196.39	303.11	400.16	419.22	425.1		(95)	
(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	te for me	an interr	ıal tempe	L erature,		L =[(39)m :	x [(93)m	L – (96)m	!]	<u> </u>			, ,	
(97)m= 769.26		678.64	562.34	430.79	285.07	190.19	198.8	310.81	475.38	629.94	759.24		(97)	
Space heating	ng requir	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		ı		
(98)m= 242.87	176.71	125.05	46.74	11.25	0	0	0	0	55.96	151.71	248.6			
			-	-	-	-	Tota	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1058.9	(98)	
Space heating	ng requir	ement in	kWh/m²	² /year								15.21	(99)	
9b. Energy re	quireme	nts – Coi	mmunity	heating	scheme	:								
This part is us										unity sch	neme.		_	
Fraction of sp	ace heat	from se	condary	/supplen	nentary I	neating ((Table 1	1) '0' if n	one			0	(301)	
Fraction of sp	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)	
The community s		-							up to four	other heat	sources; t	he latter		
includes boilers, Fraction of he		-			rom powei	r stations.	See Appei	ndix C.				1	(303a)	
Fraction of to	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)	
Factor for cor	itrol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)	
Distribution lo	ss factor	(Table 1	12c) for (commun	ity heatii	ng syste	m					1.05	(306)	
Space heating	ıg										'	kWh/yea	_ r	
Annual space	heating	requiren	nent									1058.9		
Space heat fr	om Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1111.84	(307a)	
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308	
Space heating	g require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)	
Water heatin	a													
Annual water	_	requirem	ent									2024.72		
If DHW from o		•											_	
Water heat from Community heat pump $(64) \times (303a) \times (305) \times (306) =$											2125.95	(310a)		
Electricity use	ed for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	32.38	(313)	
Cooling Syste	em Energ	y Efficie	ncy Rati	0								0	(314)	
Space cooling	g (if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)	
Electricity for													_	
mechanical v	entilation	- baland	ed, extra	act or po	sitive in	put from	outside					170.14	(330a)	

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		170.14	(331)
Energy for lighting (calculated in Appendix L)				318.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity	')			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3617.74	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto		missions g CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second t	fuel	280	(367a)
CO2 associated with heat source 1 [(307	(b)+(310b)] x 100 ÷ (367b) x	0.52	=	600.15	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.8	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	616.95	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			616.95	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	=	88.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	165.36	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	licable	0.52 x 0.01	= [-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				814.14	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				11.7	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:31

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.62m2 **Plot Reference:** Site Reference : Highgate Road - GREEN 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 13.11 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 0.18 (max. 0.70) External wall 0.17 (max. 0.30) OK **OK**

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 - Heat pump

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 m ³ /m ² h	
Deute, Welle II volve	0.147/217	
Party Walls U-value	0 W/m²K	

Photovoltaic array

		<u>U</u>	lser De	etails: _						
Assessor Name:	Neil Ingham			Stroma	Num	her:		STRO	010943	
Software Name:	Stroma FSAP 201	2		Softwa					n: 1.0.5.50	
		Prop	perty A	ddress:	03 - G					
Address :										
1. Overall dwelling dime	ensions:		Area	(m²)		Δv He	ight(m)		Volume(m³	\
Ground floor		[<u> </u>	(1a) x		.65	(2a) =	134.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	ı (1n)+(50).62	(4)			1		_
Dwelling volume		´ ` ` [)+(3c)+(3c	d)+(3e)+	.(3n) =	134.14	(5)
2. Ventilation rate:										
2. Ventuation rate.		econdary leating	C	other		total			m³ per hou	r
Number of chimneys	heating h		+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	x	20 =	0	(6b)
Number of intermittent fa	ıns				, 	0	x .	10 =	0	(7a)
Number of passive vents	i				F	0	x -	10 =	0	(7b)
Number of flueless gas fi	res				F	0	X 4	40 =	0	(7c)
					_					_
								Air ch	anges per ho	ur
Infiltration due to chimne	•				ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		ей, ргосеей то) (17), Ol	iriei wise c	onunue m	om (9) to ((10)		0	(9)
Additional infiltration	- , ,						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value corres ngs); if equal user 0.35	ponding to the	e greate	r wall area	a (after					
If suspended wooden f		ed) or 0.1 ((sealed	d), 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 st	ripped							0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate	aEO evereged in out	io motros n				2) + (13) -		oroo	0	(16)
Air permeability value, If based on air permeabil	•	•		•	•	elle ol e	rivelope	alea	3	(17)
Air permeability value applie	-					is being u	sed		0.15	(10)
Number of sides sheltere	ed								0	(19)
Shelter factor				20) = 1 - [9)] =			1	(20)
Infiltration rate incorporat	_		(:	21) = (18)	x (20) =				0.15	(21)
Infiltration rate modified f			1		_			_	1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp			20 1	27 1	4	4.0	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		
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		

0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe	ctive air	change i	rate for t	he appli	cable ca	se	<u> </u>		ļ		<u>!</u>		
If mechanica												0.5	(2:
If exhaust air h		0		, ,	,	. ,	,, .	`) = (23a)			0.5	(2
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(2
a) If balance						- `	- 	<u> </u>	2b)m + (23b) × [- ` ` `	÷ 100]	
24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(2
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b	m = (22)	2b)m + (23b)		Ī	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				_				
<u> </u>	n < 0.5 ×	<u> </u>	· ·	<u> </u>	ŕ	· ` `	É `		`	ŕ	1	1	(0
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilation								0.51				
24d)m= 0	0	0	0	0	0	0	0.5 + [(2	0	0.5]	0	0		(2
Effective air			,			<u> </u>							(_
25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(2
0.31	0.31	0.31	0.29	0.20	0.26	0.20	0.26	0.27	0.20	0.29	0.3		(2
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros	_	Openin		Net Ar		U-val		AXU		k-value		Χk
Caralanna	area	(m²)	m	l ²	A ,r		W/m2		(W/	K)	kJ/m²-l	K kJ	
/indows					8.97	x1	/[1/(1.4)+	0.04] = [11.89	ᆗ,			(2 —
/alls Type1	31.4	4	8.97		22.43	3 X	0.18	= [4.04	!	60	1345.8	3 (2
Valls Type2	22.9	92	0		22.92	2 x	0.17	=	3.85		60	1375.2	2 (2
otal area of e	lements	, m²			54.32	2							(3
arty wall					30.08	3 X	0	=	0		45	1353.6	3 (3
arty floor					50.62	2				[40	2024.8	3 (3
arty ceiling					50.62	2					30	1518.6	3 (3
nternal wall **	:				83.2						9	748.8	(3
for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	n paragraph	n 3.2	
* include the area				ls and par	titions								
abric heat los	3s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				19.78	(3
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	8366.8	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			165.29	(3
or design asses: an be used inste				construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
an be usea inste hermal bridge				ıcina Δr	nandiy l	<i>(</i>						5.00	$\neg_{\prime 2}$
details of therma	•	,			-	`						5.92	(3
otal fabric he		are not kir	OWII (30) =	- 0.00 X (3	'')			(33) +	(36) =			25.7	<u></u> (3
	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × ((25)m x (5)		
	ı	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
entilation hea	l Feb							-	-	 	+		
entilation hea	Feb 13.69	13.52	12.69	12.53	11.7	11.7	11.53	12.03	12.53	12.86	13.19		(3
Jan 8)m= 13.86	13.69	13.52	12.69	12.53	11.7	11.7	11.53		<u> </u>	<u> </u>	13.19		(3
entilation hea	13.69	13.52	12.69	12.53	37.39	37.39	37.23		12.53 = (37) + (38.22	<u> </u>	38.89	1	(3)

Heat loss par	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.78	0.78	0.77	0.76	0.76	0.74	0.74	0.74	0.75	0.76	0.76	0.77		
						l	l		Average =	: Sum(40) ₁	12 /12=	0.76	(40)
Number of da	-	nth (Tab	le 1a)		ı			1	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 hea	ating ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occ 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		71		(42)
Annual avera Reduce the annu not more that 12:	ial 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		1											
(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		
	•								Total = Su	ım(44) ₁₁₂ =	-	897.28	(44)
Energy content of	of hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x C	OTm / 3600) 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		_
If instantaneous	water heat	ing at naint	of upo (no	hot woto	r otorogol	ontor O in	hayaa (16		Total = Su	ım(45) ₁₁₂ =	= [1176.48	(45)
If instantaneous	1	· ·	·	i	, , , , , , , , , , , , , , , , , , ,		, ,	, , , ,	1		· ·		(40)
(46)m= 18.3 Water storage	16 2 loss:	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72		(46)
Storage volur) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature											0		(49)
Energy lost fr		•			or io not		(48) x (49)) =		1	10		(50)
b) If manufactHot water sto			-							0	02		(51)
If community	•			_ (,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77				0.	.02		(= -)
Volume facto	r from Ta	ble 2a								1.	.03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fr		•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	e loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	it loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar 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 ca	alculated f	or each	month (′61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0	0	0	0	0	0	0 0	0	П	0	0	0	0	1	(61)
	uired for	water he	eating ca	L	L I for eac	h month	(62)ı	——I m =	0 85 x (′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 177.25		165.36	149.47	147.37	132.96	128.91	139.		139	154.93	162.27	173.4]	(62)
Solar DHW input	calculated u	using App	endix G or	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	J	
(add additiona												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from w	ater heat	er					•	•			•	•	•	
(64)m= 177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.	.78	139	154.93	162.27	173.4]	
	•			•	•	•		Outp	ut from wa	ater heate	er (annual)	12	1827.32	(64)
Heat gains fro	m water l	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	i] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 84.78	75.41	80.82	74.71	74.84	69.22	68.71	72.3	32	71.23	77.36	78.96	83.5]	(65)
include (57)	m in calc	ulation o	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	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 85.42	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 gains	(calculat	ed in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso s	ее Т	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 ga	ins (calcu	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5		-		
(68)m= 148.84	150.39	146.5	138.21	127.75	117.92	111.35	109.	.81	113.7	121.99	132.45	142.28]	(68)
Cooking gains	s (calculat	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 fa	ns gains	(Table 5	5a)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.	33	-68.33	-68.33	-68.33	-68.33		(71)
Water heating	gains (T	able 5)											_	
(72)m= 113.95	112.22	108.64	103.76	100.59	96.14	92.35	97.	2	98.93	103.97	109.67	112.23		(72)
Total interna	l gains =				(66)m + (67)m	n + (68	8)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 325.01	323.3	313.57	298.03	282.52	267.37	257.39	262.	.22	270.09	285.81	303.84	317.1		(73)
6. Solar gain														
Solar gains are		ŭ				•	tions t	to co	nvert to th	e applical		tion.		
Orientation:	Access Fa Table 6d	actor	Area m²		Flu	ıx ble 6a		т.	g_ able 6b	т	FF able 6c		Gains (W)	
-							1 1	1 (1
Northeast 0.9x	0.77	X	8.9		_	11.28	X		0.63	_ ×	0.7	=	30.93	(75)
Northeast 0.9x	0.77	X	8.9			22.97	X		0.63	╛ [╵] ┝	0.7	_ =	62.96	(75)
Northeast 0.9x	0.77	X	8.9			41.38	X		0.63	×	0.7	=	113.43	(75)
Northeast 0.9x	0.77	X	8.9		_	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	X	8.9	97	X S	97.38	x [0.63	x	0.7	=	266.96	(75)
Northeast _{0.9x}	0.77	x	8.9	97	х	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast _{0.9x}	0.77	Х	8.9)7	х	72.63	x [0.63	x	0.7	=	199.1	(75)
Northeast _{0.9x}	0.77	Х	8.9)7	x t	50.42] x [0.63	х	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	x	8.9	97	x 2	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast _{0.9x}	0.77	x	8.9	97	х	14.2	х	0.63	_ x [0.7	=	38.92	(75)
Northeast 0.9x	0.77	X	8.9)7	х	9.21	x	0.63	_ x [0.7	=	25.26	(75)
•		<u> </u>											
Solar gains in	watts, ca	alculated	I for eacl	h month			(83)m =	Sum(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	nd solar	(84)m =	= (73)m	+ (83)m	, watts						•	
(84)m= 355.94	386.26	427.01	484.32	532.94	534.34	507.13	461.32	408.31	362.75	342.76	342.36		(84)
7. Mean inte	rnal temp	erature	(heating	season)								
Temperature	during h	eating p	eriods ir	n the livi	ng area	from Tal	ole 9, 1	h1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.98	0.96	0.93	0.82	0.64	0.44	0.32	0.37	0.61	0.87	0.96	0.98		(86)
Mean interna	al temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Ta	ole 9c)		-	•	•	
(87)m= 20.13	20.27	20.52	20.81	20.95	20.99	21	21	20.97	20.77	20.42	20.11		(87)
Temperature	during b	eating n	oriode ir	rost of	dwelling	from To	hla a	Th2 (°C)	<u> </u>	!	!		
(88)m= 20.27	20.27	20.28	20.29	20.29	20.31	20.31	20.31		20.29	20.29	20.28		(88)
` '	<u> </u>			<u> </u>	<u> </u>	<u> </u>							, ,
Utilisation fa					T	1	T	1 0.50	0.04	T 0.05	0.00		(89)
(89)m= 0.97	0.96	0.91	0.79	0.59	0.4	0.27	0.31	0.56	0.84	0.95	0.98		(03)
Mean interna	al temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)		T	Ī	
(90)m= 19.1	19.31	19.66	20.06	20.24	20.3	20.31	20.31		20.03	19.54	19.09		(90)
								1	LA = Livir	ng area ÷ (4) =	0.49	(91)
Mean_interna	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 –	fLA) × T2					
(92)m= 19.61	19.78	20.08	20.43	20.59	20.64	20.65	20.65	20.62	20.39	19.97	19.59		(92)
Apply adjust	ment to the	ne mean	interna	temper	ature fro	m Table	4e, w	here appro	opriate			•	
(93)m= 19.61	19.78	20.08	20.43	20.59	20.64	20.65	20.65	20.62	20.39	19.97	19.59		(93)
8. Space hea	·												
Set Ti to the the utilisation					ned at st	ep 11 of	Table	9b, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa			•	iviay	<u> </u>	<u> </u>	7105	,	000	1407	_ <u></u>		
(94)m= 0.97	0.95	0.91	0.79	0.61	0.42	0.3	0.34	0.58	0.85	0.95	0.97		(94)
Useful gains	, hmGm ,	W = (94	4)m x (84	 4)m	<u>!</u>	!	!		<u>I</u>	<u>!</u>	<u>!</u>		
(95)m= 344.68	367.88	388.24	384.81	326.31	224.34	151.08	157.68	3 238.18	307.45	324.2	332.97		(95)
Monthly ave	rage exte	rnal tem	perature	from T	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 rat	_				Lm , W	=[(39)m	x [(93)	m- (96)m]			•	
(97)m= 605.37		532.59	442.53	339.89	225.9	151.29	158.09		374.26	496.17	598.46		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(9	7)m – (95)m] x (4	1)m		•	
(98)m= 193.95	146.61	107.39	41.56	10.1	0	1 0	l 0	l 0	49.71	123.82	197.53		

		_		_
	Total per year (kWh/	/year) = Sum(98) _{15,912} =	870.67	(98)
Space heating requirement in kWh/m²/year			17.2	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating praction of space heat from secondary/supplementary heating (Tabl		mmunity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =	,	Γ	1	(302)
The community scheme may obtain heat from several sources. The procedure allows	s for CHP and up to f	؎ four other heat sources; the	e latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See A Fraction of heat from Community heat pump	Appendix C.	Г	1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system			(305)
Distribution loss factor (Table 12c) for community heating system	meag eyere		1.05	(306)
Space heating		L	kWh/year	
Annual space heating requirement		Γ	870.67	7
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	914.2	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		Γ	1827.32	7
If DHW from community scheme:		_		⊿ –
Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	1918.69	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	7e) + (310a)(310e)] =	28.33	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outs	side	Ε	107.68	(330a)
warm air heating system fans		Ī	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	(b) + (330g) =	107.68	(331)
Energy for lighting (calculated in Appendix L)		Ī	239.96	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (3	315) + (331) + (33	32)(237b) =	3071.72	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh k	Emissions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	fuels repeat (363) to	(366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b	o)] x 100 ÷ (367b) x	0.52	525.1	(367)
Electrical energy for heat distribution [(313)) x	0.52	14.7	(372)

Total CO2 associated with community sy	stems	(363)(366) + (368)(37	2)	=	539.8	(373)
CO2 associated with space heating (second	ondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion	on heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wa	ter heating	(373) + (374) + (375) =			539.8	(376)
CO2 associated with electricity for pumps	and fans within dwe	lling (331)) x	0.52	=	55.89	(378)
CO2 associated with electricity for lighting	9	(332))) x	0.52	=	124.54	(379)
Energy saving/generation technologies (3 Item 1	333) to (334) as appli	cable	0.52 × 0.01	= _	-56.48	(380)
Total CO2, kg/year	sum of (376)(382) =				663.75	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.11	(384)
El rating (section 14)					90.7	(385)

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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: 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 25.77 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.51 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

Party wall 0.00 (max. 0.20)
Floor (no floor)

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 - Heat pump

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	400.007	
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
Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
ased on:		
Overshading:	Average or unknown	
Windows facing: North East	9.56m²	
Windows facing: South East	8.76m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

			Jser D	etails: _						
Assessor Name:	Neil Ingham			Stroma	Num	her:		STRO	010943	
Software Name:	Stroma FSAP 2012	2		Softwa					n: 1.0.5.50	
		Pro	perty A	Address:	03 - H					
Address :										
1. Overall dwelling dime	nsions:		Δrea	a(m²)		Δv He	ight(m)		Volume(m³)	\
Ground floor				<u>` </u>	(1a) x		.65	(2a) =	169.39	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e))+(1n)	6:	3.92	(4)			.		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	169.39	(5)
2. Ventilation rate:										
		condary eating		other		total			m³ per hou	r
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	j = F	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				Ī	0	x -	10 =	0	(7a)
Number of passive vents					Ē	0	x ·	10 =	0	(7b)
Number of flueless gas fi	res				Ė	0	x 4	40 =	0	(7c)
									_	_
					_			Air ch	nanges per ho	ur —
Infiltration due to chimne	, ·				ontinue fr	0 om (9) to (÷ (5) =	0	(8)
Number of storeys in the		u, proceed to	0 (11), 0	ni ici wise e	onunae m	om (5) to ((10)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
if both types of wall are pi deducting areas of openir	resent, use the value corresp ngs); if equal user 0.35	onding to th	ne greate	er wall area	a (after					
If suspended wooden f	loor, enter 0.2 (unseale	ed) or 0.1	(seale	d), else	enter 0				0	(12)
If no draught lobby, en									0	(13)
Percentage of windows	s and doors draught str	ripped			(4.4)	001			0	(14)
Window infiltration				0.25 - [0.2 (8) + (10) -			ı (15) —		0	(15)
Infiltration rate Air permeability value,	a50 everessed in cubi	c metres						area	0	(16)
If based on air permeabil	•		•	•	•	cue oi e	invelope	aica	0.15	(18)
Air permeability value applie						is being u	sed		0.10	()
Number of sides sheltere	d								0	(19)
Shelter factor				(20) = 1 - [9)] =			1	(20)
Infiltration rate incorporat	-			(21) = (18)	x (20) =				0.15	(21)
Infiltration rate modified for	 	li i i	11	A 1	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]	
(/	7.0	0	0.0	5	•	L	I		I	
Wind Factor (22a)m = (22	'	Г							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					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		-	rate for t	пе арріі	саріе са	se					I	0.5	(238
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)			0.5	(231
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(23)
a) If balance	ed mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (22	2b)m + (23b) × [ı (23c) – 1		┛`
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3	_	(24
b) If balance	d 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		(24
c) If whole h				•					5 (00)	`			
	i	(23b), t	· ` `	ŕ		· ` `	ŕ	<u> </u>	· ` `			1	(24
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)r		on or wn en (24d)							0.51				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
2 Hoot losses	e and he	ot loco r	ooromot	or:					ı	1	•		
3. Heat losse ELEMENT	S and he Gros		Openin		Net Ar	ea	U-valı	IE	AXU		k-value	e A >	X k
LLLIVILINI	area		m		A ,r		W/m2		(W/I	〈)	kJ/m²·ł		
Windows Type	e 1				9.56	x1.	/[1/(1.4)+	0.04] =	12.67				(27
Windows Type	2				8.76	x1.	/[1/(1.4)+	0.04] =	11.61				(27
Walls Type1	61.0	9	18.3	2	42.77	, X	0.18	=	7.7	$\overline{}$ [60	2566.2	(29
Walls Type2	3.80	6	0		3.86	x	0.17	=	0.65	$\overline{}$	60	231.6	(29
Total area of e	lements	, m²			64.95	5							— (31
Party wall					37.5	x	0	=	0	\neg	45	1687.5	(32
Party floor					63.92	2					40	2556.8	(32
Party ceiling					63.92	<u> </u>				Ī	30	1917.6	(32
Internal wall **					113.4	7				Ī	9	1021.23	3 (32
* for windows and						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph		_
** include the area				is and pari	titions		(26)(30)	± (32) =			ĺ		٦,,,,
Fabric heat los		•	U)				(20)(30)		.(30) + (32	2) + (225)	(320) -	32.63	(33
Heat capacity Thermal mass		,	2 – Cm	TEA) ir	k I/m²k⁄			***	$\div (4) =$	2) + (32a).	(32e) =	9980.93	(34
For design asses	•	•		,			ecisely the	` '	. ,	TMP in T	able 1f	156.15	(35
can be used inste				conditaon	017 470 770	. rarowr pr	colocity the	maioanvo	values of		ubio 11		
Thermal bridg	es : S (L	x Y) cal	culated (using Ap	pendix l	<						7.91	(36
if details of therm		are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric he									(36) =			40.54	(37
Ventilation hea	i	i							= 0.33 × (T	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		/00
(38)m= 17.5	17.29	17.08	16.03	15.82	14.77	14.77	14.56	15.19	15.82	16.24	16.66	I	(38
1		+ 101/1/											
Heat transfer (39)m= 58.04	57.83	57.62	56.57	56.36	55.32	55.32	55.11	(39)m 55.73	= (37) + (3 56.36	38)m 56.78	57.2	ı	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.91	0.9	0.9	0.89	0.88	0.87	0.87	0.86	0.87	0.88	0.89	0.89		
				!		!			Average =	Sum(40) ₁	12 /12=	0.88	(40)
Number of day	<u> </u>			·	i .				<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 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		09		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed			se target c		3.84		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage is								1 1	1	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		
										ım(44) ₁₁₂ =	L	1006.06	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,ı	n x nm x E	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	vator hoati	na at noint	of use (no	n hot water	r storaga)	enter () in	hoves (46		Total = Su	ım(45) ₁₁₂ =	= [1319.1	(45)
			,		· · ·		· · ·	, , , ,	10.70	10.00	40.07		(46)
(46)m= 20.51 Water storage	17.94 loss:	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		0		(47)
If community h	neating a	and no ta	nk in dw	velling, e	nter 110) litres in	(47)				'		
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage					(1.14.4)								
a) If manufact				or is kno	wn (kVVI	n/day):					0		(48)
Temperature f											0		(49)
Energy lost from b) If manufact		•			or ic not		(48) x (49)) =		1	10		(50)
Hot water stor			-							0.	02		(51)
If community h	•			•		• ,							` '
Volume factor										1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or (` , ` `	,								1.	.03		(55)
Water storage	loss cal	culated 1	or each	month	•		((56)m = ((55) × (41)	m •				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(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= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•		, ,						
(modified by					ı —			<u> </u>	1	- 			
(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 v (41	١m						
(61)m= 0	0	0	0	0 0	00) + 3	03 × (41)) 0	0	T 0	0	0	1	(61)
												J (59)m + (61)m	(-)
(62)m= 192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.0		` 	` 	187.72]	(62)
Solar DHW input	<u> </u>											J	(/
(add additiona									ar contino	mon to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter					!	ļ.			<u> </u>	J	
(64)m= 192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.0)2 149.37	167.01	175.46	187.72	1	
	1	<u> </u>	<u> </u>	ļ.		Į	C	Output from v	vater heat	_ I er (annual)₁	112	1969.94	(64)
Heat gains fro	m water	heating,	kWh/me	onth 0.2	5 ′ [0.85	5 × (45)m	+ (61)m] + 0.8	x [(46)n	n + (57)m	+ (59)m	1]	-
(65)m= 89.69	79.71	85.26	78.58	78.55	72.42	71.67	75.7	` 	81.37	83.35	88.26]	(65)
include (57)	m in cald	culation of	of (65)m	only if c	vlinder	is in the	dwellir	ng or hot v	vater is	from com	munity h	ı neating	
5. Internal ga					,			<u> </u>			,	<u> </u>	
Metabolic gair	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g 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 gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m= 16.29	14.47	11.77	8.91	6.66	5.62	6.07	7.9	10.6	13.46	15.7	16.74]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	lso see Ta	able 5	•	•	•	
(68)m= 182.71	184.61	179.83	169.66	156.82	144.75	136.69	134.	8 139.57	149.75	162.58	174.65]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	e 5	•	-	-	
(69)m= 33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.4	5 33.45	33.45	33.45	33.45]	(69)
Pumps and fa	ns gains	(Table 5	ōa)					•	•			•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)			•	•	•	•	•	
(71)m= -83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	6 -83.6	-83.6	-83.6	-83.6]	(71)
Water heating	gains (T	able 5)		-		-		-	-	-	-	-	
(72)m= 120.56	118.62	114.6	109.13	105.58	100.58	96.34	101.7	78 103.71	109.37	115.76	118.63]	(72)
Total internal	gains =				(66)m + (67)m	ı + (68)	m + (69)m +	(70)m + (71)m + (72))m	-	
(73)m= 373.91	372.05	360.55	342.05	323.41	305.31	293.45	298.8	32 308.23	326.92	348.4	364.37]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	itions to	convert to t	he applica	able orienta	tion.		
Orientation:			Area		Flu			g_ Table 6b	_	FF		Gains	
_	Table 6d		m²			ble 6a		Table 60) — -	Table 6c		(W)	-
Northeast _{0.9x}	0.77	Х	9.5	56	x	11.28	x	0.63	x	0.7	=	32.96	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	22.97	X	0.63	x	0.7	=	67.1	(75)
Northeast 0.9x	0.77	X	9.5	56	X	41.38	X	0.63	x	0.7	=	120.89	(75)
Northeast 0.9x	0.77	Х	9.5	56	x	67.96	X	0.63	x	0.7	=	198.54	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	91.35	X	0.63	Х	0.7	=	266.88	(75)

		$\overline{}$					٦ .		- 1				– 1
Northeast _{0.9x}	0.77	X	9.5	56	X	97.38	X	0.63	X	0.7	=	284.52	(75)
Northeast _{0.9x}	0.77	Х	9.5	56	X	91.1	X	0.63	X	0.7	=	266.17	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	72.63	X	0.63	X	0.7	=	212.19	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	50.42	X	0.63	X	0.7	=	147.31	(75)
Northeast _{0.9x}	0.77	Х	9.5	56	X	28.07	X	0.63	X	0.7	=	82	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	14.2	X	0.63	X	0.7		41.48	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	9.21	X	0.63	X	0.7	=	26.92	(75)
Southeast _{0.9x}	0.77	Х	8.7	76	x	36.79	X	0.63	X	0.7	=	98.5	(77)
Southeast 0.9x	0.77	X	8.7	76	X	62.67	X	0.63	X	0.7	=	167.79	(77)
Southeast 0.9x	0.77	X	8.7	76	x	85.75	X	0.63	X	0.7	=	229.57	(77)
Southeast _{0.9x}	0.77	X	8.7	76	x	106.25	x	0.63	X	0.7	=	284.45	(77)
Southeast _{0.9x}	0.77	X	8.7	76	x	119.01	X	0.63	x	0.7		318.61	(77)
Southeast _{0.9x}	0.77	X	8.7	76	x	118.15	X	0.63	x	0.7	=	316.31	(77)
Southeast _{0.9x}	0.77	Х	8.7	76	x	113.91	X	0.63	x	0.7	=	304.95	(77)
Southeast _{0.9x}	0.77	X	8.7	76	x	104.39	X	0.63	X	0.7	=	279.47	(77)
Southeast _{0.9x}	0.77	x	8.7	76	x	92.85	x	0.63	X	0.7	=	248.58	(77)
Southeast _{0.9x}	0.77	x	8.7	76	x	69.27	x	0.63	х	0.7	=	185.44	(77)
Southeast _{0.9x}	0.77	x	8.7	76	х	44.07	X	0.63	X	0.7	=	117.98	(77)
Southeast _{0.9x}	0.77	x	8.7	76	x	31.49	x	0.63	x	0.7		84.3	(77)
Solar gains in	watts, cal	lculated	for eac	h month			(83)m	= Sum(74)m .	(82)m	_		•	
(83)m= 131.47	<u> </u>	350.47	483	585.49	600.83		491	.66 395.89	267.44	159.46	111.22		(83)
Total gains – i	nternal ar	nd solar	(84)m =	= (73)m ·	+ (83)n	າ , watts							
	1 1				`					<u> </u>		1	
(84)m= 505.38	606.94	711.02	825.05	908.91	906.14		790	.48 704.13	594.37	7 507.86	475.59		(84)
(84)m= 505.38 7. Mean inter				l	906.14		790	.48 704.13	594.37	7 507.86	475.59		(84)
` '	nal tempe	erature ((heating	season	906.14	864.57			594.37	7 507.86	475.59	21	(84)
7. Mean inter	nal tempe during he	erature ((heating eriods ir	season the livin	906.14) ng area	864.57			594.37	507.86	475.59	21	
7. Mean inter	nal tempe during he	erature ((heating eriods ir	season the livin	906.14) ng area	864.57	ble 9		594.37 Oct		475.59 Dec	21	
7. Mean inter Temperature Utilisation fac	rnal tempe during he ctor for ga	erature (eating points	(heating eriods ir iving are	season the livinea, h1,m	906.14) ng area (see T	a from Tal	ble 9	Th1 (°C)				21	
7. Mean inter Temperature Utilisation fac	during he ctor for ga	erature (eating points for limes for	(heating eriods ir iving are Apr 0.73	season the living ea, h1,m May	906.14) ing area (see T Jun 0.39	a from Tal able 9a) Jul 0.28	ble 9,	Th1 (°C) ug Sep 2 0.53	Oct	Nov	Dec	21	(85)
7. Mean inter Temperature Utilisation fact Jan (86)m= 0.97	during he ctor for ga	erature (eating points for limes for	(heating eriods ir iving are Apr 0.73	season the living ea, h1,m May	906.14) ing area (see T Jun 0.39	a from Tal Table 9a) Jul 0.28	ble 9,	Th1 (°C) ug Sep 12 0.53 Table 9c)	Oct	Nov 0.94	Dec	21	(85)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.97 Mean interna (87)m= 19.93	during hector for ga Feb 0.94 I tempera	erature (eating points for limited Mar 0.87 otture in lagrangement)	(heating eriods ir iving are 0.73 iving are 20.81	season n the livin ea, h1,m May 0.55 ea T1 (fo	906.14) ing area i (see T Jun 0.39 bllow st 20.99	a from Tal able 9a) Jul 0.28 eps 3 to 7	ble 9, 0.3	Th1 (°C) ug Sep 12 0.53 Table 9c) 1 20.97	Oct 0.8	Nov 0.94	Dec 0.97	21	(85)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.97 Mean interna	during hector for ga Feb 0.94 I tempera	erature (eating points for limited Mar 0.87 otture in lagrangement)	(heating eriods ir iving are 0.73 iving are 20.81	season n the livin ea, h1,m May 0.55 ea T1 (fo	906.14) ing area i (see T Jun 0.39 bllow st 20.99	a from Tal able 9a) Jul 0.28 eps 3 to 7	ble 9, 0.3	Th1 (°C) ug Sep 2 0.53 able 9c) 1 20.97 9, Th2 (°C)	Oct 0.8	Nov 0.94 20.3	Dec 0.97	21	(85)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.97 Mean interna (87)m= 19.93 Temperature (88)m= 20.16	rnal temperature during here tor for garage from 1.94 and temperature 20.19 during here 20.16	erature (eating points for line Mar 0.87 eating points 20.17	(heating eriods ir iving are 0.73 iving are 20.81 eriods ir 20.18	season the livin ea, h1,m May 0.55 ea T1 (for 20.95 rest of 20.18	906.14) ng area (see T Jun 0.39 bllow si 20.99 dwellir 20.2	a from Tallade 9a) Jul 0.28 eps 3 to 21 g from Tallade 9a)	ble 9, A) 0.3 7 in T 2 able 9	Th1 (°C) ug Sep 2 0.53 able 9c) 1 20.97 9, Th2 (°C)	Oct 0.8	Nov 0.94 20.3	Dec 0.97	21	(85) (86) (87)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.97 Mean interna (87)m= 19.93 Temperature (88)m= 20.16 Utilisation fac	rnal temperature during here tor for garage from 1.94 and temperature 20.19 during here 20.16	erature (eating points for line Mar 0.87 eating points 20.17	(heating eriods ir iving are 0.73 iving are 20.81 eriods ir 20.18	season the livin ea, h1,m May 0.55 ea T1 (for 20.95 rest of 20.18	906.14) ng area (see T Jun 0.39 bllow si 20.99 dwellir 20.2	a from Tallade 9a) Jul 0.28 eps 3 to 21 g from Tallade 9a)	Al 0.3 7 in T 2 able 9	Th1 (°C) ug Sep 12 0.53 Table 9c) 1 20.97 9, Th2 (°C) 2 20.19	Oct 0.8	Nov 0.94 20.3	Dec 0.97	21	(85) (86) (87)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.97 Mean interna (87)m= 19.93 Temperature (88)m= 20.16 Utilisation fac (89)m= 0.96	rnal temper during he ctor for ga	erature (eating points for line 120.51 eating points for ross	(heating eriods ir iving are 0.73 iving are 20.81 eriods ir 20.18 est of do 0.69	season the livin ea, h1,m May 0.55 ea T1 (for 20.95 rest of 20.18 welling, 0.51	906.14) ing area i (see T Jun 0.39 collow st 20.99 dwellin 20.2 h2,m (see T)	a from Tal Table 9a) Jul 0.28 eps 3 to 7 21 g from Ta 20.2 see Table 0.23	ble 9 Ai 0.3 7 in T 2 able 9 9a) 0.2	Th1 (°C) ug Sep 12 0.53 Table 9c) 1 20.97 0, Th2 (°C) 2 20.19	Oct 0.8 20.76 20.18	Nov 0.94 20.3	Dec 0.97 19.89 20.17	21	(85) (86) (87) (88)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.97 Mean interna (87)m= 19.93 Temperature (88)m= 20.16 Utilisation fac (89)m= 0.96 Mean interna	rnal temper during he ctor for ga Feb 0.94 Itemperate 20.19 during he ctor for ga 0.92 Itemperate 10.92 Itemperate 10.92	erature (eating points for line in leating points for rough)	cheating eriods ir iving are 20.81 eriods ir 20.18 est of do 0.69 the rest	season the livin ea, h1,m May 0.55 ea T1 (for 20.95 rest of 20.18 welling, 0.51 of dwelli	906.14) ing area (see T Jun 0.39 bllow si 20.99 dwellir 20.2 h2,m (see T) 0.34 ing T2	a from Tal a from Tal a from Tal a location Jul 0.28 eps 3 to 21 g from Tal 20.2 see Table 0.23 (follow ste	ble 9 Ai 0.3 7 in T 2 able 9 9a) 0.2 eps 3	Th1 (°C) ug Sep 2 0.53 Table 9c) 1 20.97 9, Th2 (°C) 2 20.19 16 0.47 to 7 in Table	Oct 0.8 20.76 20.18 0.77 e 9c)	Nov 0.94 20.3 20.18	Dec 0.97 19.89 20.17	21	(85) (86) (87) (88) (89)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.97 Mean interna (87)m= 19.93 Temperature (88)m= 20.16 Utilisation fac (89)m= 0.96	rnal temper during he ctor for ga	erature (eating points for line 120.51 eating points for ross	(heating eriods ir iving are 0.73 iving are 20.81 eriods ir 20.18 est of do 0.69	season the livin ea, h1,m May 0.55 ea T1 (for 20.95 rest of 20.18 welling, 0.51	906.14) ing area i (see T Jun 0.39 collow st 20.99 dwellin 20.2 h2,m (see T)	a from Tal a from Tal a from Tal a location Jul 0.28 eps 3 to 21 g from Tal 20.2 see Table 0.23 (follow ste	ble 9 Ai 0.3 7 in T 2 able 9 9a) 0.2	Th1 (°C) ug Sep 12 0.53 Table 9c) 1 20.97 0, Th2 (°C) 2 20.19 to 7 in Table 2 20.17	Oct 0.8 20.76 20.18 0.77 e 9c) 19.91	Nov 0.94 20.3 20.18 0.93	Dec 0.97 19.89 20.17 0.97		(85) (86) (87) (88) (89)
7. Mean inter Temperature Utilisation fact Jan (86)m= 0.97 Mean internation (87)m= 19.93 Temperature (88)m= 20.16 Utilisation fact (89)m= 0.96 Mean internation (90)m= 18.74	rnal temper during he ctor for ga	erature (eating points for line 20.51 eating points for rounds for	criods ir iving are 0.73 iving are 20.81 eriods ir 20.18 est of do 0.69 the rest 19.97	season the livin ea, h1,m May 0.55 ea T1 (for 20.95 rest of 20.18 welling, 0.51 of dwelling	906.14) ing area (see T Jun 0.39 bllow st 20.99 dwellin 20.2 h2,m (s 0.34 ing T2 20.19	a from Tal Table 9a) Jul 0.28 Leps 3 to 7 21 Leps Table 0.23 (follow sterm 20.2)	Al 0.3 7 in T 2 able 9 9a) 0.2 eps 3	Th1 (°C) ug Sep 12 0.53 Table 9c) 1 20.97 9, Th2 (°C) 2 20.19 16 0.47 17 to 7 in Table 2 20.17	Oct 0.8 20.76 20.18 0.77 e 9c) 19.91	Nov 0.94 20.3 20.18	Dec 0.97 19.89 20.17 0.97	0.38	(85) (86) (87) (88) (89)
7. Mean inter Temperature Utilisation fac Jan (86)m= 0.97 Mean interna (87)m= 19.93 Temperature (88)m= 20.16 Utilisation fac (89)m= 0.96 Mean interna (90)m= 18.74	rnal temper during he ctor for ga	erature (eating points for in 20.51 eating points for in 10.85 eating point	cheating eriods ir o.73 iving are 20.81 eriods ir 20.18 est of do 0.69 the rest 19.97 r the wh	season the livin ea, h1,m May 0.55 ea T1 (for 20.95 rest of 20.18 welling, 0.51 of dwelling 20.13	906.14) ing area (see T Jun 0.39 bllow st 20.99 dwellir 20.2 h2,m (s 0.34 ing T2 20.19 lling) =	a from Tal a from Tal a from Tal a lable 9a) Jul 0.28 eps 3 to 2 21 g from Ta 20.2 see Table 0.23 (follow ste 20.2	Al 0.3 7 in T 2 able 9 9a) 0.2 eps 3 20 + (1	Th1 (°C) ug Sep 52 0.53 Table 9c) 1 20.97 9, Th2 (°C) 2 20.19 16 0.47 to 7 in Table 2 20.17	Oct 0.8 20.76 20.18 0.77 e 9c) 19.91 LA = Liv	Nov 0.94 20.3 20.18 0.93 19.29 ring area ÷ (-	Dec 0.97 19.89 20.17 0.97 18.69 4) =		(85) (86) (87) (88) (89) (90) (91)
7. Mean inter Temperature Utilisation fact Jan (86)m= 0.97 Mean internation (87)m= 19.93 Temperature (88)m= 20.16 Utilisation fact (89)m= 0.96 Mean internation (90)m= 18.74	during he tor for ga Feb 0.94 Itempera 20.19 during he 20.16 ctor for ga 0.92 Itempera 19.11	erature (eating points for line 20.51 eating points for rounds for	cheating eriods ir iving are 20.81 eriods ir 20.18 est of do 0.69 the rest 19.97 er the who 20.29	season the livin ea, h1,m May 0.55 ea T1 (for 20.95 rest of 20.18 welling, 0.51 of dwelling 20.13	906.14) ing area (see T Jun 0.39 ollow st 20.99 dwellin 20.2 h2,m (s 0.34 ing T2 20.19 lling) = 20.5	a from Tal Table 9a) Jul 0.28 eps 3 to 7 20.2 see Table 0.23 (follow sterm 20.2) fLA × T1 20.5	ble 9 Al 0.3 7 in T 2 able 9 0.2 9a) 0.2 eps 3 20 + (1 20	Th1 (°C) ug Sep 12 0.53 Table 9c) 1 20.97 9, Th2 (°C) 2 20.19 16 0.47 to 7 in Table 2 20.17 f f LA) × T2 5 20.47	Oct 0.8 20.76 20.18 0.77 e 9c) 19.91 LA = Liv	Nov 0.94 20.3 20.18 0.93 19.29 ring area ÷ (-	Dec 0.97 19.89 20.17 0.97		(85) (86) (87) (88) (89)

(93)m= 19.19	19.52	19.92	20.29	20.44	20.5	20.5	20.5	20.47	20.23	19.67	19.14		(93)
8. Space hea													
Set Ti to the rethe utilisation			•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac													
(94)m= 0.95	0.91	0.84	0.7	0.52	0.36	0.25	0.29	0.49	0.77	0.92	0.96		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 481.7	555.07	597.49	576.76	475.72	323.61	215.39	225.34	345.69	458.98	466.53	457.07		(95)
Monthly avera	_	r	. 		r								(0.0)
(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 (97)m= 864.4	845.57	an intern	644.22	492.83	Lm , VV =	=[(39)m : 215.79	x [(93)m- 226.04	- (96)m 355.11	542.96	713.83	854.77		(97)
Space heating		<u> </u>			l .						004.77		(37)
(98)m= 284.73	195.21	130.84	48.57	12.73	0	0.02	0	0	62.48	178.05	295.89		
(32)							Tota	l per year) = Sum(9	<u> </u>	1208.5	(98)
Space heating	a requir	ement in	k\/\/h/m²	?/vear				7 - 7	()	, (-	[18.91	(99)
•	•										l	10.91	(99)
9b. Energy red	•		The state of the s	Ĭ			ting prov	idad by	a comm	unity cok	nomo		
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none										0	(301)		
Fraction of spa	ace heat	from co	mmunity	svstem	1 – (30	1) =					[1	(302)
The community so			•	•	,	,	allows for	CHP and i	ın to four	other heat	sources: th	•	(000)
includes boilers, h									ap to rour	outer ricat	3001003, 11	ic iditor	
Fraction of hea	at from C	Commun	ity heat	pump								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ting syst	tem		ĺ	1	(305)
Distribution los	s factor	(Table 1	(2c) for c	commun	itv heatii	na svste	m				[1.05	(306)
Space heating		()	,		,	3 - 7					Į	kWh/yea	
Annual space		requirem	nent									1208.5	<u></u>
Space heat fro	•	•		p				(98) x (30)4a) x (30	5) x (306) :	₌ [1268.93	(307a)
Efficiency of se		•			svstem	in % (frc	m Table	4a or A	ppendix	E)		0	(308
Space heating	,		•	_	-	,)1) x 100 -	,	[[0	(309)
opace neating	require	mem no	300011	uai y/3u _l	picinicii	tary syst	CIII	(00) X (00	71) X 100	. (000) –	Į		(000)
Water heating		o autro m	ont								ſ	4000.04	7
Annual water h	_	-									l	1969.94	
If DHW from co Water heat from)				(64) x (30)3a) x (30	5) x (306) =	= [2068.44	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	33.37	(313)		
Cooling Syster	m Energ	v Efficie	ncv Ratio	0							[0	(314)
Space cooling	_	•	•		n if not e	enter (1)		= (107) ÷	(314) =		ا [0	(315)
	,					,		()	V= -7		l	<u> </u>	
Electricity for p mechanical ve							outside				[135.98	(330a)
				•	·						L		_

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =		135.98	(331)
Energy for lighting (calculated in Appendix L)		287.67	(332)		
Electricity generated by PVs (Appendix M) (negative quantity	<i>'</i>)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =		3652.2	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second	fuel	280	(367a)
CO2 associated with heat source 1 [(307	7b)+(310b)] x 100 ÷ (367b) x	0.52	=	618.6	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	17.32	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	=	635.93	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			635.93	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	=	70.57	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	149.3	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	olicable	0.52 × 0.01	= [-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				799.32	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				12.51	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:23

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 26.33 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.53 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 - Heat pump

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	10.070	<u> </u>
Continuous supply and extract system		
	0.47	
Specific fan power:	• • • • • • • • • • • • • • • • • • • •	214
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	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	
vermanon rate.	0.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	• · · · · · · · · · · · · · · · · · · ·	
Photovoltaic array		

		l lsar I	Details:										
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Ve				010943 on: 1.0.5.50					
Address :	Property Address: 03 - I Address:												
1. Overall dwelling dime	ensions:												
3		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	<u> </u>	0	Ī - Ē	0	x 2	20 =	0	(6b)				
Number of intermittent fa	ns				0	x '	10 =	0	(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)+(ontinus fr	0		÷ (5) =	0	(8)				
Number of storeys in the	een carried out or is intended, proceence	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 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 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	3	(17)				
· ·	es if a pressurisation test has been do				is being u	sed		0.15	(10)				
Number of sides sheltere	ed							0	(19)				
Shelter factor			(20) = 1 -		19)] =			1	(20)				
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.15	(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						
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>	I	<u> </u>	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	te (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		•	rate ior t	пе арріі	саріе са	se						0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	h heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h	ı) =				75.65	(23
a) If balance	ed mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (I	ЛV) (24b	o)m = (22	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r		tract ver × (23b), t		•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)					
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losse	s and he	eat loss	paramet	er:									
LEMENT	Gros area		Openin m	=	Net Ar A ,r		U-val W/m2		A X U (W/I	〈)	k-value kJ/m²-l		
Windows Type	e 1				4.7	x1	/[1/(1.4)+	0.04] =	6.23				(27
Vindows Type	e 2				6.09	x1	/[1/(1.4)+	0.04] =	8.07				(27
Vindows Type	e 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		60	2345.4	(29
Walls Type2	27.3	31	0		27.3	X	0.17	=	4.59		60	1638.6	(29
Total area of e	elements	s, m²			80.11								(31
Party wall					16.88	3 x	0	=	0		45	759.6	(32
Party floor					60.34	1					40	2413.6	(32
Party ceiling					60.34	1					30	1810.2	(32
nternal wall **	•				107.9	1					9	971.190	1 (32
for windows and						ated using	formula 1	1/[(1/U-valu	ıe)+0.04] a	is given in	paragraph	3.2	
* include the area abric heat los				is and par	uuons		(26)(30) + (32) =				29.8	(33
Heat capacity		•	0,					, , ,	(30) + (32	2) + (32a).	(32e) =	9938.59](34
hermal mass		. ,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K				÷ (4) =	, , ,	` ,	164.71	(35
or design asses an be used inste	sments wh	nere the de	tails of the	,			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	<						7.62	(36
f details of therma		are not kn	own (36) =	= 0.05 x (3	11)								_
Total fabric he									(36) =			37.42	(37
entilation hea		1	·						= 0.33 × () 	l	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m= 16.52	16.32	16.12	15.13	14.93	13.94	13.94	13.75	14.34	14.93	15.33	15.72		(38)
` ′		L	13.13	14.93	13.94	13.94	13.73			l	15.72		(30)
Heat transfe		53.54	52.55	52.35	51.36	51.36	51.16	51.76	= (37) + (3 52.35	52.75	53.14		
(00)111=	00.71	00.01	02.00	02.00	01.00	01.00	01.10			Sum(39) ₁	<u> </u>	52.5	(39)
Heat loss pa	rameter (I	HLP), W	m²K						= (39)m ÷				_
(40)m= 0.89	0.89	0.89	0.87	0.87	0.85	0.85	0.85	0.86	0.87	0.87	0.88		_
Number of d	avs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.87	(40)
Jan	i	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 requ	irement:								kWh/ye	ear:	
Assumed so	ou no nov	NI											(40)
Assumed oc if TFA > 1	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.		99		(42)
if TFA £ 1: Annual avera	,	ater usad	ae in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		81	.49		(43)
Reduce the ann	ual average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.70		(10)
not more that 1.		· ·				<u> </u>							
Jan Hot water usag		Mar r day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
	'	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64		
(44)m= 89.64	00.30	03.12	79.00	76.6	73.34	73.34	70.0			m(44) ₁₁₂ =	L	977.9	(44)
Energy content	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			. ,	L	077.0	(```
(45)m= 132.9	3 116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74		
If in atomton a cur	water beet	na ot noint	of upo (no	hot water	· otorogo)	antar O in	havea (16		Γotal = Su	m(45) ₁₁₂ =	=	1282.18	(45)
If instantaneous			·			1		` '	40.00	17.70	1004		(46)
(46)m= 19.94 Water storage		18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31		(46)
Storage volu) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storag		eclared I	oss facto	or is kno	wn (kWh	n/day).					0		(48)
Temperature				01 10 1410	("uay).					0		(49)
Energy lost f				ear			(48) x (49)) =			10		(50)
b) If manufa	cturer's d	eclared o	cylinder l	loss fact									, ,
Hot water sto	•			le 2 (kW	h/litre/da	ıy)				0.	02		(51)
If community Volume factor	_		011 4.3							1	.03		(52)
Temperature			2b							—	.6		(53)
Energy lost f	rom wate	r storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter (50) o	r (54) in (55)								1.	03		(55)
Water storag	je loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m= 32.01		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder conta	ins 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	хН	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from	om Table 3			0		(58)
Primary circuit loss calculated		(58) ÷ 365 × (41)m			
(modified by factor from Tab	ole H5 if there is solar wa	ater heating and	a cylinder 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 2	23.26	(59)
Combi loss calculated for each	n month (61)m = (60) ÷ 3	365 × (41)m				
(61)m= 0 0 0	0 0 0	0 0	0 0	0	0	(61)
Total heat required for water h	neating calculated for ea	ch month (62)m :	= 0.85 × (45)m +	(46)m + (5	 7)m + (59)m + (61)m	
(62)m= 188.21 166.19 175.25	158.09 155.64 140.1	135.53 147.37	146.69 163.88	ì í	184.02	(62)
Solar DHW input calculated using App			I L O' if no solar contribut	ļļ_	l neating)	
(add additional lines if FGHRS	· · · · · ·					
(63)m = 0 0 0	0 0 0	0 0	0 0	0	0	(63)
Output from water heater		<u> </u>	1	ļl		
(64)m= 188.21 166.19 175.25	158.09 155.64 140.1	135.53 147.37	146.69 163.88	172.05 1	184.02	
(0.7)	1	-	put from water heate			(64)
Heat gains from water heating	. kWh/month 0.25 ′ [0.8], ,
(65)m= 88.42 78.6 84.11	77.57 77.59 71.59	70.91 74.84	73.78 80.33		87.03	(65)
` '	! ! !			<u> </u>		(00)
include (57)m in calculation	. ,	is in the aweiling	or not water is if	om commu	unity neating	
5. Internal gains (see Table !	,					
Metabolic gains (Table 5), Wa		1 1 .				
Jan Feb Mar	Apr May Jun	Jul Aug	Sep Oct	Nov	Dec	(0.0)
(66)m= 99.56 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 A	`` 	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 1	15.93	(67)
Appliances gains (calculated in	n Appendix L, equation I	L13 or L13a), als	o see Table 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 1	166.13	(68)
Cooking gains (calculated in A	ppendix L, equation L15	5 or L15a), also s	ee Table 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	32.96	(69)
Pumps and fans gains (Table	5a)	•				
(70)m = 0 0 0	0 0 0	0 0	0 0	0	0	(70)
Losses e.g. evaporation (nega	ative 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	-79.65	(71)
Water heating gains (Table 5)	.1 1		ļ l	II		
(72)m= 118.85 116.96 113.06	107.74 104.29 99.43	95.3 100.59	102.47 107.97	114.19 1	116.97	(72)
Total internal gains =	 	<u> </u>	+ (69)m + (70)m + (7	<u> </u>		
(73)m= 361.01 359.2 348.18	, , , , , , , , , , , , , , , , , , , 	, , , , , , , , , , , , , , , , , , , 	298.19 316.08	<u> </u>	351.9	(73)
6. Solar gains:	9:210: 200:0	200.00	200.10	000.00	50.10	
Solar gains are calculated using sola	ar flux from Table 6a and asso	ciated equations to c	onvert to the applicat	ole orientation	1.	
Orientation: Access Factor		ux	g_	FF	Gains	
Table 6d				able 6c	(W)	
Southeast 0.9x 0.77 x	6.09 ×	36.79 ×	0.63 ×	0.7	= 68.48	(77)
Southeast 0.9x 0.77 x		62.67 X	0.63 x	0.7	= 116.65](77)
0.11 ×		<u></u> "		0.7		1, ,

Jan	Feb	Mar	Apr	May	Ju		Α	ug Se	ер	Oct	Nov	Dec]	
Temperature of Utilisation fact	_	•			-		ole 9	Th1 (°C	;)				21	(85)
7. Mean interr														
(84)m= 492.41	586.37	667.88	741.48	786.63	771.	86 740.9	698	.24 649.	.37	569.55	494.64	463.96]	(84)
Total gains – in	iternal ar	nd solar	(84)m =	(73)m -	+ (83	m , watts							-	
(83)m= 131.4	227.17	319.7		473.96	476.	51 456.92	409			253.46	157.99	112.06		(83)
Solar gains in v	vatts, ca	lculated	I for each	month			(83)m	ı = Sum(74	l)m	.(82)m				
Northwest _{0.9x}	0.77	X	2.92	2	x	9.21	X	0.63	3	X	0.7	=	8.22	(81)
Northwest 0.9x	0.77	×	2.92		x _	14.2	X	0.63]	0.7	=	12.67	(81)
Northwest 0.9x	0.77	X	2.92		×	28.07	X	0.63] × [0.7	=	25.05	(81)
Northwest 0.9x	0.77	X	2.92	2	x	50.42	X	0.63	3] x [0.7	=	44.99	(81)
Northwest 0.9x	0.77	x	2.92	2	x	72.63	X	0.63	3	x [0.7	=	64.81	(81)
Northwest 0.9x	0.77	X	2.92		x	91.1	x	0.63	3	_ x [0.7	=	81.3	(81)
Northwest 0.9x	0.77	X	2.92	2	x	97.38	x	0.63	3	x [0.7	=	86.9	(81)
Northwest _{0.9x}	0.77	x	2.92	2	x	91.35	x	0.63	3	_ x [0.7	=	81.52	(81)
Northwest 0.9x	0.77	x	2.92	2	x \Box	67.96	x	0.63	3	_ x [0.7		60.64	(81)
Northwest _{0.9x}	0.77	x	2.92		x 🗀	41.38	x	0.63	3] × [0.7	_ =	36.93	(81)
Northwest _{0.9x}	0.77	x	2.92		x \Box	22.97	x	0.63	3] x [0.7		20.5	(81)
Northwest 0.9x	0.77	x	2.92	2	x	11.28	x	0.63	3] x [0.7	=	10.07	(81)
Southwest _{0.9x}	0.77	x	4.7		x \Box	31.49	j	0.63	3] x [0.7	=	45.23	(79)
Southwest _{0.9x}	0.77	x	4.7		x	44.07	ĺ	0.63	3] x [0.7	=	63.3	(79)
Southwest _{0.9x}	0.77	x	4.7		x	69.27	ĺ	0.63	3] × [0.7	=	99.49	(79)
Southwest _{0.9x}	0.77	x	4.7		x –	92.85	1	0.63]	0.7	=	133.37	(79)
Southwest _{0.9x}	0.77	x	4.7		x	104.39	1	0.63]	0.7	=	149.94	(79)
Southwest _{0.9x}	0.77	×	4.7		x [113.91]	0.63] ^ L] x [0.7	= =	163.62	(79)
Southwest _{0.9x}	0.77	$=$ $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$	4.7		`	118.15]	0.63		」^L] _x 「	0.7	= =	169.71	(79)
Southwest _{0.9x}	0.77	$=$ $\stackrel{\wedge}{}$	4.7		^	119.01]	0.63		」^L] x 「	0.7	\dashv	170.94	(79)
Southwest _{0.9x}	0.77	$=$ $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$	4.7		`	106.25]]	0.63		」^L 1 _× 「	0.7	- -	152.62	(79)
Southwest _{0.9x}	0.77	- ` x	4.7		x L	62.67 85.75]]	0.63		」	0.7		90.02	(79)
Southwest _{0.9x}	0.77	×	4.7		×	36.79]]	0.63		」×] _× 「	0.7	=	52.85	(79)
Southwest _{0.9x}	0.77	×	6.09	<u>'</u>	×	31.49]	0.63		」 ×	0.7	╡ -	58.6	(77)
Southeast 0.9x	0.77	×	6.09		×	44.07] X] ,	0.63]	0.7	=	82.02	(77)
Southeast 0.9x	0.77	x	6.09		×	69.27] X] ,	0.63]	0.7	=	128.92	(77)
Southeast 0.9x	0.77	X	6.09		× _	92.85] X]	0.63]	0.7	=	172.81	(77)
Southeast 0.9x	0.77	X	6.09		x _	104.39] X]	0.63]	0.7	=	194.29	(77)
Southeast 0.9x	0.77	X	6.09		x	113.91] X]	0.63]	0.7	=	212.01	(77)
Southeast 0.9x	0.77	X	6.09		x _	118.15] X	0.63]	0.7	=	219.9	(77)
Southeast 0.9x	0.77	×	6.09		x _	119.01	X	0.63]	0.7	=	221.5	(77)
Southeast 0.9x	0.77	X	6.09		x	106.25	X	0.63	3] x [0.7	=	197.75	(77)
O		\neg		=	=		ī			╡╞		=		=

(86)m= 0.97 0.93 0.87 0.75 0.59 0.42 0.3 0.34 0.53 0.8 0.94 0.97]	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	_	
(87)m= 20.03 20.28 20.56 20.82 20.95 20.99 21 21 20.97 20.8 20.38 19.99]	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_	
(88)m= 20.17 20.18 20.18 20.19 20.2 20.21 20.21 20.21 20.2 20.2 20.19 20.18]	(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	_	
(89)m= 0.96 0.92 0.85 0.72 0.55 0.37 0.25 0.28 0.48 0.76 0.92 0.97]	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 18.9 19.24 19.63 19.99 20.14 20.2 20.21 20.21 20.18 19.97 19.41 18.84]	(90)
$fLA = Living area \div (4) =$	0.44	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		
(92)m= 19.4 19.7 20.04 20.35 20.5 20.55 20.56 20.56 20.53 20.34 19.84 19.35]	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	-	
(93)m= 19.4 19.7 20.04 20.35 20.5 20.55 20.56 20.56 20.53 20.34 19.84 19.35	J	(93)
8. Space heating requirement	. 1-1-	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-cale the utilisation factor for gains using Table 9a	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	1	
Utilisation factor for gains, hm:	_	
(94)m= 0.95 0.92 0.85 0.72 0.56 0.39 0.27 0.3 0.5 0.77 0.92 0.96]	(94)
Useful gains, hmGm , W = (94)m x (84)m	7	
(95)m= 469.79 536.92 566.33 537.01 442.7 303.05 202.92 212.18 325.06 438.84 454.12 446.31]	(95)
Monthly average external temperature from Table 8	٦	(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	J	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 814.42 795.35 725.02 601.93 460.68 305.71 203.32 212.81 333 509.67 672 805.28	1	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m	J	(- /
(98)m= 256.41 173.67 118.07 46.74 13.38 0 0 0 0 52.7 156.87 267.08	1	
Total per year (kWh/year) = Sum(98) _{15,912} =	1084.92	(98)
Space heating requirement in kWh/m²/year	17.98	(99)
9b. Energy requirements – Community heating scheme		J
This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources;	the latter	•
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		1,,,,,,,,
Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	-
Annual space heating requirement	1084.92]

		,		7
Space heat from Community heat pump	(98) x (304a) x	x (305) x (306) =	1139.16	(307a)
Efficiency of secondary/supplementary heating system in	n % (from Table 4a or Appe	ndix E)	0	(308
Space heating requirement from secondary/supplementa	ary system (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		[1933.02	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	x (305) x (306) =	2029.67	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	31.69] (313)
Cooling System Energy Efficiency Ratio		[0] (314)
Space cooling (if there is a fixed cooling system, if not er	nter 0) = (107) ÷ (314	l) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive inp	ut from outside	· [128.36	(330a)
warm air heating system fans		[0	(330b)
pump for solar water heating		ĺ	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	0b) + (330g) =	128.36	(331)
Energy for lighting (calculated in Appendix L)		ĺ	273.64	(332)
Electricity generated by PVs (Appendix M) (negative qua	antity)	Ī	-108.82	(333)
T . I . II		,		
Total delivered energy for all uses (307) + (309) + (310)	+ (312) + (315) + (331) + (3	32)(237b) =	3462.02	(338)
12b. CO2 Emissions – Community heating scheme	+ (312) + (315) + (331) + (3	(32)(237b) =	3462.02	(338)
	+ (312) + (315) + (331) + (3 Energy kWh/year	Emission factor		(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) If there is C	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) If there is C	Energy kWh/year t CHP) CHP using two fuels repeat (363) to	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 =	Emissions kg CO2/year	(367a) (367)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 =	280 587.37	(367a) (367) (372)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(376)	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 =	280 587.37 16.45 603.81	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary)	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(376)	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or insertions.	Energy kWh/year (CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(376) (309) x tantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81 0 603.81	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instance CO2 associated with space and water heating	Energy kWh/year (CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(376) (309) x tantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81 0 603.81	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instance CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(376) (309) × stantaneous heater (312) × (373) + (374) + (375) = In dwelling (331)) × (332))) ×	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81 0 603.81 66.62	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instance CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(376) (309) × stantaneous heater (312) × (373) + (374) + (375) = In dwelling (331)) × (332))) × stapplicable	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	280 587.37 16.45 603.81 0 603.81 66.62 142.02	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instance CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within CO2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) as litem 1	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(376) (309) × stantaneous heater (312) × (373) + (374) + (375) = In dwelling (331)) × (332))) × stapplicable	Emission factor kg CO2/kWh 0 (366) for the second fuel 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	280 280 587.37 16.45 603.81 0 603.81 66.62 142.02	(367a) (367) (372) (373) (374) (375) (376) (378) (379)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:20

Project Information:

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

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 103.81m²

Plot Reference: Site Reference : Highgate Road - GREEN 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 10.86 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 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 - Heat pump

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	10.070	<u> </u>
Continuous supply and extract system		
	0.54	
Specific fan power:		014
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	
ventilation rate.	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	5 11/111	
Photovoltaic array		

		l lser I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa					0010943 on: 1.0.5.50	
Address :	F	Property	Address	: 04 - 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 = (1a	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 hoι	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	x2	20 =	0	(6b)
Number of intermittent fa	ns				0	x ²	10 =	0	(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)+(aantinua fi	0		÷ (5) =	0	(8)
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	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 pu deducting areas of openir	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 amaza dia adia adia ada		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$	•	•	•	ietre oi e	envelope	area	3	(17)
•	es if a pressurisation test has been do				is being u	sed		0.15	(10)
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		19)] =			1	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.15	(21)
Infiltration rate modified for	- 1 	1	Δ	0	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	
(<u></u> /	5.0	<u> </u>	1	<u> </u>	<u> </u>	1	l	J	
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 infilt	ration rat	e (allowi	ina for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		•	rate for t	he appli	cable ca	se			ı			I	_
If mechanic			andiv N. (C	93h) _ (22¢	a) v Emy (aguatian (I	VEVV otho	muiaa (22h) - (220)			0.5	(23a)
If exhaust air h) = (23a)			0.5	(23b)
a) If balance		-	-	_					2h\m . /	22h) v [1 (22a)	74.8	(23c)
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3	- 100]	(24a)
b) If balance	ļ		<u> </u>	<u> </u>	Į		<u>Į</u>	ļ	<u>l</u>	ļ	0.0		, ,
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	nouse ex	tract ver	tilation o	r positiv	/e input	ı ventilatio	on from (utside	<u> </u>			l	
,	m < 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)ı	ventilation m = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	r change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	d) in bo	x (25)	-	-	-		
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openin		Net Ar A ,r		U-val W/m2		A X U (W/l		k-value kJ/m²-l		X k /K
Windows Typ		` ,			13.2	x1	/[1/(1.4)+	0.04] =	17.51	,			(27)
Windows Typ	e 2				5.5	x1	/[1/(1.4)+	0.04] =	7.29				(27)
Windows Typ	e 3				4.61	x1	/[1/(1.4)+	0.04] =	6.11	一			(27)
Walls Type1	76.1	16	23.3	2	52.84	1 X	0.18		9.51		60	3170.4	4 (29)
Walls Type2	49.7	77	0		49.77	7 X	0.17	=	8.36		60	2986.2	2 (29)
Total area of	elements	, m²			125.9	3							(31)
Party wall					12.14	1 X	0	=	0		45	546.3	(32)
Party floor					103.8	1					40	4152.4	(32a)
Party ceiling					103.8	1				Ī	30	3114.3	(32b)
Internal wall *	*				193.1	7				Ī	9	1738.5	(32c)
* for windows and ** include the are						lated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
Fabric heat lo	ss, W/K :	= S (A x	U)				(26)(30) + (32) =				48.78	(33)
Heat capacity	Cm = S	(A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	15708.13	(34)
Thermal mass	s parame	eter (TMI	P = Cm -	: TFA) ir	n kJ/m²K			= (34)	÷ (4) =			151.32	(35)
For design asses can be used inste				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	jes : S (L	x Y) cal	culated	using Ap	pendix	K						9.77	(36)
if details of therm		are not kr	own (36) =	= 0.05 x (3	31)			(00)	(26)				7,50
Total fabric he		alaulata :	l manthi					, ,	(36) =	'0E\m + (E)		58.55	(37)
Ventilation he	Feb	Mar	· ·	<u> </u>	Jun	Jul	Aug	Sep	= 0.33 × (Nov	Dec]	
Jan	Len	I IVIAI	Apr	May	Juli	l Jui	Aug	l geh	Oct	INOV	l nec	I	

(00)	00.0	00.40	00.40	00.40	00.00	04.07	04.07	04.00	05.00	00.00	00.70	07.44		(20)
(38)m=	28.8	28.46	28.12	26.42	26.08	24.37	24.37	24.03	25.06	26.08	26.76	27.44		(38)
Heat tr (39)m=	87.35	oefficier 87.01	1t, VV/K 86.67	84.97	84.63	82.93	82.93	82.59	(39)m 83.61	= (37) + (3 84.63	38)m 85.31	85.99		
(39)111=	67.33	67.01	00.07	04.97	04.03	02.93	02.93	02.39			Sum(39) ₁	<u> </u>	84.89	(39)
Heat Id	ss para	meter (F	HLP), W	m²K			_	_		= (39)m ÷		27		 ` ′
(40)m=	0.84	0.84	0.83	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83		_
Numbe	er of day	rs in mor	nth (Tab	le 1a)					1	Average =	Sum(40) ₁	12 /12=	0.82	(40)
rtuinot	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 ener	gy requi	rement:								kWh/ye	ear:	
Λ			\.											
		ipancy, I 9, N = 1		[1 - exp	(-0.0003	349 x (TF	-A -13.9)2)] + 0.(0013 x (ΓFA -13.		77		(42)
if TF	A £ 13.9	9, N = 1			`	,	•	, , -	,					
								(25 x N) to achieve		se target o		0.04		(43)
		•		0,	ater use, l	Ū	Ū			J J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	110.04	106.04	102.04	98.04	94.04	90.03	90.03	94.04	98.04	102.04	106.04	110.04		
En a rou .	aantant of	hat water	used sel	aulatad m	anthly 1	100 v Vd n	n v nm v F	Tm / 2600			m(44) ₁₁₂ =	L	1200.45	(44)
					,		1	OTm / 3600		,				
(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	4572.00	(45)
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotai = Su	m(45) ₁₁₂ =	• [1573.98	(43)
(46)m=	24.48	21.41	22.09	19.26	18.48	15.95	14.78	16.96	17.16	20	21.83	23.71		(46)
Water	storage	loss:						ļ				<u> </u>		
Ū		` ,		•			Ū	within sa	ame ves	sel		0		(47)
	•	_			elling, e			, ,	a = a \ a = a + a	· · · (O) : · · · (47\			
	vise ii no storage		not wate	er (triis ir	iciudes i	nstantar	ieous co	mbi boil	ers) ente	er o in (47)			
	•		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
•			storage	-				(48) x (49)) =		1	10		(50)
,				•	oss fact									(= 4)
		_	ee secti		e 2 (kW	n/litre/da	ıy)				0.	02		(51)
	-	from Ta		JII 4.0							1.	.03		(52)
Tempe	erature fa	actor fro	m Table	2b							—	.6		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	03		(54)
Enter	(50) or (54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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 Appendi	хН	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

		1
Primary circuit loss (annual) from Table 3	0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	otot)	
(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	22.51 23.26	(59)
	22.01 20.20	(66)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		1 (04)
(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 × (45)m +	` ` ` ` ` ` 	1 ` ′ ′
(62)m= 218.46 192.65 202.56 181.9 178.48 159.81 153.79 168.33 167.89 188.6	199.03 213.32	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribut	ion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		l (63)
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater		1
(64)m= 218.46 192.65 202.56 181.9 178.48 159.81 153.79 168.33 167.89 188.6	199.03 213.32	0004.00 (64)
Output from water heate		2224.82 (64)
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$		1
(65)m= 98.48 87.4 93.19 85.49 85.19 78.15 76.98 81.81 80.83 88.55	91.18 96.77	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is fr	om community h	leating
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	
(66)m= 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61	138.61 138.61	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		_
(67)m= 23.39 20.77 16.89 12.79 9.56 8.07 8.72 11.34 15.21 19.32	22.55 24.04	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 262.34 265.07 258.21 243.6 225.17 207.84 196.26 193.54 200.4 215.01	233.44 250.77	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5		
(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 5a)	•	'
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)		ı
(71)m= -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88	-110.88 -110.88	(71)
Water heating gains (Table 5)		I
(72)m= 132.37 130.06 125.26 118.73 114.5 108.53 103.47 109.96 112.27 119.02	126.65 130.07	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m$	1)m + (72)m	l
(73)m= 482.68 480.48 464.94 439.71 413.81 389.03 373.03 379.42 392.47 417.93	447.22 469.45	(73)
6. Solar gains:		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicab	ole orientation.	
Orientation: Access Factor Area Flux g_	FF	Gains
	able 6c	(VV)
Southeast 0.9x 0.77 x 5.5 x 36.79 x 0.63 x	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= 22 Total gain	26.28	390.73 ternal ar	548.6	3 lar	for each mor 703.29 809.1 (84)m = (73)1 1143 1223.	2 8 M +	812.79 (83)m	779.69	699		97 43	35.62 53.54	-	193.03	_		(83)
(83)m= 22	26.28	390.73	548.6	3	703.29 809.3	2 8		779.69					272	193.03	3		(83)
				\neg		_							_		_		
Solar gair										- Cum(74)	(O	22)m					
140111111111111111111111111111111111111	U.9X	0.77		X	4.61	X		9.21	X	0.63		x	0.7	=		12.98	(81)
Northwest Northwest	_	0.77	\dashv	X	4.61	」× T √		14.2] ×] _v	0.63	\blacksquare	ΧL	0.7	┥ :	\vdash	20	(81)
Northwest	<u> </u>	0.77	_	X	4.61	X		8.07	X	0.63		X L	0.7	_ =	\vdash	39.54	(81)
Northwest	<u> </u>	0.77	_	X	4.61	X		0.42	X	0.63		x L	0.7	_ =	Ļ	71.04	(81)
Northwest	<u> </u>	0.77		X	4.61	X	7	2.63	X	0.63		x L	0.7	=	Ļ	102.32	(81)
Northwest	<u> </u>	0.77		X	4.61	x	9	91.1	x	0.63		×	0.7	=		128.35	(81)
Northwest	느	0.77		X	4.61	x	9	7.38	x	0.63		x	0.7	=		137.2	(81)
Northwest	t 0.9x	0.77		X	4.61	x	9	1.35	x	0.63		x	0.7			128.7	(81)
Northwest	t 0.9x	0.77		X	4.61	x	6	7.96	x	0.63		x [0.7			95.74	(81)
Northwest	t 0.9x	0.77		X	4.61	j x	4	1.38	x	0.63		x [0.7			58.3	(81)
Northwest	t 0.9x	0.77		X	4.61	x	2	2.97	x	0.63		× [0.7			32.36	(81)
Northwest	t 0.9x	0.77		X	4.61	×	1	1.28	x	0.63		x	0.7	= =	F	15.9	(81)
Southwest	t _{0.9x}	0.77	\exists	X	13.21	i x	3	1.49	ĺ	0.63	$\overline{}$	x [0.7		F	127.12	(79)
Southwest	<u> </u>	0.77		X	13.21	X		4.07	ĺ	0.63		x [0.7		片	177.92	(79)
Southwest	<u> </u>	0.77	\dashv	X	13.21	X		9.27	i	0.63	\dashv	×	0.7	╡ -	\vdash	279.64	(79)
Southwest		0.77	=	X	13.21] ^] x		2.85]	0.63		× [0.7	╡ -	H	374.86	(79)
Southwest	<u> </u>	0.77	\dashv	X	13.21] ^] x		04.39]]	0.63	\dashv	^ L × Г	0.7	=	H	421.44	(79)
Southwest	<u> </u>	0.77	_	X	13.21	」^]		13.91]]	0.63	_	^ L х [0.7	╡ :	\vdash	459.87	(79)
Southwest	<u> </u>	0.77	\dashv	x x	13.21	」×] x		19.01 18.15]]	0.63	\blacksquare	x L	0.7	\dashv	H	480.46 476.99	(79)
Southwest	<u> </u>	0.77		X	13.21	」× ┐、		06.25] 1	0.63		× L	0.7	=	H	428.95	(79)
Southwest Southwest	<u> </u>	0.77	\blacksquare	X	13.21	」× ┐,		5.75] 1	0.63		× L	0.7	_ = =	\vdash	346.2	$= \frac{(79)}{(70)}$
Southwest		0.77	\blacksquare	X	13.21	_ ×		2.67] 1	0.63	\blacksquare	X L	0.7	_ = -	H	253.02	(79)
Southwest	<u> </u>	0.77	_	X	13.21	X	3	6.79]	0.63		x L	0.7	=	Ļ	148.54	(79)
Southeast	<u> </u>	0.77		X	5.5	X	3	1.49	X	0.63		x [0.7	=	Ļ	52.93	(77)
Southeast	<u> </u>	0.77		X	5.5	X	4	4.07	X	0.63		x	0.7	=		74.08	(77)
Southeast	느	0.77		X	5.5	X	6	9.27	X	0.63		x	0.7	=	L	116.43	(77)
Southeast	<u> </u>	0.77		X	5.5	X	9	2.85	X	0.63		x	0.7	=		156.07	(77)
Southeast	<u> </u>	0.77		X	5.5	X	10	04.39	x	0.63		x	0.7	=		175.47	(77)
Southeast	느	0.77		X	5.5	×	1	13.91	x	0.63		x	0.7	=		191.47	(77)
Southeast	t 0.9x	0.77		X	5.5	X	1	18.15	x	0.63		x [0.7	=		198.6	(77)
Southeast	t 0.9x	0.77		x	5.5	x	1	19.01	x	0.63		x	0.7	=		200.04	(77)
Southeast	t 0.9x	0.77		X	5.5	X	10	06.25	x	0.63		x [0.7		⋷┌	178.6	(77)

												_	
(86)m= 0.9	8 0.95	0.89	0.77	0.61	0.44	0.32	0.35	0.56	0.83	0.95	0.98		(86)
Mean inte	nal temper	rature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	' in Table	e 9c)					
(87)m= 19.	9 20.18	20.49	20.79	20.94	20.99	21	21	20.97	20.75	20.28	19.86		(87)
Temperatu	ıre during h	neating p	eriods i	n rest of	dwelling	from Ta	ıble 9, Ti	h2 (°C)					
(88)m= 20.2	22 20.22	20.22	20.24	20.24	20.25	20.25	20.26	20.25	20.24	20.23	20.23		(88)
Utilisation	factor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						
(89)m= 0.9	7 0.94	0.87	0.74	0.57	0.39	0.26	0.29	0.5	0.8	0.94	0.98		(89)
Mean inte	nal temper	rature in	the rest	of dwelli	ing T2 (f	ollow ste	ps 3 to 7	7 in Tabl	le 9c)				
(90)m= 18.7	75 19.14	19.58	19.99	20.18	20.25	20.25	20.26	20.22	19.95	19.3	18.69		(90)
	•	•			•			1	fLA = Livin	g area ÷ (4) =	0.38	(91)
Mean inte	nal temper	rature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 19.1	_ -	19.93	20.3	20.47	20.53	20.54	20.54	20.51	20.26	19.68	19.14		(92)
Apply adju	stment to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 19.1	9 19.54	19.93	20.3	20.47	20.53	20.54	20.54	20.51	20.26	19.68	19.14		(93)
8. Space h	eating req	uirement											
	ne mean in		•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
	ion factor fo				1	11	A	Can	004	Nov	Daa		
Ja Utilisation	n Feb factor for g	Mar lains hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m= 0.9	<u>_</u>	0.86	0.74	0.58	0.4	0.28	0.32	0.52	0.8	0.94	0.97		(94)
` '	ns, hmGm	, W = (9	1——— 4)m x (8	1 4)m	ļ								
(95)m= 684.	1	876.63	848.5	708.01	486.63	325.87	340.61	519.7	681.17	673.32	644.36		(95)
Monthly av	erage exte	ernal tem	perature	e from Ta	able 8			ı		•	•		
(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 temp	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]		,	•	
(97)m= 1300				742.05	491.85	326.66	341.91	535.72	817.5	1073.07	1284.7		(97)
	ting require	1				Î		T .	Î			I	
(98)m= 458.	37 311.36	213.82	86.23	25.32	0	0	0	0	101.43	287.82	476.41		7(00)
							Tota	l per year	(kWh/yeaı	r) = Sum(9	18)15,912 =	1960.76	(98)
Space hea	ting require	ement in	kWh/m ²	²/year								18.89	(99)
9b. Energy	requiremer	nts – Coi	mmunity	heating	scheme								
This part is			• .		•		.	•		unity sch	neme.		7(204)
Fraction of	•		•		•		Table T	1) 'U' If N	one			0	(301)
Fraction of	space heat	from co	mmunity	/ system	1 – (30	1) =						1	(302)
The communit		-							up to four	other heat	sources; t	he latter	
Fraction of		-			ioni powe	stations.	осс Арреі	idix C.				1	(303a)
Fraction of	total space	heat fro	m Comr	nunity he	eat pum)			(3	02) x (303	a) =	1	(304a)
Factor for c	•			•			unity hea	ating sys	tem			1	(305)
Distribution				,	,		•	0 ,				1.05	(306)
Space hear		,	,		, , , , , , , , , , , , , , , , , , , ,	J = 7 = = 0						kWh/yea	
Annual spa	_	requiren	nent									1960.76	
		1	-									1 223 2	

Space heat from Community heat pump	(08) v (304a)	x (305) x (306) =	2058.8	(307a)
	, , , ,			」` ´
Efficiency of secondary/supplementary heating system	`	•	0	(308
Space heating requirement from secondary/supplement	ntary system (98) x (301) x	(100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2224.82]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a)	x (305) x (306) =	2336.06	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	07e) + (310a)(310e)] =	43.95	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = $(107) \div (31)$	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 41 mechanical ventilation - balanced, extract or positive in	•		253.73	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	30b) + (330g) =	253.73	(331)
Energy for lighting (calculated in Appendix L)			412.99	(332)
Electricity generated by PVs (Appendix M) (negative q	uantity)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310	0) + (312) + (315) + (331) + (3	332)(237b) =	4952.76	(338)
Total delivered energy for all uses (307) + (309) + (310 12b. CO2 Emissions – Community heating scheme	0) + (312) + (315) + (331) + (3	332)(237b) =	4952.76	(338)
	0) + (312) + (315) + (331) + (3 Energy kWh/year	Emission factor		(338)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (r	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (r	Energy kWh/year not CHP)	Emission factor kg CO2/kWh	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%)	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%) CO2 associated with heat source 1	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0.52 =	Emissions kg CO2/year 280 814.62 22.81	(367a) (367)
12b. CO2 Emissions – Community heating scheme CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0.52 =	Emissions kg CO2/year 280 814.62 22.81 837.43	(367a) (367) (372)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0	280 814.62 22.81 837.43	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary)	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0	280 814.62 22.81 837.43	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or in	Energy kWh/year not CHP) s CHP using two fuels repeat (363) of [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x nstantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0	280 814.62 22.81 837.43 0 837.43	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or intotal CO2 associated with space and water heating	Energy kWh/year not CHP) s CHP using two fuels repeat (363) of [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x nstantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.22 = 0.22 = 0.22	280 280 814.62 22.81 837.43 0 837.43 131.68	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or in the control of the cont	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x Instantaneous heater (312) x (373) + (374) + (375) = thin dwelling (331)) x (332))) x	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0.52 = 0.52 = 0.52 = 0.22 = 0.22 = 0.52 = 0	280 814.62 22.81 837.43 0 837.43 131.68	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or into the community systems CO2 associated with space and water heating CO2 associated with electricity for pumps and fans with co2 associated with electricity for lighting Energy saving/generation technologies (333) to (334) in the control of the control	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(363) x (309) x Instantaneous heater (312) x (373) + (374) + (375) = (332))) x (332))) x as applicable	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0	280 280 814.62 22.81 837.43 0 837.43 131.68 214.34	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or in the cost of	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(363) x (309) x Instantaneous heater (312) x (373) + (374) + (375) = (332))) x (332))) x as applicable	Emission factor kg CO2/kWh to (366) for the second fue 0.52 = 0	280 280 814.62 22.81 837.43 0 837.43 131.68 214.34	(367a) (367) (372) (373) (374) (375) (376) (378) (379)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:43:17*

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 27.22 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.14 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) 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 - Heat pump

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 electric heat pump		
Photovoltaic array		

		Heor	Details:						
A No	No il lo ale ave	Usei		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Contware Hame.	0.10111a 1 07 11 20 12		y Address:		31011.		7 01010	71. 110.0.00	
Address :		·	·						
1. Overall dwelling dime	ensions:								
Ground floor		Ar	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (4.5)		(1a) x	2	65	(2a) =	165.78	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(1n)	62.56	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	165.78	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
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				Ĺ	0		10 =	0	(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	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)	+(6b)+(7a)+(7b))+(7c) =	Г	0		÷ (5) =	0	(8)
•	peen carried out or is intended			ontinue fr			- (3) =	0	(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 correspond			•	ruction			0	(11)
deducting areas of openii		oriding to the gre	aler wall are	a (anter					
If suspended wooden f	floor, enter 0.2 (unseale	d) or 0.1 (sea	aled), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
ŭ	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2	, ,	_	. (45)		0	(15)
Infiltration rate	arron avanced in auhic		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic	•	•	•	etre or e	envelope	area	3	$= \begin{pmatrix} (17) \\ (48) \end{pmatrix}$
•	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere			,	,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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]	
								J	

Adjusted infiltra	ation rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effect		-	rate for t	he appli	cable ca	se	-		-	-			
If exhaust air he			endix N (2	3b) = (23a	a) × Fmv (e	equation (N	NS)) other	wise (23h) = (23a)			0.5	(238
If balanced with		0 11		, ,	, ,	. ,	,, .	,) = (20a)			0.5	(231
		•	•	_					26\m . /	22h) [:	1 (22.5)	74.8	(230
a) If balance (24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3	- 100] 	(24a
b) If balance					l	l	l				0.0	J	(=
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole h	-			-	ļ	<u> </u>						J	•
if (22b)m				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v				•	•				0.5]	-			
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	•	•	•	•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25)
3. Heat losses	and he	at lose r	naramete	ar.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e A	Χk
	area	-	m		A ,r		W/m2		(W/		kJ/m²-l		J/K
Vindows Type	1				12.71	x1.	/[1/(1.4)+	0.04] =	16.85				(27)
Windows Type	2				3.46	x1.	/[1/(1.4)+	0.04] =	4.59				(27)
Walls Type1	46.7	'2	16.1	7	30.55	, x	0.18	= [5.5		60	1833	(29)
Walls Type2	13.7	' 5	0		13.75	x	0.17	_ = [2.31	\neg [60	825	(29)
Total area of el	ements	, m²			60.47	,							(31)
Party wall					30.32	<u>x</u>	0	=	0		45	1364	4 (32)
Party floor					62.56	5					40	2502	4 (32
Party ceiling					62.56					Ī	30	1876	8 (32)
nternal wall **					100.8	<u> </u>				Ī	9	907.	=
for windows and it include the area					alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] a	as given in			`
abric heat los				o ana pan	1110110		(26)(30)	+ (32) =				29.25	(33
leat capacity (•	• ,					((28)	(30) + (32	2) + (32a).	(32e) =	9308.8	(34)
Thermal mass	`	,	P = Cm -	- TFA) ir	n kJ/m²K			***	÷ (4) =	_,	(0=0)	148.8	(35)
For design assess can be used instea	ments wh	ere the de	tails of the	•			ecisely the	` '	. ,	TMP in Ta	able 1f	140.0	(00)
hermal bridge				usina Ap	pendix ł	<						7.08	(36
f details of therma												7.00	(00
Total fabric hea	at loss							(33) +	(36) =			36.33	(37
entilation hea	t 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= 17.36	17.15	16.95	15.92	15.72	14.69	14.69	14.48	15.1	15.72	16.13	16.54		(38
Heat transfer c	oefficier	nt, W/K						(39)m	= (37) + (38)m			
39)m= 53.68	53.48	53.27	52.25	52.04	51.01	51.01	50.81	51.42	52.04	52.45	52.86		
		-								-			

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.86	0.85	0.85	0.84	0.83	0.82	0.82	0.81	0.82	0.83	0.84	0.84		
						!			Average =	Sum(40) ₁	12 /12=	0.83	(40)
Number of day	<u> </u>	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 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		05		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed i			se target o		96		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 222	1 000	1			
(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		
. ,		!				ļ	ļ		I Total = Su	ım(44) ₁₁₂ =	=	995.51	(44)
Energy content of	f 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= 135.33	118.36	122.14	106.48	102.17	88.17	81.7	93.75	94.87	110.56	120.69	131.06		
									Total = Su	im(45) ₁₁₂ =	=	1305.27	(45)
If instantaneous v	vater heati	ing 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 volum) includir	na anv e	olar or M	WHDS	etoraga	within co	ama vac	വ				(47)
· ·	•	•				· ·		airie ves	361		0		(47)
If community hotherwise if no	•			_			. ,	ers) ente	er '0' in <i>(</i>	(47)			
Water storage			(,		()			
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If manufact			-										
Hot water stor	-			e 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community he Volume factor	_		011 4.3							1	03		(52)
Temperature f			2b							-	.6		(52)
Energy lost fro				ear			(47) x (51)) x (52) x ((53) =		03		(54)
Enter (50) or		_	, 1	Jui			(11)11(21)	, (==, (,/	-	.03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				, ,
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain												ix H	(00)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(57)m= 32.01	20.92	32.01	30.96	32.01	30.96	32.01	32.01	30.96	32.01	<u> </u>	<u> </u>		, ,
Primary circuit	•	,			50 \	(EO)					0		(58)
Primary circuit				,	•		, ,		r tharma	otat)			
(modified by		1	ı —	ı —	ı —			<u> </u>	1	- 	22.22		(59)
(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		(38)

Combi loss ca	lculated f	or each	month (61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0	0	0	0	0	0	0 0) 0		0	0	0	0	1	(61)
	uired for	water he	eating ca	alculated	L for eac	h month	(62)ı	—— m =	0 85 x (′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 190.61	168.29	177.41	159.97	157.45	141.66	136.98	149.	_	148.36	165.84	174.18	186.34]	(62)
Solar DHW input	L L L L L L L L L L L L L L L L L L L	using App	endix G or	Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	J	
(add additiona												-		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from w	ater heat	er				•	•				•	!	•	
(64)m= 190.61	168.29	177.41	159.97	157.45	141.66	136.98	149	.03	148.36	165.84	174.18	186.34]	
						•		Outp	ut from wa	ater heate	er (annual)	12	1956.11	(64)
Heat gains fro	m water l	heating,	kWh/mo	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	ı] + 0.8 x	((46)m	+ (57)m	+ (59)m]	
(65)m= 89.22	79.3	84.83	78.2	78.19	72.11	71.39	75.3	39	74.34	80.98	82.92	87.8]	(65)
include (57)	m in calc	ulation o	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 ga	ains (see	Table 5	and 5a):										
Metabolic gair	ns (Table	5). Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 102.65	102.65	102.65	102.65	102.65	102.65	102.65	102	.65	102.65	102.65	102.65	102.65	1	(66)
Lighting gains	(calculat	ed in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso s	ee T	Table 5				•	
(67)m= 15.99	14.2	11.55	8.74	6.54	5.52	5.96	7.7	'5	10.4	13.21	15.42	16.43]	(67)
Appliances ga	ins (calcu	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 179.35	181.22	176.53	166.54	153.94	142.09	134.18	132	.32	137.01	146.99	159.59	171.44]	(68)
Cooking gains	(calculat	ted in Ap	pendix	L, equat	ion L15	or L15a), als	o se	e Table	5			-	
(69)m= 33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.2	27	33.27	33.27	33.27	33.27]	(69)
Pumps and fa	ns gains	(Table 5	ia)										•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (negat	ive 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 heating	gains (T	able 5)											-	
(72)m= 119.92	118	114.02	108.61	105.1	100.15	95.95	101.	.34	103.25	108.85	115.17	118.01]	(72)
Total internal	gains =				(66)m + (67)m	า + (68	8)m +	- (69)m + ((70)m + (7	71)m + (72))m	-	
(73)m= 369.06	367.21	355.89	337.69	319.37	301.56	289.88	295	5.2	304.45	322.84	343.98	359.68]	(73)
6. Solar gains	s:													
Solar gains are		ŭ	r flux from	Table 6a	and assoc	ciated equa	tions 1	to co	nvert to th	e applica		tion.		
Orientation:		actor	Area m²		Flu	ıx ble 6a		т	g_ able 6b	т	FF able 6c		Gains	
_	Table 6d					DIE 0a	, ,	1	able ob	_ '	able oc		(W)	,
Northeast _{0.9x}	0.77	X	12.	71	X	11.28	X		0.63	×	0.7	=	43.83	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	22.97	X		0.63	x	0.7	=	89.21	(75)
Northeast 0.9x	0.77	X	12.	71	X .	41.38	X		0.63	x	0.7	=	160.73	(75)
Northeast 0.9x	0.77	×	12.	71	X	67.96	X		0.63	x	0.7	=	263.96	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	91.35	X		0.63	X	0.7	=	354.82	(75)

Northeast 0,50	Nawth a a a 4		_			_		7		_		_		– ,,
Northeast 0.9x	Northeast _{0.9x}	0.77	×	12.	71	×	97.38	X	0.63	×	0.7	=	378.27	(75)
Northwest 0.8x	Ļ	0.77	X	12.	71	X _	91.1	X	0.63	X	0.7	=	353.87	(75)
Northwest 0.9x	Ļ	0.77	X	12.	71	x _	72.63	X	0.63	X	0.7	=	282.11	(75)
Northeast 0.8	Northeast _{0.9x}	0.77	X	12.	71	x	50.42	X	0.63	X	0.7	=	195.85	(75)
Northwest 0, 9x	<u>L</u>	0.77	X	12.	71	X	28.07	X	0.63	X	0.7	=	109.02	(75)
Northwest 0, sk	Northeast _{0.9x}	0.77	X	12.	71	X	14.2	X	0.63	X	0.7	=	55.15	(75)
Northwest 0, 9x	Northeast 0.9x	0.77	X	12.	71	x	9.21	X	0.63	X	0.7	=	35.79	(75)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	3.4	-6	X	11.28	X	0.63	X	0.7	=	11.93	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	3.4	-6	x	22.97	X	0.63	X	0.7	=	24.29	(81)
Northwest 0,9 x	Northwest 0.9x	0.77	X	3.4	-6	x	41.38	X	0.63	X	0.7	=	43.75	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	6	x	67.96	X	0.63	х	0.7	=	71.86	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	6	x	91.35	X	0.63	x	0.7		96.59	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	-6	x	97.38	X	0.63	x	0.7	=	102.98	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	6	x	91.1	x	0.63	х	0.7	=	96.33	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	6	x	72.63	X	0.63	х	0.7	=	76.8	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	3.4	6	x	50.42	X	0.63	x	0.7	_ =	53.32	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m	Northwest 0.9x	0.77	×	3.4	6	x	28.07	X	0.63	x	0.7	=	29.68	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 55.76	Northwest 0.9x	0.77	×	3.4	6	x	14.2	X	0.63	x	0.7		15.01	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = \$5.76	Northwest 0.9x	0.77	×	3.4	6	x	9.21	X	0.63	×	0.7		9.74	(81)
(83)m= 55.76 113.5 204.48 335.82 451.41 481.25 450.2 358.9 249.17 138.7 70.16 45.53 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 424.81 480.71 560.38 673.51 770.78 782.81 740.09 654.1 553.62 461.54 414.13 405.21 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	_							_						_
(83)m= 55.76 113.5 204.48 335.82 451.41 481.25 450.2 358.9 249.17 138.7 70.16 45.53 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 424.81 480.71 560.38 673.51 770.78 782.81 740.09 654.1 553.62 461.54 414.13 405.21 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	Solar gains in	watts, calcu	ulated	for eacl	h month	l		(83)m	n = Sum(74)m	(82)m				
Ref	(83)m= 55.76	113.5 20	04.48	335.82	451.41	481.2	5 450.2	358	3.9 249.17	138.7	70.16	45.53		(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= 0.98 0.96 0.91 0.78 0.59 0.41 0.3 0.35 0.6 0.87 0.96 0.98 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.85 20.04 20.37 20.75 20.94 20.99 21 21 21 20.95 20.66 20.2 19.82 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.24 20.19 19.83 19.18 18.63 (90) ## ILA = Living area + (4) = 0.43 (91) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	Total gains – i	nternal and	solar	(84)m =	(73)m	+ (83)	m , 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= 0.98 0.96 0.91 0.78 0.59 0.41 0.3 0.35 0.6 0.87 0.96 0.98 0.98 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.85 20.04 20.37 20.75 20.94 20.99 21 21 20.95 20.66 20.2 19.82 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.24 20.19 19.83 19.18 18.63 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.57 20.52 20.19 19.62 19.14 (92)	(84)m= 424.81	480.71 56	60.38	673.51	770.78	782.8	1 740.09	654	1.1 553.62	461.5	414.13	405.21		(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 tempera	ature (heating	seasor	1)								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during hea	iting pe	eriods ir	the livi	ng are	a from Ta	ble 9	, Th1 (°C)				21	(85)
(86)m=	Utilisation fac	tor for gain	s for li	ving are	ea, h1,m	ı (see	Table 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.85 20.04 20.37 20.75 20.94 20.99 21 21 20.95 20.66 20.2 19.82 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	Jan	Feb	Mar	Apr	May	Jur	n Jul	Α	ug Sep	Oct	Nov	Dec		
(87)m=	(86)m= 0.98	0.96	0.91	0.78	0.59	0.41	0.3	0.3	35 0.6	0.87	0.96	0.98		(86)
(87)m=	Mean interna	l temperatu	ıre in li	iving are	ea T1 (f	ollow s	steps 3 to	7 in T	able 9c)	•	•	•	•	
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90) ### Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)		· · ·			· •	1	_i	т —		20.66	20.2	19.82]	(87)
(88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	Tomporatura	during hoo	ting n	oriodo ir	root of	dwalli	na from T	abla (<u> </u>	<u>!</u>		ı	
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	· -					1	-	1		20.23	20.22	20.21	1	(88)
(89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)						<u> </u>		-	20.20	20.20	20.22	20.21		()
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= $\begin{bmatrix} 18.66 & 18.94 & 19.41 & 19.93 & 20.16 & 20.23 & 20.24 & 20.24 & 20.19 & 19.83 & 19.18 & 18.63 & (90) \\ & & & & & & & & & & & & & & & & & & $						1	`	T	.		T		1	(00)
	(89)m= 0.97	0.95	0.9	0.76	0.55	0.36	0.25	0.3	3 0.55	0.84	0.95	0.98		(89)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	Mean interna	l temperatu	ıre in t			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= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	(90)m= 18.66	18.94 1	9.41	19.93	20.16	20.23	3 20.24	20.		<u> </u>		ļ		
(92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)										fLA = Li\	ring area ÷ (4) =	0.43	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	Mean interna	I temperatu	ıre (for	the wh	ole dwe	elling) =	= fLA × T1	+ (1	– fLA) × T2					
		 	`			1	1	1 `		1	19.62	19.14		(92)

(93)m= 19.17	19.42	19.83	20.28	20.49	20.56	20.57	20.57	20.52	20.19	19.62	19.14		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l				<u> </u>								
(94)m= 0.97	0.95	0.89	0.76	0.57	0.38	0.27	0.32	0.57	0.84	0.94	0.97		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	•								
(95)m= 410.32	454.37	499.35	510.31	436.71	300.96	201.78	210.63	315.05	388.63	390.91	393.37		(95)
Monthly avera		1	-	from T	r e							l	
(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		i	· ·		i	-``	· · ·	<u> </u>				1	(07)
(97)m= 798.2	776.21	709.91	594.7	457.66	303.93	202.28	211.64	330.02	499.01	656.71	789.76		(97)
Space heatin (98)m= 288.59	g require 216.28	156.66	60.76	15.58	/vn/mon	$\ln = 0.02$	24 X [(97))m – (95 0)MJ X (4 82.12	1)m 191.38	294.91		
(96)111= 200.59	210.20	130.00	60.76	15.56		0				l .	<u> </u>	1306.29	(98)
				.,			TUld	l per year	(KVVII/yeai) = Sum(9	O)15,912 =		╡``
Space heatin	g require	ement in	kvvh/m²	/year								20.88	(99)
9b. Energy red			· ·	Ĭ									
This part is use Fraction of spa										unity sch	neme.	0	(301)
·			•		-	_	(Table T	1) 0 11 11	OHE				╡`
Fraction of spa	ace neat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so includes boilers, h									up to four	other heat	sources; t	he latter	
Fraction of hea		-			rom power	stations.	ове Арреі	iuix C.				1	(303a)
Fraction of total			-		eat pump)			(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	(12c) for	commun	ity heatii	ng syste	m					1.05	(306)
Space heating	q										ļ	kWh/yea	 r
Annual space	_	requiren	nent									1306.29	7
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	1371.61	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	1												
Annual water		equirem	ent									1956.11	
If DHW from c											,		_
Water heat fro		•)						5) x (306) :		2053.91	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)([310e)] =	34.26	(313)
Cooling System	_	•	•			. 0)		(10 -)	(2.4.1)			0	(314)
Space cooling	,			•		,		= (107) ÷	(314) =			0	(315)
Electricity for p mechanical ve							outeide				İ	450.04	(330a)
mechanical ve	rillialiOf1	- paiaii(eu, exilî	aui ui pi	onuve III	put 110IM	outside					152.91	(330a)

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330l	o) + (330g) =	152.91	(331)
Energy for lighting (calculated in Appendix L)			282.38	(332)
Electricity generated by PVs (Appendix M) (negative	e quantity)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (3	310) + (312) + (315) + (331) + (33	32)(237b) =	3751.99	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating Efficiency of heat source 1 (%)	(not CHP) re is CHP using two fuels repeat (363) to	(366) for the second fu	el 280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	634.94	(367)
Electrical energy for heat distribution	[(313) x	0.52	17.78	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	652.72	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater of	or instantaneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		652.72	(376)
CO2 associated with electricity for pumps and fans v	within dwelling (331)) x	0.52	79.36	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	146.56	(379)
Energy saving/generation technologies (333) to (334 Item 1	4) as applicable	0.52 x 0.01 =	-56.48	(380)
Total CO2, kg/year sum of (376)	(382) =		822.16	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			13.14	(384)

El rating (section 14)

(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:14

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 27.06 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.86 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 - Heat pump

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 electric heat pump		
Photovoltaic array		

		l Iser-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 - C						
1. Overall dwelling dime	ensions:									
3		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 = (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	<u> </u>	0	Ī - Ē	0	x2	20 =	0	(6b)	
Number of intermittent fa	ns				0	x ²	10 =	0	(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)+(ontinus fr	0		÷ (5) =	0	(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	0.15	(17)	
•	es if a pressurisation test has been do				is being u	sed		3.13	` ′	
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) =				0.15	(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)m : 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]		
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	1 0.95	0.92		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	_	_			
0.19 Calculate effe	0.19	0.18	0.16	0.16 he appli	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		-	ale for t	пе аррп	cable ca	30						0.5	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				74.8	(23
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	_
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(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		(24
c) If whole h if (22b)r		tract ver (23b), t		•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]			1	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)		•		•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		X k
Windows Type		(111)			12.71				16.85		NO/III I	τ πο/	(27
Windows Type					3.46	_	/[1/(1.4)+	Ļ	4.59	\dashv			(27
Walls Type1	72.6	2	16.1	7	56.45	=	0.18	= [10.16	╡┌	60	3387	(29 (29
Walls Type1	17.7		0			=			2.99	륵 ¦		1066.8	= '
Total area of e					17.78	3 ×	0.17	[2.99	[60		(31
Party wall	Jonnon	,			90.4						AF	1264.4	`
Party floor					30.32	=	0	[0	L	45	1364.4 2904.8	=
Party ceiling					72.62	=				L	40	- -	=
Internal wall **					72.62	=				Ĺ	30	2178.6	= `
* for windows and		owe uso c	effective wi	ndow I I ve	146.1		ı formula 1	/[/1/ L volu	(0) 1 0 041 4	e given in	9 naragraph	1315.50	3 (32
** include the area						ateu using	i ioiiiiuia i	/[(1/ O- valu	1 0)+0.04] a	is giveri iii	i parayrapri	1 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				34.58	(33
Heat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	12217.13	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			168.23	(35
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		_
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						7.11	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(22)	(20)				¬,,,_
Total fabric he		aloudoto -	l manthi	,					(36) =	(25)m + (F)	\	41.69	(37
Ventilation hea	Feb	i			lun	Jul	۸۰۰۰		= 0.33 × (l	1	1	
(38)m= 20.15	19.91	Mar 19.67	Apr 18.48	May 18.24	Jun 17.05	Jui 17.05	Aug 16.81	Sep 17.53	Oct 18.24	Nov 18.72	Dec 19.19		(38
20.13			10.70	10.24	17.00	17.00	L 10.01	17.55	L 10.24	<u> </u>	13.13	i	,00
11								100	(07)	00\			
Heat transfer (39)m= 61.84	coefficier 61.6	nt, W/K 61.36	60.17	59.93	58.74	58.74	58.51	(39)m 59.22	= (37) + (37) 59.93	38)m 60.41	60.89	1	

eat loss pa	rameter (HLP), W	m²K			1	1	(40)m	= (39)m ÷	· (4)			
0.85 O.85	0.85	0.84	0.83	0.83	0.81	0.81	0.81	0.82	0.83	0.83	0.84		_
umber of d	ave in mo	onth (Tah	le 1a)						Average =	Sum(40) ₁	12 /12=	0.83	(4
Jar	<u> </u>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
<u> </u>													
. Water he	eating ene	rgy requi	irement:								kWh/yea	ar:	
sumed oc	cupancy	N									04		()
if TFA > 1	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (TFA -13		31		(4
if TFA £ 13 inual aver	•	ator usar	na in litra	s nar da	v Vd av	orano –	(25 v NI)	± 36					(4
duce the ani									se target o		0.02		(-
t more that 1.	25 litres per	person per	day (all w	ater use, l	not and co	ld)			,				
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usag						1	· <i>'</i>						
)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		— ,
ergy content	of hot water	r used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D)Tm / 3600			m(44) ₁₁₂		1068.18	(4
)m= 145.2		131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63		
,	. 1	101.00	111.20	100.00	0 1.0	07.00	100.00		<u> </u>	m(45) ₁₁₂ =	<u> </u>	1400.56	(4
nstantaneous	s water heat	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(10)112	L		`
)m= 21.78	19.05	19.66	17.14	16.44	14.19	13.15	15.09	15.27	17.8	19.42	21.09		(4
ater storaç													
orage volu	•	•	•			_		ame ves	sel		0		(4
community herwise if	•			-				ora) ant	or 'O' in <i>(</i>	17 \			
ater storaç		not wate	וו פוווט) ול	iciuues i	IIStaiitai	ieous co	ווטט וטוווי	ers) erik	ei U iii (47)			
If manufa		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(4
mperature	factor fro	om Table	2b								0		(4
ergy lost t	rom wate	r storage	, kWh/ye	ear			(48) x (49)) =		1	10		(5
If manufa			-										
ot water st	•			e 2 (kW	h/litre/da	ıy)				0.	.02		(5
community Jume facto	_		011 4.3							1	03		(5
mperature			2b								.6		(!
ergy lost f				ear			(47) x (51)) x (52) x (53) =		.03		(!
nter (50) o		_	,								.03		(!
ater storaç	je loss ca	lculated t	for each	month			((56)m = ((55) × (41)	m				
)m= 32.0°	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
ylinder conta		ed 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	Н	
7)m= 32.0°	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
mary circ	uit loss (a	nnual) fro	m Table	. 3				•	•		0		(!
mary circ	•	•			59)m = ((58) ÷ 36	65 × (41)	ım					
modified				,		. ,	, ,		r thermo	stat)			

Combi loss calculate	d for each	month (′61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0 0	0	0	0	0	0	0		0	0	0	0	1	(61)
Total heat required for	r water he	eating ca	L	L I for eac	h month	(62)r	—— n =	0.85 × (45)m +	. (46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 200.48 176.93		167.75	164.91	148.1	142.94	155.	_	155.29	173.91	182.99	195.9]	(62)
Solar DHW input calculate	d using App	endix G oı	· Appendix	: H (negati	ve quantity	/) (ente	er '0'	if no sola	r contribu	tion to wate	er heating)		
(add additional lines											0,		
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water he	ater				•	•				•	•	•	
(64)m= 200.48 176.93	186.33	167.75	164.91	148.1	142.94	155.	.87	155.29	173.91	182.99	195.9	1	
			•	•	•		Outp	ut from wa	ater heate	er (annual)	112	2051.4	(64)
Heat gains from water	r heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	ı] + 0.8 x	: [(46)m	n + (57)m	+ (59)m	۱]	
(65)m= 92.5 82.17	87.8	80.78	80.67	74.25	73.37	77.6	67	76.64	83.67	85.85	90.98]	(65)
include (57)m in ca	lculation	of (65)m	only if c	ylinder i	s in the	dwelli	ing (or hot w	ater is f	from com	munity h	neating	
5. Internal gains (se	e Table 5	and 5a):										
Metabolic gains (Tab	le 5), Wat	ts											
Jan Feb		Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 115.4 115.4	115.4	115.4	115.4	115.4	115.4	115	.4	115.4	115.4	115.4	115.4	1	(66)
Lighting gains (calcul	ated in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5			-	-	
(67)m= 18.13 16.1	13.09	9.91	7.41	6.26	6.76	8.7	9	11.79	14.97	17.48	18.63]	(67)
Appliances gains (ca	culated in	Append	dix L, eq	uation L	13 or L1	3a), a	also	see Tal	ole 5	-	•	•	
(68)m= 203.33 205.44	200.13	188.81	174.52	161.09	152.12	150.	.01	155.32	166.64	180.93	194.36]	(68)
Cooking gains (calcu	ated in A	ppendix	L, equat	ion L15	or L15a), also	o se	e Table	5	•	-	•	
(69)m= 34.54 34.54	34.54	34.54	34.54	34.54	34.54	34.5	54	34.54	34.54	34.54	34.54]	(69)
Pumps and fans gair	s (Table 5	ōa)			•							•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evaporat	ion (negat	tive valu	es) (Tab	le 5)	-					-	-	-	
(71)m= -92.32 -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 gains	Table 5)				•		•			•		•	
(72)m= 124.33 122.28	118.01	112.2	108.43	103.13	98.61	104.	.39	106.45	112.46	119.24	122.28]	(72)
Total internal gains	=			(66))m + (67)m	ı + (68)m +	- (69)m + (70)m + (71)m + (72))m	•	
(73)m= 403.41 401.44	388.85	368.54	347.98	328.09	315.11	320.	.81	331.19	351.69	375.27	392.9]	(73)
6. Solar gains:													
Solar gains are calculate	•	r flux from	Table 6a		•	itions t	0 CO	nvert to th	e applica		tion.		
Orientation: Access Table 6		Area m²		Flu	ıx ble 6a		т.	g_ able 6b	-	FF Table 6c		Gains (W)	
						1 1	1 (_ '				1
Northeast 0.9x 0.7	7 ×	12.	71	X	11.28	X		0.63	_ ×	0.7	=	43.83	(75)
Northeast 0.9x 0.7		12.			22.97	X		0.63	x	0.7	=	89.21	(75)
Northeast 0.9x 0.7		12.		-	41.38	X		0.63	x	0.7	=	160.73	(75)
Northeast 0.9x 0.7		12.	71	-	67.96	X		0.63	x [0.7	=	263.96	(75)
Northeast 0.9x 0.7	7 ×	12.	71	x (91.35	x		0.63	X	0.7	=	354.82	(75)

Nawkaaak F					г					_				–
Northeast _{0.9x}	0.77	×	12.	71	X	97.	.38	X	0.63	X	0.7	=	378.27	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	91	1.1	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	1.2	X	0.63	X	0.7	=	55.15	(75)
Northeast _{0.9x}	0.77	X	12.	71	x	9.2	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	х	0.63	X	0.7	=	71.86	(81)
Northwest _{0.9x}	0.77	x	3.4	16	x	91.	.35	x	0.63	x	0.7		96.59	(81)
Northwest 0.9x	0.77	x	3.4		x	97.	.38	х	0.63	x	0.7	=	102.98	(81)
Northwest 0.9x	0.77	x	3.4		x	91	1.1	х	0.63	x	0.7	=	96.33	(81)
Northwest 0.9x	0.77	x	3.4	16	x	72.	.63	х	0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	×	3.4	16	x [50.	.42	x	0.63	×	0.7	_ =	53.32	(81)
Northwest 0.9x	0.77	×	3.4	16	x	28.	.07	х	0.63	×	0.7	=	29.68	(81)
Northwest _{0.9x}	0.77	×	3.4	16	x [14	1.2	x	0.63	×	0.7	_	15.01	(81)
Northwest 0.9x	0.77	= x	3.4		x [9.2		х	0.63	X	0.7	= =	9.74	(81)
0.40 X 0.40 X 0.77 (0.7)														
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m														
(83)m= 55.76		04.48	335.82	451.41	1	31.25	450.2	358		138.7	70.16	45.53		(83)
Total gains – i	nternal and	d solar	(84)m =	- (73)m	+ (8	33)m , v	watts				-1	ļ	l	
(84)m= 459.17	514.94 5	93.33	704.36	799.39	80	9.34	765.31	679	.71 580.35	490.4	445.43	438.43		(84)
7. Mean inter	nal temper	ature i	heating	seasor)									
						area fro	om Tah	0						
Utilisation fac	•	•		Temperature during heating periods in the living area from Table 9, Th1 (°C)										
Jan	Feb	10 101 1	vina are	a h1 m	•			ые <u>9</u> ,	Th1 (°C)				21	(85)
		Mar			n (se	ee Tab	le 9a)		, ,	Oct	Nov	Dec	21	(85)
(86)m= 0.99		Mar 0.94	Apr 0.84	May	n (se		ole 9a) Jul	Aı	ug Sep	Oct		Dec 0.99	21	(85)
(86)m= 0.99	0.98	0.94	Apr 0.84	May 0.65	n (se	ee Tab Jun .46	Jul 0.34	Aı 0.3	ug Sep 9 0.66	Oct 0.91	Nov 0.98		21	
Mean interna	0.98 I temperatu	0.94 ure in I	Apr 0.84 iving are	0.65 ea T1 (f	ollov	Jun Jun 0.46 w step:	ole 9a) Jul 0.34 s 3 to 7	0.3 ' in T	ug Sep 9 0.66 able 9c)	0.91	0.98	0.99	21	(86)
Mean interna (87)m= 19.91	0.98 I temperatu 20.08 2	0.94 ure in l 20.38	Apr 0.84 iving are 20.74	May 0.65 ea T1 (for 20.93	ollov	Jun .46 w step:	ole 9a) Jul 0.34 s 3 to 7	0.3 ' in T	ug Sep 19 0.66 Table 9c) 1 20.95		0.98		21	
Mean interna (87)m= 19.91 Temperature	0.98 I temperatu 20.08 2 during hea	0.94 ure in l 20.38 ating p	Apr 0.84 iving are 20.74 eriods ir	May 0.65 ea T1 (for 20.93	ollov	Jun 1.46 w step: 0.99 elling f	Jul 0.34 s 3 to 7 21	0.3 ' in T 2'	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C)	0.91 20.66	20.23	0.99	21	(86)
Mean interna (87)m= 19.91	0.98 I temperatu 20.08 2 during hea	0.94 ure in l 20.38	Apr 0.84 iving are 20.74	May 0.65 ea T1 (for 20.93	ollov	Jun .46 w step:	ole 9a) Jul 0.34 s 3 to 7	0.3 ' in T	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C)	0.91	20.23	0.99	21	(86)
Mean interna (87)m= 19.91 Temperature	0.98 I temperatu 20.08 2 during hea 20.21 2	0.94 ure in l 20.38 ating p	Apr 0.84 iving are 20.74 eriods ir 20.23	May 0.65 ea T1 (for 20.93) n rest of 20.23	ollow col	ee Tab Jun .46 w step: 0.99 elling f	Jul 0.34 s 3 to 7 21 from Ta 20.25	0.3 ' in T 2' ble 9	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C)	0.91 20.66	20.23	0.99	21	(86)
Mean interna (87)m= 19.91 Temperature (88)m= 20.21	0.98 I temperatu 20.08	0.94 ure in l 20.38 ating p	Apr 0.84 iving are 20.74 eriods ir 20.23	May 0.65 ea T1 (for 20.93) n rest of 20.23	ollow 20 h2,r	ee Tab Jun .46 w step: 0.99 elling f	Jul 0.34 s 3 to 7 21 from Ta 20.25	0.3 ' in T 2' ble 9	ug Sep 19 0.66 Table 9c) 1 20.95 10, Th2 (°C) 25 20.24	0.91 20.66	20.23	0.99	21	(86)
Mean interna (87)m= 19.91 Temperature (88)m= 20.21 Utilisation fac	0.98 I temperatu 20.08	0.94 ure in 1 20.38 ating p 20.21 ns for r 0.93	Apr 0.84 iving are 20.74 eriods ir 20.23 est of do 0.81	May 0.65 ea T1 (for 20.93 no rest of 20.23 welling, 0.61	ollow 20 dwee 20 h2,r	w step: 0.99 elling f 0.25 m (see	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28	Au 0.3 7 in T 2 ble 9 20.3 9a) 0.3	ug Sep 19 0.66 Table 9c) 1 20.95 20, Th2 (°C) 25 20.24	0.91 20.666 20.23	20.23	0.99	21	(86) (87) (88)
Mean internal (87)m= 19.91 Temperature (88)m= 20.21 Utilisation fact (89)m= 0.98	0.98 I temperate 20.08 20.21 20.21 ctor for gair 0.97 I temperate	0.94 ure in 1 20.38 ating p 20.21 ns for r 0.93	Apr 0.84 iving are 20.74 eriods ir 20.23 est of do 0.81	May 0.65 ea T1 (for 20.93 no rest of 20.23 welling, 0.61	(se 0 0 0 0 0 0 0 0 0	w step: 0.99 elling f 0.25 m (see	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28	Au 0.3 7 in T 2 ble 9 20.3 9a) 0.3	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C) 25 20.24 13 0.6 10 7 in Table	0.91 20.666 20.23	0.98 20.23 20.23 0.97	0.99	21	(86) (87) (88)
Mean interna (87)m= 19.91 Temperature (88)m= 20.21 Utilisation fac (89)m= 0.98 Mean interna	0.98 I temperate 20.08 20.21 20.21 ctor for gair 0.97 I temperate	0.94 ure in 1 20.38 ating p 20.21 ns for r 0.93 ure in t	Apr 0.84 iving are 20.74 eriods ir 20.23 est of dr 0.81 he rest	May 0.65 ea T1 (for 20.93) n rest of 20.23 welling, 0.61 of dwell	(se 0 0 0 0 0 0 0 0 0	w steps 0.99 elling f 0.25 m (see	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28	Ai 0.33 ' in T 2' ble 9 20.3 9a) 0.3 ps 3	ug Sep 9 0.66 Table 9c) 1 20.95 0, Th2 (°C) 25 20.24 to 7 in Table 25 20.2	0.91 20.66 20.23 0.89 e 9c)	0.98 20.23 20.23 0.97	0.99 19.89 20.22 0.99	0.38	(86) (87) (88) (89)
Mean interna (87)m= 19.91 Temperature (88)m= 20.21 Utilisation fact (89)m= 0.98 Mean interna (90)m= 18.74	0.98 I temperatu 20.08	0.94 ure in I 20.38 ating por 20.21 ns for r 0.93 ure in t 19.42	Apr 0.84 iving are 20.74 eriods ir 20.23 est of de 0.81 he rest 19.93	May 0.65 ea T1 (for 20.93 no rest of 20.23 welling, 0.61 of dwell 20.17	0.0 ollov 200 h2,r 0.1 lling 200	w steps 0.99 elling f 0.25 m (see	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28 llow ste	AI 0.3 ' in T 2 ble 9 20.3 9a) 0.3 ps 3 20.3	ug Sep 19 0.66 Table 9c) 1 20.95 2), Th2 (°C) 25 20.24 13 0.6 15 7 in Table 25 20.2	0.91 20.66 20.23 0.89 e 9c)	0.98 20.23 20.23 0.97	0.99 19.89 20.22 0.99		(86) (87) (88) (89)
Mean interna (87)m= 19.91 Temperature (88)m= 20.21 Utilisation fac (89)m= 0.98 Mean interna (90)m= 18.74	0.98 I temperate 20.08 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.94 ure in 1 20.38 ating p 20.21 ns for r 0.93 ure in t 19.42 ure (fo	Apr 0.84 iving are 20.74 eriods ir 20.23 est of dr 0.81 he rest 19.93	May 0.65 ea T1 (for 20.93 no rest of 20.23 welling, 0.61 of dwell 20.17	ollow col	w step: 0.99 elling f 0.25 m (see 0.41 T2 (fol 0.24	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28 llow ste 20.24	Ai 0.3 ' in T 2' bble § 20.3 9a) 0.3 ps 3 20.4	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C) 25 20.24 13 0.6 15 7 in Table 25 20.2	0.91 20.66 20.23 0.89 e 9c) 19.84 LA = Liv	0.98 20.23 20.23 0.97 19.23 ring area ÷ (-	0.99 19.89 20.22 0.99 18.72 4) =		(86) (87) (88) (89) (90) (91)
Mean interna (87)m= 19.91 Temperature (88)m= 20.21 Utilisation fact (89)m= 0.98 Mean interna (90)m= 18.74	0.98 I temperatu 20.08	0.94 ure in I 20.38 ating pr 20.21 ns for r 0.93 ure in t 19.42 ure (fo 19.79	Apr 0.84 iving are 20.74 eriods ir 20.23 est of dr 0.81 he rest 19.93 r the wh	May	Second S	w step: 0.99 elling f 0.25 m (see 0.41 T2 (fol 0.24 0.53	Jul 0.34 s 3 to 7 21 from Ta 20.25 Table 0.28 llow ste 20.24 A × T1 20.53	Ai 0.33 'in T 2' ble § 20.3 9a) 0.3 ps 3 20.3 + (1 20.4)	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C) 25 20.24 13 0.6 10 7 in Tabl 25 20.2 11 — fLA) × T2 154 20.49	0.91 20.66 20.23 0.89 e 9c) 19.84 LA = Liv	0.98 20.23 20.23 0.97 19.23 ring area ÷ (-	0.99 19.89 20.22 0.99		(86) (87) (88) (89)

(93)m= 19.19 19.41 19.79 20.24 20.46 20.53 20.53 20.54 20.49 20.15 19.61 19	7 (93)
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 the utilisation factor for gains using Table 9a	alculate
	ec
Utilisation factor for gains, hm:	<u>'</u>
(94)m= 0.98 0.97 0.93 0.81 0.62 0.43 0.3 0.35 0.62 0.88 0.96 0.	8 (94)
Useful gains, hmGm , W = (94)m x (84)m	_
(95)m= 449.99 497.58 549.78 572.64 498.55 344.88 230.65 240.9 360.02 433.61 429.81 43	.1 (95)
Monthly average external temperature from Table 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	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
(97)m= 920.89 893.8 815.46 682.31 525.12 348.22 231.14 241.92 378.27 572.65 755.98 91	39 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 350.35 266.26 197.66 78.97 19.77 0 0 0 103.45 234.84 357	
Total per year (kWh/year) = Sum(98) _{15,8}	1608.62 (98)
Space heating requirement in kWh/m²/year	22.15 (99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community schemer Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	/
Fraction of space heat from community system 1 – (301) =	1 (302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sour includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	s; the latter
Fraction of heat from Community heat pump	1 (303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1 (304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1 (305)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year
Annual space heating requirement	1608.62
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1689.05 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0 (309)
Water heating	
Annual water heating requirement	2051.4
If DHW from community scheme:	(040-)
Water heat from Community heat pump $ (64) \times (303a) \times (305) \times (306) = $	2153.97 (310a)
Electricity used for heat distribution 0.01 x [(307a)(307e) + (310a)(310e)	
Cooling System Energy Efficiency Ratio	0 (314)
Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$	0 (315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	177.49 (330a)
Talances, extract of positive input from outdoor	(0000)

			_
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year =(330a) + (330b)	b) + (330g) =	177.49	(331)
Energy for lighting (calculated in Appendix L)		320.14	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (33	32)(237b) =	4231.84	(338)
12b. CO2 Emissions – Community heating scheme			
Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to	(366) for the second fue	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0.52	712.33	(367)
Electrical energy for heat distribution [(313) x	0.52	19.95	(372)
Total CO2 associated with community systems (363)(366) + (368)(372	2) =	732.28	(373)
CO2 associated with space heating (secondary) (309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating (373) + (374) + (375) =		732.28	(376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x	0.52	92.12	(378)
CO2 associated with electricity for lighting (332))) x	0.52	166.15	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1	0.52 x 0.01 =	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =		934.07	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		12.86	(384)
El rating (section 14)		89.36	(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:43:11*

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: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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 28.13 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.99 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 - Heat pump

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	12.07m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0.141/217	
Faity Walls O-value	0 W/m²K	

Photovoltaic array

		User [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 - D					
1. Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)	_	Volume(m ³	<u>''</u>
Ground floor		ţ	53.96	(1a) x	2	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	ins				0	Χ.	10 =	0	(7a)
Number of passive vents	3				0	x	10 =	0	(7b)
Number of flueless gas fi	ires			Ī	0	x	40 =	0	(7c)
				_			A : I-		
Letter Const. Letter L. Const. Const.	(Ca) (Cb) (7-\.(7 .).	(7 -)	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in the		(/,			(-)	()		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o resent, use the value corresponding to			•	ruction			0	(11)
deducting areas of openi		o ine grea	ler wall are	a (aner					
•	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)		_	+ (15) =		0	(15)
	q50, expressed in cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] + (18)$	8), otherw	rise (18) = ((16)				0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere Shelter factor	90		(20) = 1 -	[0.075 x (²	19)] =			0	(19)
Infiltration rate incorporate	ting shelter factor		(21) = (18	3) x (20) =				0.15	(21)
Infiltration rate modified f									`
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		
								ı	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				-	
0.19 Calculate effect	0.19 Ctive air	0.18 Change i	0.16 ate for t	0.16 he appli	0.14 cable ca	0.14 SE	0.14	0.15	0.16	0.17	0.18]	
If mechanica		_										0.5	(23a
If exhaust air h	eat pump ı	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23k
If balanced with	n heat reco	overy: effic	ency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				75.65	(230
a) If balance	ed mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)) ÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(248
b) If balance	ed mecha	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)	ī	,	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n	ouse ex n < 0.5 ×			•					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)n	ventilation			•	•				0.5]			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)		-	-	_	
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3]	(25)
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	re	AXU		k-value	e A	λΧk
	area	(m^2)	' m		A ,r	m²	W/m2	K	(W/I	K)	kJ/m²•	K k	J/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		60	935	.4 (29)
Walls Type2	24.2	24	0		24.24	, x	0.17	= [4.07		60	1454	4.4 (29)
Total area of e	elements	, m²			51.9								(31)
Party wall					31.67	, X	0	= [0		45	1425	i.15 (32)
Party floor					53.96	5					40	2158	3.4 (32
Party ceiling					53.96	5					30	1618	3.8 (32)
Internal wall **	ŧ				95.03	3					9	855.	27 (32
* for windows and						ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragrapi	h 3.2	
** include the area				ls and par	titions		(00) (00)	(20)				_	
Fabric heat los		•	U)				(26)(30)		(00) - (0)	0) - (00-)	(00-)	22.88	(33)
Heat capacity	,	,		TEA) :				***	.(30) + (32)	2) + (32a).	(32e) =	8447.42	(34)
Thermal mass For design assess	•	•		•			ooisoly the	` '	\div (4) =	TMD in T	ahla 1f	156.55	(35)
can be used inste				CONSTRUCT	ion are noi	known pi	ecisely lile	illulcative	values of	TIVIT III I	able II		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						6.04	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he								(33) +	(36) =			28.91	(37)
Ventilation hea	at loss ca	alculated	monthly	/					= 0.33 × ((25)m x (5) T	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	4=
(38)m= 14.77	14.59	14.42	13.53	13.35	12.47	12.47	12.29	12.82	13.35	13.71	14.06]	(38)
Heat transfer of		nt, W/K			·	·			= (37) + (38)m		1	
(39)m= 43.68	43.51	43.33	42.45	42.27	41.38	41.38	41.21	41.74	42.27	42.62	42.98		
									Average =	Sum(39) ₁	12 /12=	42.4	(39)

Heat loss	s parar	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.81	0.81	0.8	0.79	0.78	0.77	0.77	0.76	0.77	0.78	0.79	0.8		
										Average =	Sum(40) ₁	12 /12=	0.79	(40)
Number	of day		nth (Tab	le 1a)			·	ı						
_	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	ng ene	rgy requi	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 (⁻	TFA -13		81		(42)
Annual a Reduce the not more th	e annuai	l average	hot water	usage by	5% if the a	lwelling is	designed t	` ,		se target o		.11		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water u		litres per	day for ea		,		Table 1c x	_	· ·		!			
(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		
										Total = Su	m(44) ₁₁₂ =		925.35	(44)
Energy cor	ntent of I	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= 1	25.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82		
If in atomton		ator booti	na ot noint	of upo (no	, hot water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	- [1213.27	(45)
If instantan				,		, , , , , , , , , , , , , , , , , , ,	·	` '	,	1	ı	1		(10)
(46)m= Mater sto	18.87 Orage	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27		(46)
Storage	_		includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If commu		` '					_					<u> </u>		(/
Otherwis	-	_			-			' '	ers) ente	er '0' in ((47)			
Water sto	•													
a) If mar	nufactu	ırer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempera	ature fa	ctor fro	m Table	2b								0		(49)
Energy lo			•					(48) x (49)) =		1	10		(50)
b) If marHot wate				-								02		(51)
If commu		-			C 2 (KVV)	ii/iiti C/GC	·y /				0.	02		(31)
Volume f		_									1.	03		(52)
Tempera	ature fa	actor fro	m Table	2b							0	.6		(53)
Energy lo	ost fror	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (5	0) or (54) in (5	55)								1.	03		(55)
Water sto	orage l	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder of	contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary o	circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary		`	,			59)m = ((58) ÷ 36	65 × (41)	m			-		• /
•					,		. ,	, ,	cylinde	r thermo	stat)			
(59)m= 2	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 cal	culated :	for each	month ((61)m –	(60) ± 3	R65 v (11	/m						
(61)m= 0	0	0	0	0 0	00) + 0	0 7 (41) o	0	0	0	0	1	(61)
		-	-									J · (59)m + (61)m	(- /
(62)m= 181.07	159.94	168.8	152.47	150.25	135.45		142.4	_	158.05	165.67	177.1	1	(62)
Solar DHW input c									ļ]	(-)
(add additional										morrio wan	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from wa	ater heat	ter				1	!	I	!	1	!	1	
(64)m= 181.07	159.94	168.8	152.47	150.25	135.45	131.22	142.4	12 141.68	158.05	165.67	177.1	1	
	'						C	Output from w	ater heat	er (annual)	112	1864.11	(64)
Heat gains fror	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)m] + 0.8	x [(46)m	n + (57)m	+ (59)m		-
(65)m= 86.05	76.52	81.97	75.7	75.8	70.04	69.47	73.2	72.12	78.39	80.1	84.73]	(65)
include (57)r	n in calc	culation of	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is f	from com	munity h	neating	
5. Internal ga			. ,		•						•		
Metabolic gains	s (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.3	4 90.34	90.34	90.34	90.34		(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e 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 gai	ns (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a), a	lso see Ta	ble 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	(calcula	ted in A	opendix	L, equat	ion L15	or L15a), also	see Table	5	•	-	•	
(69)m= 32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.0	3 32.03	32.03	32.03	32.03		(69)
Pumps and far	ns gains	(Table 5	āa)					•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-	-	-	•	
(71)m= -72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.2	7 -72.27	-72.27	-72.27	-72.27		(71)
Water heating	gains (T	able 5)		-		-		-	-	-	-	•	
(72)m= 115.65	113.87	110.17	105.15	101.88	97.28	93.38	98.3	8 100.16	105.37	111.24	113.88		(72)
Total internal	gains =				(60	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 337.3	335.58	325.44	309.18	292.9	277.01	266.54	271.4	9 279.71	296.15	315.03	328.97		(73)
6. Solar gains):												
Solar gains are c	alculated ı	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to the	ne applica	ble orienta	tion.		
Orientation: A		actor	Area			UX		g_ Table 6b	-	FF		Gains	
_	able 6d		m²		- 18	able 6a		Table 6b	_ '	Table 6c		(W)	_
Northeast _{0.9x}	0.77	X	12.	07	x	11.28	X	0.63	x	0.7	=	41.62	(75)
Northeast _{0.9x}	0.77	x	12.	07	х	22.97	X	0.63	x	0.7	=	84.72	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	41.38	X	0.63	x	0.7	=	152.64	(75)
Northeast _{0.9x}	0.77	Х	12.	07	X	67.96	X	0.63	x	0.7	=	250.67	(75)
Northeast _{0.9x}	0.77	X	12.	07	X	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.	07	x	91.1	X		0.63	x	0.7	=	336.05	(75)
Northeast _{0.9x}	0.77	X	12.	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	Х	12.	07	x	9.21	X		0.63	x	0.7	=	33.99	(75)
Solar gains in	watts, ca	alculated	for eac	h month	_		(83)m	n = Si	um(74)m .	(82)m	_			
(83)m= 41.62	84.72	152.64	250.67	336.95	359.2	3 336.05	267	7.9	185.99	103.53	52.37	33.99		(83)
Total gains –	internal a	and solar	(84)m =	= (73)m	+ (83)	m , watts						•	•	
(84)m= 378.92	420.3	478.07	559.85	629.86	636.2	4 602.59	539	.39	465.7	399.68	367.4	362.95		(84)
7. Mean inte	rnal temp	perature	(heating	season)									
Temperature	during h	neating p	eriods ir	n the livi	ng are	a from Ta	ble 9	, Th	1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see	Table 9a)								
Jan	Feb	Mar	Apr	May	Jui	n Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 0.98	0.96	0.91	0.79	0.6	0.41	0.3	0.3	35	0.59	0.86	0.96	0.98		(86)
Mean interna	al temner	ature in	living an		llow s	tens 3 to	7 in T	 Table	2 9c)					
(87)m= 20.03	20.19	20.48	20.8	20.95	20.9	_i	2		20.97	20.74	20.34	20		(87)
, ,					-l 113		-1-1- (-0 (00)		1			
Temperature (88)m= 20.25	20.25	20.25	20.26	20.27	20.2	<u> </u>	20.		12 (°C) 20.28	20.27	20.26	20.26		(88)
. ,	ļ			<u> </u>	<u> </u>	!	ļ	20	20.20	20.27	20.20	20.26		(00)
Utilisation fa	 					`	T			1	1	1	1	(2.2)
(89)m= 0.97	0.95	0.9	0.76	0.56	0.37	0.25	0.3	3	0.54	0.83	0.95	0.98		(89)
Mean interna	al temper	ature in	the rest	of dwell	ng T2	(follow ste	eps 3	to 7	7 in Tabl	e 9c)	_			
(90)m= 18.94	19.19	19.59	20.03	20.22	20.2	3 20.28	20.	28	20.25	19.97	19.41	18.92		(90)
									f	LA = Livir	ng area ÷ (4) =	0.47	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) :	= fLA × T1	+ (1	– fL	A) × T2					
(92)m= 19.45	19.66	20.01	20.4	20.57	20.6	2 20.62	20.	62	20.59	20.33	19.85	19.43		(92)
Apply adjust	ment to t	he mean	interna	l temper	ature	from Table	e 4e,	whe	re appro	opriate				
(93)m= 19.45	19.66	20.01	20.4	20.57	20.6	2 20.62	20.	62	20.59	20.33	19.85	19.43		(93)
8. Space hea	ating requ	uirement												
Set Ti to the					ned at	step 11 of	Tabl	le 9b	o, so tha	t Ti,m=	(76)m an	d re-calc	culate	
the utilisation	1			i			Ι,		0	0.1	NI.			
Jan Utilisation fo	Feb	Mar	Apr	May	Jui	n Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation fa	0.95	0.89	0.76	0.57	0.39	0.28	0.3	32	0.56	0.84	0.94	0.97		(94)
Useful gains				<u> </u>	0.50	0.20	0.0	,,,	0.50	0.04	0.54	0.57		(0.)
(95)m= 365.75	`	427.33	427.25	360.81	247.2	2 166.11	173	.41	261.73	334.22	345.95	352.08		(95)
Monthly ave				<u> </u>		1					1		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 loss rat				l .	Lm , \	V =[(39)m]	1	I	I	
(97)m= 661.94		585.42	487.92	374.76	248.9		173		270.77	411.33	543.52	654.55		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Nh/m	$\frac{1}{\text{onth}} = 0.02$	24 x [[(97)	m – (95)m] x (4	1)m		•	
(98)m= 220.37	164.48	117.62	43.69	10.37	0	0	0)	0	57.37	142.25	225.03		
	-				-	•	•			-	•	-	•	

		_		
7	Total per year (kWh/y	ear) = Sum(98) _{15,912} =	981.18	(98)
Space heating requirement in kWh/m²/year			18.18	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating p Fraction of space heat from secondary/supplementary heating (Table		munity scheme.	0	(301)
Fraction of space heat from community system 1 – (301) =	,	ř	1	(302)
The community scheme may obtain heat from several sources. The procedure allows	for CHP and up to fo	L ur other heat sources; the	e latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See Approximation of heat from Community heat pump	ppendix C.	Γ	1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	 1	(304a)
Factor for control and charging method (Table 4c(3)) for community h	heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system	3 - 7 - 7	F	1.05	(306)
Space heating		L	kWh/year	
Annual space heating requirement		Γ	981.18	7
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1030.24	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Append	dix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		Г	1864.11	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1957.32	(310a)
Electricity used for heat distribution	0.01 x [(307a)(307e	e) + (310a)(310e)] =	29.88	(313)
Cooling System Energy Efficiency Ratio		Ī	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) :	<u> </u>	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsi	ide		114.79	(330a)
warm air heating system fans		Ī	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	114.79	(331)
Energy for lighting (calculated in Appendix L)		Ī	247.96	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (37	15) + (331) + (33	2)(237b) =	3241.49	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh k	Emissions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two f	fuels repeat (363) to (366) for the second fuel	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b))] x 100 ÷ (367b) x	0.52 =	553.76	(367)
Electrical energy for heat distribution [(313)	x	0.52 =	15.51	(372)

Total CO2 associated with community s	systems	(363)(366) + (368)(372))	=	569.27	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	aneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			569.27	(376)
CO2 associated with electricity for pum	ps and fans within dw	elling (331)) x	0.52	=	59.58	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	128.69	(379)
Energy saving/generation technologies Item 1	(333) to (334) as app		0.52 × 0.0	ı1 – F		7(200)
item i			0.52 × 0.0	' - _	-56.48	(380)
Total CO2, kg/year	sum of (376)(382) =				701.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.99	(384)
El rating (section 14)					90.51	(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:09

Proiect 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 27.09 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.15 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

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 - Heat pump

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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
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 electric heat pump		
Photovoltaic array		

		Hear	Details:						
Access an Name	Noil lo above	0361		- M	L		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Continui o Italiio:	5.1.5.1.1.2.1.2.1.2		ty Address:		0.011.		7 0 10 10	711 11010100	
Address :		·	•						
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a) .	. (4.5)		(1a) x	2	65	(2a) =	184.47	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	F(1n)	69.61	(4)	\	I) (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	184.47	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of altimospess	heating he	ating		,			40 =		_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents				L	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	0		÷ (5) =	0	(8)
•	peen carried out or is intended,			ontinue fr			- (3) =	0	(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			•	ruction			0	(11)
deducting areas of openii		maing to the git	eater wan 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								0	(13)
ŭ	s and doors draught strip	pped						0	(14)
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	aro avaraged in subje		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic $(18) = (17)$	•	•	•	etre or e	envelope	area	3	$= \begin{pmatrix} (17) \\ (48) \end{pmatrix}$
•	es if a pressurisation test has b				is beina u	sed		0.15	(18)
Number of sides sheltere			3 ,,	,	3			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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		
						-		ı	

ajustea iriiliti	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				-	
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18]	
<i>alcul<mark>ate effed</mark></i> If mechanica		-	rate for t	ne appli	cable ca	se						0.5	(2
If exhaust air he			endix N. (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) . othe	wise (23b) = (23a)			0.5	=\(\frac{1}{2}\)
If balanced with									, , ,			74.8	=\\(^2
a) If balance		•	-	_					2h\m + (23h) √ [·	1 – (23c)		(2
4a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3]	(2
b) If balance					l		l			23h)		J	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h	OUSE EX	tract ver	tilation (or nositiv	e input v	<u>l</u> ventilatio	n from c	utside				J	
,			then (24	•	•				5 × (23b)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	ļ.		<u>!</u>	1	
,			m = (221)		•				0.5]			_	
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(:
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
5)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3]	(:
3. Heat losse	s and he	at lose r	naramet	or:									
LEMENT	Gros	·	Openin		Net Ar	A 2	U-valı	IA	AXU		k-value	Δ Δ	Χk
LEIVIEINI	area	_	m		A,r		W/m2		(W/I	<)	kJ/m²-		/K
indows Type	· 1				8.97	x1.	/[1/(1.4)+	0.04] =	11.89				(
indows Type	2				2.92	x1,	/[1/(1.4)+	0.04] =	3.87				(
alls Type1	41.5	i9	11.89	9	29.7	X	0.18		5.35	=	60	1782	
/alls Type2	18.4	<u> </u>	0		18.41	x	0.17	=	3.09	=	60	1104.6	$\frac{1}{6}$
oof	69.6		0		69.61	=	0.13	<u> </u>	9.05	ᅴ ;	9	626.49	=
otal area of e					129.6	=	0.10		0.00			020.40	Ш,
arty wall	iomonto	,				=		— r			45) م
•					38.68	=	0	=	0		45	1740.6	〓.
arty floor					69.61					Ĺ	40	2784.4	= '
ternal wall **					136.2					L	9	1225.8	89 (
or windows and include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	1 3.2	
abric heat los							(26)(30)	+ (32) =				33.25	
eat capacity		•	- /					((28)	.(30) + (32	2) + (32a).	(32e) =	9263.98	\exists
nermal mass	,	,	⊃ = Cm -	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =	, , ,	, ,	133.08	\exists
r design assess	•	•		,			ecisely the			TMP in Ta	able 1f	100.00	`
n be used inste						·							
nermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						7.36	
details of therma		are not kn	own (36) =	= 0.05 x (3	1)								_
otal fabric he									(36) =			40.61	(
entilation hea						<u> </u>	1		= 0.33 × (1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 19.31	19.08	18.86	17.71	17.49	16.34	16.34	16.12	16.8	17.49	17.94	18.4]	(
eat transfer o	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			

leat lo	ss para	meter (F	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
10)m=	0.86	0.86	0.85	0.84	0.83	0.82	0.82	0.81	0.82	0.83	0.84	0.85		_
lumbe	er of day	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.84	(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. Wa	ter heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		24		(42
nnual educe	averag	e hot wa al average		usage by	5% if the α	lwelling is	designed t	(25 x N) to achieve		se target c		7.32		(4:
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
4)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		_
nerav d	content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.r	n x nm x E	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1047.84	(4
5)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		
-,		12.1100							l		m(45) ₁₁₂ =	L	1373.88	(4
instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					_
l6)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		(4
	storage e volum		includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
_		, ,	ind no ta				_					<u> </u>		
therw	ise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
	storage		ا لمصمام	ft-	ممادة	/1.\^/b	· /d o · ·) ·							
•			eclared I		or is kno	wn (Kvvr	i/day):					0		(4
-			m Table					(40) (40)				0		(4
			storage eclared o	-		or is not		(48) x (49)) =		1	10		(5
			factor fr	-							0.	02		(5
	-	_	ee secti	on 4.3										
		from Tal									1.	03		(5
empe	rature f	actor fro	m Table	2b							0	.6		(5
٠.			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(5
		(54) in (5	,								1.	.03		(5
/ater	storage	loss cal	culated 1	or each	month			((56)m = (55) × (41)ı	m 				
6)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
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	хH	
57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
rimar	y circuit	loss (an	nual) fro	m Table	e 3							0		(5
rimar	y circuit	loss cal	culated t	for each	month (•	. ,	65 × (41)						
(mod	dified by	factor fi	rom Tab	le H5 if t	here is s	solar 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		(5

Combi loss o	ralculated	for each	month ((61)m –	(60) ± 3	65 v (41)m							
(61)m= 0	0	0	0	0	00) - 0	00 x (+1) 0		0	0	T 0	0	1	(61)
	<u>l</u>			alculated	for eac	h month							J · (59)m + (61)m	` ,
(62)m= 197.7		183.83	165.57	162.82	146.29	141.27	153	_	153.35	171.65	180.52	193.22	1	(62)
Solar DHW inpu			<u> </u>						if no sola		1		1	` ,
(add addition												· · · · · · · · · · · · · · · · · ·		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	1	(63)
Output from	water hea	ter	ı										•	
(64)m= 197.7		183.83	165.57	162.82	146.29	141.27	153	.96	153.35	171.65	180.52	193.22	1	
			ı			1		Outp	out from wa	ater heate	er (annual) ₁	112	2024.72	(64)
Heat gains fi	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	κ [(46)m	+ (57)m	+ (59)m	n]	_
(65)m= 91.58	81.36	86.97	80.06	79.98	73.65	72.81	77.0	03	76	82.92	85.03	90.09]	(65)
include (5	7)m in cald	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	ins (Table	e 5), Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 111.8	3 111.83	111.83	111.83	111.83	111.83	111.83	111.	.83	111.83	111.83	111.83	111.83]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 d	r L9a), a	lso s	ee ¯	Table 5				_	
(67)m= 18.0 ²	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 of	gains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Ta	ble 5		-	_	
(68)m= 196.3	9 198.42	193.29	182.36	168.55	155.58	146.92	144.	.88	150.02	160.95	174.75	187.72]	(68)
Cooking gair	ns (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 t	ans gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g.	evaporatio	on (nega	tive valu	es) (Tab	le 5)									
(71)m= -89.4	6 -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	ng gains (T	able 5)											_	
(72)m= 123.1	121.08	116.89	111.2	107.5	102.29	97.87	103	.54	105.55	111.45	118.1	121.09]	(72)
Total intern	al gains =				(66	i)m + (67)m	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 394.0	7 392.08	379.76	359.97	339.98	320.65	308.06	313	.71	323.86	343.85	366.79	383.9		(73)
6. Solar gai														
Solar gains ar		•				•	tions 1	to co		e applica		tion.		
Orientation:	Access F Table 6d		Area m²		Fli Ta	ıx ıble 6a		Т	g_ able 6b	Т	FF able 6c		Gains (W)	
Northoast o o							1 1					_	. ,	1,75
Northeast 0.93		X				11.28	X]		0.63	×	0.7	=	30.93	(75)
	<u> </u>	X				22.97	X]		0.63	_	0.7	_ =	62.96	(75)
Northeast 0.9	<u> </u>	X	8.9			41.38	X]		0.63	×	0.7	=	113.43	[(75)
Northeast 0.9		X	8.9		<u> </u>	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)

		_			_		7		_		_		_
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	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	х	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	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	×	2.9	12	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	12	x	119.01		0.63	X	0.7	=	106.2	(79)
Southwest _{0.9x}	0.77	×	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	X	0.7	=	101.65	(79)
Southwest _{0.9x}	0.77	×	2.9	2	x	104.39]	0.63	x	0.7	=	93.16	(79)
Southwest _{0.9x}	0.77	×	2.9	2	x	92.85]	0.63	x	0.7	=	82.86	(79)
Southwest _{0.9x}	0.77	×	2.9	2	x	69.27	Ī	0.63	x	0.7	=	61.81	(79)
Southwest _{0.9x}	0.77	×	2.9	2	x	44.07	1	0.63	x	0.7	=	39.33	(79)
Southwest _{0.9x}	0.77	×	2.9	2	x	31.49	Ī	0.63	x	0.7	=	28.1	(79)
Solar gains in						4 1 054 00	ř	n = Sum(74)m .		70.05	50.00		(02)
(83)m= 63.76 Total gains – i		39.96 Solar	281.11	356.62	372.4		292	.25 221.08	138.76	78.25	53.36		(83)
(84)m= 457.84		30iai 39.72	641.07	696.59	693.0		605	.97 544.94	482.6	445.04	437.26		(84)
` '					<u> </u>	000.40	1 003	.57 544.54	402.0	1 443.04	437.20		(01)
7. Mean inter			,		<i></i>	, -		TI 4 (00)					7,
Temperature	Ū	٠.			•		ole 9	, Ih1 (°C)				21	(85)
Utilisation fac	 	$\overline{}$			`				0.1	l Ni-			
Jan	+ +	Mar	Apr	May	Jur	+	 	ug Sep	Oct	0.96	Dec		(86)
(86)m= 0.97).92	0.83	0.69	0.51	0.38		10 0.66			0.98		(00)
Mean interna					•			12 0.66	0.88	0.00	<u> </u>		
	1 1					_i	7 in T	able 9c)					(07)
(87)m= 19.7	1 1	re in I 0.21	iving are	ea T1 (fo 20.85	20.9	_i		able 9c)	20.57		19.68		(87)
(87)m= 19.7 Temperature	19.9 2	0.21	20.6	20.85	20.9	7 20.99	7 in T	able 9c) 99 20.91					(87)
	19.9 2 during hea	0.21	20.6	20.85	20.9	7 20.99 ng from Ta	7 in T	able 9c) 99 20.91 9, Th2 (°C)		20.09			(87)
Temperature	19.9 2 during hea 20.2 2	0.21 ting p	20.6 eriods ir 20.22	20.85 rest of 20.22	20.9° dwelli 20.24	7 20.99 ng from Ta 4 20.24	7 in T 20. able 9 20.	able 9c) 99 20.91 9, Th2 (°C)	20.57	20.09	19.68		, ,
Temperature (88)m= 20.2	during hea 20.2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.21 ting p	20.6 eriods ir 20.22	20.85 rest of 20.22	20.9° dwelli 20.24	7 20.99 ng from Ta 4 20.24 (see Table	7 in T 20. able 9 20.	Fable 9c) 99 20.91 9, Th2 (°C) 24 20.23	20.57	20.09	19.68		, ,
Temperature (88)m= 20.2 Utilisation fact (89)m= 0.97	19.9 2 during hea 20.2 2 ctor for gain 0.95 0	0.21 ting p 0.21 s for r	20.6 eriods ir 20.22 est of do 0.81	20.85 n rest of 20.22 welling, 0.65	20.9° dwelli 20.24 h2,m 0.45	ng from Ta 4 20.24 (see Table 0.31	7 in T 20. able 9 20. 9a) 0.3	Fable 9c) 99 20.91 9, Th2 (°C) 24 20.23	20.57	20.09	19.68		(88)
Temperature (88)m= 20.2 Utilisation fac	during hear 20.2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.21 ting p 0.21 s for r	20.6 eriods ir 20.22 est of do 0.81	20.85 n rest of 20.22 welling, 0.65	20.9° dwelli 20.24 h2,m 0.45	ng from Ta 4 20.24 (see Table 0.31 (follow ste	7 in T 20. able 9 20. 9a) 0.3	Fable 9c) 99 20.91 9, Th2 (°C) 24 20.23 86 0.6 8 to 7 in Table	20.57	20.09	19.68		(88)
Temperature (88)m= 20.2 Utilisation fac (89)m= 0.97 Mean interna	during hear 20.2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	o.21 ting pool.21 s for r	20.6 eriods ir 20.22 est of do 0.81 the rest	20.85 n rest of 20.22 welling, 0.65 of dwelli	20.9 dwelli 20.24 h2,m (0.45	ng from Ta 4 20.24 (see Table 0.31 (follow ste	7 in T 20. able (20. 9a) 0.3	Fable 9c) 99 20.91 9, Th2 (°C) 24 20.23 36 0.6 3 to 7 in Tabl 23 20.15	20.57 20.22 0.85 e 9c) 19.71	20.09	19.68 20.21 0.97	0.38	(88)
Temperature (88)m= 20.2 Utilisation fac (89)m= 0.97 Mean interna (90)m= 18.46	19.9 2 during heat 20.2 2 ctor for gain 0.95 0 al temperature 18.74 1	0.21 ting producting production of the control of t	20.6 eriods ir 20.22 est of do 0.81 the rest 19.73	20.85 n rest of 20.22 welling, 0.65 of dwelli 20.07	20.9 dwelli 20.24 h2,m 0.45 ing T2 20.2	7 20.99 ng from Ta 4 20.24 (see Table	7 in T 20. able 9 20. 9a) 0.3 eps 3	Fable 9c) 99 20.91 9, Th2 (°C) 24 20.23 36 0.6 3 to 7 in Table 23 20.15	20.57 20.22 0.85 e 9c) 19.71	20.09 20.22 0.95	19.68 20.21 0.97	0.38	(88) (89) (90)
Temperature (88)m= 20.2 Utilisation fact (89)m= 0.97 Mean internation (90)m= 18.46	during hear 20.2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.21 ting producting production of the control of t	20.6 eriods ir 20.22 est of do 0.81 the rest 19.73	20.85 n rest of 20.22 welling, 0.65 of dwelli 20.07	20.9 dwelli 20.24 h2,m 0.45 ing T2 20.2	7 20.99 ng from Ta 4 20.24 (see Table	7 in T 20. able 9 20. 9a) 0.3 eps 3	Fable 9c) 99 20.91 9, Th2 (°C) 24 20.23 36 0.6 3 to 7 in Tabl 23 20.15	20.57 20.22 0.85 e 9c) 19.71	20.09 20.22 0.95 19.02 ring area ÷ (-	19.68 20.21 0.97	0.38	(88) (89) (90)
Temperature (88)m= 20.2 Utilisation fac (89)m= 0.97 Mean interna (90)m= 18.46	19.9 2 during heat 20.2 2 ctor for gain 0.95 0 It temperature 18.74 1 It temperature 19.18 1	0.21 ting pool 0.21 s for r 0.91 re in t 9.19 re (fo 9.58	20.6 eriods ir 20.22 est of d 0.81 the rest 19.73 r the wh	20.85 n rest of 20.22 welling, 0.65 of dwelli 20.07 ole dwe 20.37	20.9 dwelli 20.24 h2,m 0.45 ng T2 20.2 llling) = 20.5	7 20.99 ng from Ta 4 20.24 (see Table	7 in T 20. able 9 20. 9a) 0.3 eps 3 20. + (1 20.	Fable 9c) 99 20.91 9, Th2 (°C) 24 20.23 36 0.6 3 to 7 in Tabl 23 20.15 - fLA) × T2 52 20.44	20.57 20.22 0.85 e 9c) 19.71 iLA = Liv	20.09 20.22 0.95 19.02 ring area ÷ (-	19.68 20.21 0.97 18.43 4) =	0.38	(88) (89) (90) (91)

		•				•	•			•			
(93)m= 18.93	19.18	19.58	20.06	20.37	20.5	20.52	20.52	20.44	20.04	19.43	18.9		(93)
8. Space heat													
Set Ti to the r the utilisation			•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		l	<u> </u>	,			19						
(94)m= 0.96	0.94	0.9	0.8	0.65	0.47	0.34	0.38	0.62	0.85	0.94	0.96		(94)
Useful gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m= 439.27	480.25	511.52	515.27	455.14	326.24	221.49	230.62	336.01	408.15	416.96	421.82		(95)
Monthly avera	age exte	rnal tem	perature	from T	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		i —			i —					<u> </u>			
(97)m= 876.88	852.5	777.76	651.09	503.53	335.98	223.41	233.76	363.88	548.54	721.97	867.71		(97)
Space heating		1			I	I				r -	004.75		
(98)m= 325.58	250.15	198.08	97.79	36	0	0	0	0	104.45	219.61	331.75	4500.40	7(00)
							lota	l per year	(kWh/yeai	r) = Sum(9	8) _{15,912} =	1563.42	(98)
Space heating	g require	ement in	kWh/m²	/year								22.46	(99)
9b. Energy req	uiremer	nts – Cor	mmunity	heating	scheme								
This part is use										unity sch	neme.		7(204)
Fraction of spa			-		-	_	(Table 1	i) 'U' if n	one		[0	(301)
Fraction of spa	ice heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so									up to four	other heat	sources; th	ne latter	
includes boilers, he Fraction of hea		-			rom powei	r stations.	See Appei	ndix C.			Γ	1	(303a)
				•	act numr	_			(2	00) v (202	_\ 		╡`
Fraction of tota	•			•					•	02) x (303	a) = [1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting syst	tem			1 	(305)
Distribution los	s factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space heating)										_	kWh/yea	<u>r_</u>
Annual space I	neating	requiren	nent									1563.42	
Space heat fro	m Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	- [1641.6	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =	Ī	0	(309)
											L		
Water heating Annual water h		equirem	ent								Г	2024.72	7
	•	•									L	2024.72	
If DHW from community scheme: Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2125.95 (310)											(310a)		
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	37.68	(313)
Cooling Syster	n Enera	v Efficie	ncv Ratio	0								0	(314)
Space cooling	•	•	•		n if not e	enter (1)		= (107) ÷	(314) =		[0	(315)
	,					,		- (101) -	(5.4) =		L		(010)
Electricity for p mechanical ver							outside				ſ	170.14	(330a)
			,	. 1							L		」 ` ′

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	170.14	(331)
Energy for lighting (calculated in Appendix L)			318.62	(332)
Electricity generated by PVs (Appendix M) (negative quanti	ty)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (33	32)(237b) =	4147.49	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not Cl Efficiency of heat source 1 (%)	HP) vusing two fuels repeat (363) to	(366) for the second fu	el 280	(367a)
CO2 associated with heat source 1 [(3	07b)+(310b)] x 100 ÷ (367b) x	0.52	698.34	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 19.55	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	717.9	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instar	ntaneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		717.9	(376)
CO2 associated with electricity for pumps and fans within d	welling (331)) x	0.52	= 88.3	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	165.36	(379)
Energy saving/generation technologies (333) to (334) as ap Item 1	pplicable	0.52 x 0.01 =	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =			915.09	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			13.15	(384)

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:07

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 31.43 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

14.61 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

Li abilo o valdes

 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)
 0.13 (max. 0.20)
 0.13 (max. 0.35)
 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 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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:	0.47	
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 m ³ /m ² h	
Deute, Welle II volve	0.147/217	
Party Walls U-value	0 W/m²K	

Photovoltaic array

User Details:									
Assessor Name: Neil Ingham Stroma Number: STRO010 Software Name: Stroma FSAP 2012 Software Version: 1									
Property Address: 04 - F Address:									
1. Overall dwelling dimensions:									
Š	olume(m³)								
Ground floor 50.62 (1a) x 2.65 (2a) =	134.14 (3a)								
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 50.62 (4)									
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	134.14 (5)								
2. Ventilation rate:									
main secondary other total m heating heating	³ per 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 0 x 10 =	0 (7a)								
Number of passive vents 0 x 10 =	0 (7b)								
Number of flueless gas fires 0	0 (7c)								
	```								
Air changes per hour									
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$	0 (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	3 (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	0.15 (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) =	0.15 (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 ÷ 4									
Wind 1 actor (22a)iii = (22)iii + 4									

0.19	0.19	0.18	0.16	0.16	0.14	0.14	(21a) x	0.15	0.16	0.17	0.18	]	
Calculate effe		•	rate for t	he appli	cable ca	se	<u> </u>			<u> </u>			
If mechanic												0.5	(2:
If exhaust air h		0		, ,	,	. `	,, .	,	) = (23a)			0.5	(2
If balanced wit		-	-	_								75.65	(2
a) If balance		anical ve				<del>- ` ` </del>	HR) (24a	ŕ	2b)m + (	23b) × [	1 – (23c)	) ÷ 100]	
24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(2
b) If balance							r ``	<del>í `</del>	<del>-                                    </del>	<del>-                                    </del>	ı	1	,_
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
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Effective air	change	rate - en	ıter (24a	or (24b	o) or (24	c) or (24	d) in box	· (25)				4	
25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3	1	(2
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oof otal area of earty wall arty floor ternal wall ** for windows and include the area abric heat lose eat capacity hermal mass or design asses in be used instention the details of thermo otal fabric he entilation her	22.9 50.6 elements  I roof winder as on both ess, W/K = Cm = S( a parame esments where ad of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a december of a decem	ows, use e sides of in S (A x k ) eter (TMF tailed calcular x Y) calculare not known	o o o o o o o o o o o o o o o o o o o	ndow U-vals and part - TFA) ir construction using Ap	22.92 50.62 104.9 30.08 50.62 83.2 alue calculations  h kJ/m²K	x x 4 x x x x x x x x x x x x x x x x x	0.17 0.13 0 formula 1 (26)(30)	= [ = [ = [ ] = [ ] = [ ] = [ ] + (32) = ((28) = (34) e indicative	3.85 $6.58$ $0$ $ae)+0.04] a$ $add (30) + (32)$ $add (40) = 4$ $avalues of$ $(36) = 4$	- 2) + (32a) TMP in T	60 9 45 40 9 paragraph (32e) =	1375.2 455.56 1353.6 2024.8 748.8 h 3.2 26.36 7303.78 144.29	() () () () () () () () () () () () () (
oof otal area of earty wall arty floor sternal wall ** for windows and include the area abric heat lose eat capacity hermal mass or design asses an be used insternate hermal bridg details of thermo otal fabric he entilation hea	22.9 50.6 Elements I roof winddens on both ss, W/K = Cm = S( sparame sments when and of a der es : S (L al bridging eat loss at loss ca Feb 13.69	ows, use e sides of in = S (A x k) ter (TMF) tere the detailed calculated are not known alculated Mar 13.52	offective winternal walk U)  P = Cm ÷ tails of the valuation. culated to own (36) =	ndow U-vals and part  - TFA) ir  construction using Ap = 0.05 x (3)	22.92 50.62 104.9 30.08 50.62 83.2 alue calculations kJ/m²K ion are not	x x 4 x x 4 x x x x x x x x x x x x x x	0.17 0.13 0 1 formula 1 (26)(30)	= [ = [ = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [ ] = [	$3.85$ $6.58$ 0 $(30) + (32)$ $\div (4) = 0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$	25)m x (5 Nov 12.86	60 9 45 40 9 paragraph (32e) =	1375.2 455.56 1353.6 2024.8 748.8 h 3.2 26.36 7303.78 144.29	(3) (3) (3)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.92	0.91	0.91	0.89	0.89	0.88	0.88	0.87	0.88	0.89	0.9	0.9		
		!	<u>.                                    </u>	!		!	!		Average =	Sum(40) ₁	12 /12=	0.89	(40)
Number of day	<u> </u>	<u> </u>	· ·						<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 requ	irement:								kWh/ye	ear:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	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 i			se target c		.77		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea				Table 1c x		<u>'</u>	!	!	<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		
_						_				im(44) ₁₁₂ =	L	897.28	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1			
(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		<b>—</b> ,
If instantaneous v	vater heati	ing at point	of use (no	o hot water	· storage).	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =	= [	1176.48	(45)
(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	1	10.01	14.4	10.01	11.52	11.00	12.00	12.00	14.55	10.02	17.72		(1.0)
Storage volum	ne (litres	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	/elling, 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 a) If manufact		oclared I	occ foct	or ic kno	wo (k\\/k	2/d2v/):							(40)
•				JI IS KIIO	WII (KVVI	i/uay).					0		(48)
Temperature f Energy lost fro				oor			(48) x (49)	١ _			0		(49)
b) If manufact		•			or is not		(40) X (49)	) =		1	10		(50)
Hot water stor			-							0.	02		(51)
If community h	_		on 4.3										
Volume factor			Oh.							-	.03		(52)
Temperature f							(47) (54)	) ( <b>50</b> ) (	50)	0	.6		(53)
Energy lost fro Enter (50) or		_	, KVVh/ye	ear			(47) x (51)	) x (52) x (	53) =	-	03		(54) (55)
Water storage	` , ` `	,	for each	month			((56)m = (	(55) × (41)	m	1.	.03		(33)
		1			20.00		. , ,	. , , ,	ı	T 20 00	22.04		(56)
(56)m= 32.01 If cylinder contain	28.92 s dedicate	32.01	30.98	32.01 m = (56)m	30.98 x [(50) = (	32.01 H11)] ÷ (5	32.01 0) else (5	30.98 $7)m = (56)$	32.01	30.98 (H11) is fro	32.01	хH	(50)
		1								1		X11	(EZ)
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	•	,			<b>-</b> 0)	(=o) -	,				0		(58)
Primary circuit				,		` '	, ,		r thormo	setat)			
(modified by (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)
(33)11= 23.20	21.01	23.20	ا لا. 22	20.20	ا ل. 22	20.20	20.20	22.01	23.20	22.01	23.20		(00)

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	П	0	0	0	0	1	(61)
	uired for	water he	eating ca	L	L I for eac	h month	(62)ı	——I m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 177.25		165.36	149.47	147.37	132.96	128.91	139.		139	154.93	162.27	173.4	]	(62)
Solar DHW input	calculated u	using App	endix G or	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	J	
(add additiona												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from w	ater heat	er					•	•			•	•	•	
(64)m= 177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.	.78	139	154.93	162.27	173.4	]	
	•			•	•	•		Outp	ut from wa	ater heate	er (annual)	12	1827.32	(64)
Heat gains fro	m water l	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	i] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	1]	
(65)m= 84.78	75.41	80.82	74.71	74.84	69.22	68.71	72.3	32	71.23	77.36	78.96	83.5	]	(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 g	ains (see	Table 5	and 5a	):										
Metabolic gair	ns (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(66)m= 85.42	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 gains	(calculat	ed in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso s	ее Т	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 ga	ins (calcu	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5		_		
(68)m= 148.84	150.39	146.5	138.21	127.75	117.92	111.35	109.	.81	113.7	121.99	132.45	142.28	]	(68)
Cooking gains	s (calculat	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 fa	ns gains	(Table 5	5a)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.33	-68.	33	-68.33	-68.33	-68.33	-68.33		(71)
Water heating	gains (T	able 5)											_	
(72)m= 113.95	112.22	108.64	103.76	100.59	96.14	92.35	97.	2	98.93	103.97	109.67	112.23		(72)
Total interna	l gains =				(66	)m + (67)m	n + (68	8)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 325.01	323.3	313.57	298.03	282.52	267.37	257.39	262.	.22	270.09	285.81	303.84	317.1		(73)
6. Solar gain														
Solar gains are		ŭ				•	tions t	to co	nvert to th	e applical		tion.		
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)														
-							1 1	1 (						1
Northeast 0.9x	0.77	X	8.9		_	11.28	X		0.63	_  ×	0.7	=	30.93	(75)
Northeast 0.9x	0.77	X	8.9			22.97	X		0.63	╛ [╵] ┝	0.7	_ =	62.96	(75)
Northeast 0.9x	0.77	X	8.9			41.38	X		0.63	×	0.7	=	113.43	(75)
Northeast 0.9x	0.77	X	8.9		_	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	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	Х	8.9	17	х	50.42	x		0.63	x	0.7	=	138.22	(75)
Northeast _{0.9x}	0.77	x	8.9	17	x	28.07	x		0.63	x	0.7		76.94	(75)
Northeast _{0.9x}	0.77	x	8.9	7	х	14.2	x		0.63	x	0.7		38.92	(75)
Northeast 0.9x	0.77	X	8.9	7	х	9.21	x		0.63	_ x [	0.7	=	25.26	(75)
•		<u> </u>					-							
Solar gains in	watts, ca	alculated	for eacl	n month			(83)m	= Sur	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	nd solar	(84)m =	(73)m	+ (83)m	, watts							•	
(84)m= 355.94	386.26	427.01	484.32	532.94	534.34	507.13	461.	32	408.31	362.75	342.76	342.36		(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	ea, h1,m	(see Ta	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ıg 📗	Sep	Oct	Nov	Dec		
(86)m= 0.97	0.96	0.93	0.85	0.7	0.51	0.38	0.43	3	0.68	0.89	0.96	0.98		(86)
Mean interna	al temper	atura in	living ar	22 T1 (f	ollow eta	one 3 to 3	7 in T	ـــــــــــــــــــــــــــــــــــــ	9c)					
(87)m= 19.72	19.89	20.19	20.59	20.85	20.97	20.99	20.9	-	20.9	20.56	20.09	19.7		(87)
` '	ļ				<u> </u>	ļ								, ,
Temperature (88)m= 20.15	20.16				20.19	<u> </u>			<u> </u>	20.47	20.47	20.46		(88)
(88)m= 20.15	20.16	20.16	20.17	20.17	20.19	20.19	20.1	19	20.18	20.17	20.17	20.16		(00)
Utilisation fac	T	ains for r			h2,m (s	ee Table	9a)				Т		Ī	
(89)m= 0.97	0.96	0.92	0.82	0.65	0.45	0.31	0.36	6	0.62	0.86	0.95	0.97		(89)
Mean interna	al temper	ature in	the rest	of dwell	ing T2 (	follow ste	eps 3	to 7	in Tabl	e 9c)	_			
(90)m= 18.45	18.68	19.12	19.67	20.02	20.16	20.18	20.1	18	20.09	19.65	18.99	18.42		(90)
									f	LA = Livir	ng area ÷ (	4) =	0.49	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = i	fLA × T1	+ (1 -	– fLA	A) × T2					
(92)m= 19.07	19.27	19.64	20.12	20.43	20.56	20.58	20.5	58	20.49	20.1	19.53	19.05		(92)
Apply adjust	ment to tl	ne mean	internal	temper	ature fro	om Table	4e, v	wher	e appro	priate		Į.		
(93)m= 19.07	19.27	19.64	20.12	20.43	20.56	20.58	20.5	58	20.49	20.1	19.53	19.05		(93)
8. Space hea	ating requ	uirement												
Set Ti to the					ned at st	tep 11 of	Table	e 9b,	so tha	t Ti,m=(	76)m an	d re-calc	culate	
the utilisation	1				Ι	1	١.		_		<del></del>	_	l	
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
Utilisation factors (94)m= 0.96	0.95	0.91	0.82	0.67	0.48	0.34	0.39	<u>а</u> Т	0.64	0.86	0.94	0.97		(94)
Useful gains					0.40	0.34	0.5	9	0.04	0.00	0.94	0.91		(04)
(95)m= 342.25	_	388.32	396.27	354.46	255.99	174.71	181.0	67	260.98	312.14	322.6	330.69		(95)
Monthly avei					ļ	1		•		0.2	022.0	000.00		, ,
(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 rat	L				l .	<u> </u>				]	1	I	1	
(97)m= 686.17		606.21	508.18	393.82	263.86	176.3	184.	·	285.2	428.51	565.03	679.91		(97)
Space heatir	ng require	ement fo	r each m	nonth, k	Wh/mor	$\frac{1}{1}$ th = 0.02	24 x [(	(97)r	n – (95	)m] x (4	1)m		1	
(98)m= 255.88	201.37	162.11	80.57	29.28	0	0	0		0	86.58	174.55	259.82		
	-				-	-	-				-		•	

Pactor for control and charging method (Table 4c(3)) for community heating system   1 (305)					
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none Fraction of space heat from community system 1 – (301) = 1 (302) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes bothers. heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump (302) × (303a) = 1 (304a) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (304b) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (305b) Distribution loss factor (Table 12c) for community heating system 1 (305b) Space heating Space heating requirement Space heat from Community heat pump (89 × (304a) × (305b) × (306) = 1312.67 (307a) Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) (30a) Space heating requirement from secondary/supplementary system (98) × (301) × 100 + (308) = 0 (30a)  Water heating Annual water heating requirement (64) × (303a) × (205) × (306) = 1918.60 (310a)  Water heating Annual water heating requirement  If DHW from community sheat pump (64) × (303a) × (205) × (306) = 1918.60 (310a)  Electricity used for heat distribution 0.01 × (307a) · (307e) + (310a) · (310a) · (310a) · (310a)  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans pump for solar water heating Total electricity for the above, kWhyear = (330a) + (330b) + (330b) + (330b) + (330b) = (320b) - (332b)  Energy for lighting (calculated in Appendix L)  Energy kerical distribution  Lectricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (315) + (315) + (315)	Тс	otal per year (kWh/y	/ear) = Sum(98) _{15,912} =	1250.16	(98)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	Space heating requirement in kWh/m²/year			24.7	(99)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	9b. Energy requirements – Community heating scheme				
Fraction of space heat from community system 1 – (301) = 1 (302)  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources, the interincturbes bollers, heat pumps, geothermal and water heat from power stations. See Appendix C.  Fraction of heat from Community heat pump (302) x (303a) = 1 (304a)  Fraction of total space heat from Community heat pump (302) x (303a) = 1 (305a)  Fraction of secondrol and charging method (Table 4c(3)) for community heating system 1,05 (306)  Fractor for control and charging method (Table 4c(3)) for community heating system 1,05 (306)  Space heating requirement  Space heat from Community heat pump (89) x (304a) x (305) x (306) = 1 (3267a) (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308)  Space heating requirement from secondary/supplementary system (89) x (301) x 100 + (308) = 0 (308)  Water heating  Annual water heating requirement from secondary/supplementary system (89) x (301) x 100 + (308) = 0 (308)  Water heating requirement from secondary/supplementary system (89) x (301) x 100 + (308) = 0 (308)  Water heating requirement from secondary/supplementary system (89) x (301) x 100 + (308) = 0 (308)  Water heating requirement from secondary/supplementary system (84) x (303a) x (305) x (306) = 0 (308)  Water heating requirement from secondary/supplementary system (84) x (303a) x (305) x (306) = 0 (308)  Fraction of the stating requirement from secondary/supplementary system (84) x (303a) x (305) x (306) = 0 (308)  Fraction of the stating requirement from secondary/supplementary system (84) x (303a) x (305) x (306) = 0 (308)  Fraction of the stating system fant from community heat pump (64) x (303a) x (305) x (306) = 0 (308)  Fraction of the stating system fant from community heating fractory from outside from community fraction of the stating system fant fraction fractory fraction fractory fraction fractory fraction fractory fraction fractory fraction fractory fract			nmunity scheme.	0	(301)
Traction of heat from Community heat pump   (302) x (303a) =   1 (304a)		,	Ĺ	1	(302)
Fraction of heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Fraction of total space heating requirement  Space heating requirement  Space heat from Community heat pump  Space heating requirement  Space heating requirement from secondary/supplementary system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system in % (from Table 4a or Appendix E)  Space heating requirement  If DHW from community scheme:  Water heat from Community scheme:  Water heat from Community scheme:  Water heat from Community scheme:  User for heat distribution  Space cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = (303) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) + (310) +	The community scheme may obtain heat from several sources. The procedure allows for	or CHP and up to fo	L our other heat sources; th	e latter	_
Fraction of total space heat from Community heat pump  (302) x (303a) = 1 (304a)  Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  (1.05) (306)  Space heating  Annual space heating requirement  Space heat from Community heat pump  (88) x (304a) x (305) x (306) = 1250.16  Space heat from Community heat pump  (88) x (304a) x (305) x (306) = 1312.67  (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system (88) x (301) x 100 + (308) = 0  (309)  Water heating  Water heating  Holly from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1918.69  (310a)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 32.31  (313)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0  (315)  Electricity for pumps and fans within dwelling (Table 4f):  mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 107.68  (331)  Energy for lighting (calculated in Appendix L)  Energy for lighting (calculated in Appendix L)  Energy kernerated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18  (338)  **Discovery finessons — Community heating scheme  Energy kernerated (363) to (366) for the second fuel		oendix C.	Г	1	7 _(303a)
Pactor for control and charging method (Table 4c(3)) for community heating system   1			(302) x (303a) =		] (304a)
Distribution loss factor (Table 12c) for community heating system   1.05   (306)		eating system		1	╣ .
Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) = 1312.67 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308  Space heating requirement from secondary/supplementary system (98) x (301) x 100 + (308) = 0 (309)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community beat pump (64) x (303a) x (305) x (306) = 1918.69 (310a)  Electricity used for heat distribution 0.01 x (307a)(307e) + (310a)(310e) = 32.31 (313)  Cooling System Energy Efficiency Ratio 0.14 (307a) (307a) (307e) + (310a)(310e) = 0.316  Electricity for pumps and fans within dwelling (Table 4f):  mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  protal electricity for the above, kWh/year = (330a) + (330g) = 107.68 (330a)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  Energy for lighting (calculated in Appendix L)  Energy keriosions - Community heating scheme  Energy keriosions factor keriosions key CO2/kwh kg CO2/kwh  kg CO2/kwh kg CO2/kwh  kg CO2/kwh kg CO2/kwh  kg CO2/kwh kg CO2/kwh  kg CO2/kwh kg CO2/kwh  kg CO2/kwh kg CO2/kwh  cO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)		0 ,	Ĺ	1.05	ᅼ
Space heat from Community heat pump	Space heating		L	kWh/year	_
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	Annual space heating requirement			1250.16	
Water heating         (98) x (301) x 100 ÷ (308) =         0         (309)           Water heating         Annual water heating requirement         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827.32         1827	Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1312.67	(307a)
Water heating         Annual water heating requirement         1827.32           If DHW from community scheme:         (64) x (303a) x (305) x (306) =         1918.69         (310a           Electricity used for heat distribution         0.01 x [(307a)(307e) + (310a)(310e)] =         32.31         (313)           Cooling System Energy Efficiency Ratio         0         (314)         0         (314)           Space cooling (if there is a fixed cooling system, if not enter 0)         = (107) + (314) =         0         (315)           Electricity for pumps and fans within dwelling (Table 4f):         107.68         (330a)           warm air heating system fans         0         (330b)           pump for solar water heating         0         (330a)           Total electricity for the above, kWh/year         =(330a) + (330b) + (330g) =         107.68         (331)           Energy for lighting (calculated in Appendix L)         239.96         (332)           Electricity generated by PVs (Appendix M) (negative quantity)         -108.82         (333)           Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =         3470.18         (338)           12b. CO2 Emissions – Community heating scheme         Energy kWh/year         Emission factor kg CO2/kWh         Emissions kg CO2/kWh         Emissions kg CO2/kWh         598.95<	Efficiency of secondary/supplementary heating system in % (from Tab	ole 4a or Appen	dix E)	0	(308
Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1918.69 (310a)  Electricity used for heat distribution  0.01 x ((307a)(307e) + (310a)(310e)] = 32.31 (313)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 107.68 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kWh/year (CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg CO2/kWh kg C	Space heating requirement from secondary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) = 1918.69 (310a)  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 32.31 (313)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330a)  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 107.68 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 (%)  [310a)  [311b)  [311b) [31c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311c) [311			-		_
Water heat from Community heat pump       (64) x (303a) x (305) x (306) =       1918.69       (310a)         Electricity used for heat distribution       0.01 x [(307a)(307e) + (310a)(310e)] =       32.31       (313)         Cooling System Energy Efficiency Ratio       0       (314)         Space cooling (if there is a fixed cooling system, if not enter 0)       = (107) ÷ (314) =       0       (315)         Electricity for pumps and fans within dwelling (Table 4f):       107.68       (330a)         warm air heating system fans       0       (330b)         pump for solar water heating       0       (330g)         Total electricity for the above, kWh/year       =(330a) + (330b) + (330g) =       107.68       (331)         Energy for lighting (calculated in Appendix L)       239.96       (332)         Electricity generated by PVs (Appendix M) (negative quantity)       -108.82       (333)         Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =       3470.18       (338)         12b. CO2 Emissions – Community heating scheme       Energy kWh/year       Emission factor kg CO2/kWh       Emissions kg CO2/kWh       Emissions kg CO2/kWh       280       (367a)         CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)       If there is CHP using two fuels repeat (363) to (366) for the second fuel </td <td>- ·</td> <td></td> <td>L</td> <td>1827.32</td> <td></td>	- ·		L	1827.32	
Cooling System Energy Efficiency Ratio  O (314)  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 107.68 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy kmission factor kg CO2/kWh kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  280 (367a)  CO2 associated with heat source 1  (307b)+(310b)  x 100 ÷ (367b) x 0.52  Essential of the second fuel  280 (367a)	·	(64) x (303a) x	(305) x (306) =	1918.69	(310a)
Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 107.68 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 ((307b)+(310b)] x 100 ÷ (367b) x 0.52 = 598.95 (367)	Electricity used for heat distribution 0.0	01 × [(307a)(307	e) + (310a)(310e)] =	32.31	(313)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330a) pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330b) + (330g) = 107.68 (331) Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year Emission factor kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 598.95 (367)	Cooling System Energy Efficiency Ratio			0	(314)
mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 598.95 (367)	Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 107.68 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 598.95 (367)	· · · ·	e	Г	107.68	(330a)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 107.68 (331)  Energy for lighting (calculated in Appendix L)	warm air heating system fans		Ĺ	0	⊒ (330b)
Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 598.95 (367)	pump for solar water heating			0	_ (330g)
Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 598.95 (367)	Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	107.68	(331)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3470.18 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 [(307b)+(310b)] × 100 ÷ (367b) × 0.52 = 598.95 (367)	Energy for lighting (calculated in Appendix L)		Ī	239.96	(332)
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 598.95 (367)	Electricity generated by PVs (Appendix M) (negative quantity)		Ī	-108.82	(333)
Energy kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 [(307b)+(310b)] × 100 ÷ (367b) × 0.52 = 598.95 (367)	Total delivered energy for all uses (307) + (309) + (310) + (312) + (315)	5) + (331) + (33	(2)(237b) =	3470.18	(338)
kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel  CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 598.95 (367)	12b. CO2 Emissions – Community heating scheme		_		
Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x  0.52 = 598.95 (367)					
CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times 0.52 = 598.95$ (367)		els repeat (363) to	(366) for the second fuel	280	(367a)
		x 100 ÷ (367b) x	0.52 =		_
	Electrical energy for heat distribution [(313) x			16.77	(372)

Total CO2 associated with community systems	(363)(366) + (368)(372)	=	615.73	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater	or instantaneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating	g   (373) + (374) + (375) =		615.73	(376)
CO2 associated with electricity for pumps and fans	s within dwelling (331)) x	0.52	55.89	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	124.54	(379)
Energy saving/generation technologies (333) to (33 Item 1	34) as applicable 0.52	x 0.01 =	-56.48	(380)
Total CO2, kg/year sum of (376)	)(382) =		739.68	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =	:		14.61	(384)
El rating (section 14)			89.63	(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 *Printed on 06 December 2021 at 10:43:05* 

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: 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 28.34 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.88 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

 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 - Heat pump

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	400.007	
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
Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
ased on:		
Overshading:	Average or unknown	
Windows facing: North East	9.56m²	
Windows facing: South East	8.76m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

Sassessor Name:   Neil Ingham   Stroma FSAP 2012   Software Version:   Version: 1.0.5.50			User_[	Details:							
## Structural inititation of to to binneys, flues and fans = (80) (80) (70) (70) (70) (70) (70) (70) (70) (7		•									
Area(m²)			Property	Address	: 04 - G						
A c a (m²)   A c a (m²)   A c a (m²)   A c a (m²)   A c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B c a (m²)   B		anaiona:									
Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   Common   C	1. Overall dwelling diffle	ensions.	Δre	a(m²)		Δν Ηρ	iaht(m	`	Volume(m	3)	
Dwelling volume	Ground floor				(1a) x		• • •	_		<u>-</u>	
Dwelling volume	Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	63 92	] [(4)						
2. Ventilation rate:    main   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heating   heati			.,		J	)+(3c)+(3c	d)+(3e)+	(3n) =	400.00		
Number of chimneys					(00)1(00	71(00)1(00	2)1(00)1	(011) =	169.39	(5)	
Number of chimneys	2. Ventilation rate:	main seconda	ıry	other		total			m³ per hou	ır	
Number of open flues	Number of chimneys	heating heating			л <u>-</u> г		<del></del>	40 =		_	
Number of intermittent fans    0	•		ᆜ 닏		╛╘					╡` ′	
Number of passive vents	·		†	0	┚╶┋	0			0	<b>=</b>  ``	
Number of flueless gas fires	Number of intermittent fa	ins			L	0	<u> </u>	(10 =	0	(7a)	
Air changes per hour	Number of passive vents	3				0	X	10 =	0	(7b)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	Number of flueless gas f	ires				0	<b>)</b>	(40 =	0	(7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =								Air ch	anges ner h	our.	
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)	Indituation due to abicono										
Number of storeys in the dwelling (ns)		•			continue fi	-	(16)	÷ (5) =	0	(8)	
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			ou to (1.7),			0 (0) 10 (	( . 0)		0	(9)	
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  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 × (14) ÷ 100] = 0  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 × (19)] = 0  Infiltration rate incorporating shelter factor  (21) = (18) × (20) = 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	Additional infiltration						[(9	9)-1]x0.1 =	0	(10)	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0   0   (12)					•	ruction			0	(11)	
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  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  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 (19)  Infiltration rate incorporating shelter factor  (21) = (18) x (20) = 0.15  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			to the grea	ter wall are	ea (after						
Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times$	-		).1 (seal	ed), else	enter 0				0	(12)	
Window infiltration $0.25 - [0.2 \times (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 If based on air permeability value, then $ (18) = [(17) \div 20] + (8), \text{ otherwise } (18) = (16) $ [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 $ [19] $ (20) = 1 - [0.075 \times (19)] = 0 $ [19] Infiltration rate incorporating shelter factor $ (21) = (18) \times (20) = 0 $ [19] Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Infiltration rate modified for 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 $	If no draught lobby, en	ter 0.05, else enter 0							0	(13)	
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 $(18) = (16)$ 0.15 (18)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered 0 (19)  Shelter factor (20) = 1 - [0.075 × (19)] = 1 (20)  Infiltration rate incorporating shelter factor (21) = (18) × (20) = 0.15 (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	-	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  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 $(22a)m = (22)m \div 4$									0	=	
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 $(22a)m = (22)m \div 4$				( ) ( )	. , , ,	, , ,	` /			=	
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 $(21) = (18) \times (20) = 1 \cdot [0.075 \times (19)] = 1  (20)$ 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	envelop	e area		=	
Number of sides sheltered $ (20) = 1 - [0.075 \times (19)] = $ $ (20) = 1 - [0.075 \times (19)] = $ $ (20) = 1 - [0.075 \times (19)] = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (22) = (18) \times (20) = $ $ (22) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (22) = (18) \times (20) = $ $ (22) = (18) \times (20) = $ $ (21) = (18) \times (20) = $ $ (22) = (18) \times (20) = $ $ (22) = (18) \times (20) = $ $ (22) = (18) \times (20) = $ $ (23) = (18) \times (20) = $ $ (24) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (18) \times (20) = $ $ (25) = (20) \times (20) = $ $ (25) = (20) \times (20) = $ $ (25) = (20) \times (20) = $ $ (25) = (20) \times (20) = $ $ (25) = (20) \times (20) = $ $ (25) = (20) \times (20) = $ $ (25) = (20) \times (20) = $ $ (25) = (20) \times (20) = $	•	•				is being u	sed		0.15	(10)	
Infiltration rate incorporating shelter factor					·				0	(19)	
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	Shelter factor			(20) = 1 -	[0.075 x (	19)] =			1	(20)	
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	·	•		(21) = (18	3) x (20) =				0.15	(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		<del></del>	1	1 .	<del>-</del>	T _	1	<u> </u>	1		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			Jul	Aug	Sep	Oct	Nov	Dec			
Wind Factor (22a)m = (22)m ÷ 4	<del> </del>	<del> </del>	1	T	1 .	1	T	1	1		
	(22)m= 5.1 5	4.9   4.4   4.3   3.8	3.8	3.7	<u> </u>	4.3	4.5	4.7			
(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	Wind Factor (22a)m = (2	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 infiltration rate (allowing for shelf	er and wind s	speed) =	(21a) x	(22a)m					
1 1 1 1 1	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effective air change rate for the lf mechanical ventilation:	applicable ca	ise		-	-	-			7,22
If exhaust air heat pump using Appendix N, (23b)	= (23a) x Fmv (	eguation (I	N5)) othe	rwise (23h	) = (23a)			0.5	(23)
If balanced with heat recovery: efficiency in % allo	` , ` `	. ,	,, .	`	) — ( <b>20</b> 0)			0.5	$\frac{1}{2}$
a) If balanced mechanical ventilation wi	_				2h\m + (	23h) ~ [	1 _ (23c)	75.65	(23
· · · · · · · · · · · · · · · · · · ·	0.28 0.26	0.26	0.26	0.27	0.28	0.29	0.3	- 100j	(24
b) If balanced mechanical ventilation wi		L	L				0.0		`
(24b)m= 0 0 0 0	0 0	0	0	0	0	0	0		(24
c) If whole house extract ventilation or p		<u> </u>							,
if $(22b)m < 0.5 \times (23b)$ , then $(24c) =$	•				5 × (23b	o)			
(24c)m= 0 0 0 0	0 0	0	0	0	0	0	0		(24
d) If natural ventilation or whole house	ositive input	ventilatio	on from I	oft	<u> </u>	<u>I</u>	ļ.		
if (22b)m = 1, then (24d)m = (22b)m	•				0.5]				
(24d)m= 0 0 0 0	0 0	0	0	0	0	0	0		(24
Effective air change rate - enter (24a) o	r (24b) or (24	c) or (24	d) in box	(25)				-	
(25)m= 0.31 0.31 0.31 0.29 (	0.28	0.26	0.26	0.27	0.28	0.29	0.3		(25
3. Heat losses and heat loss parameter:									
ELEMENT Gross Openings	Net Ar	ea	U-val	ıe	AXU		k-value	e A 2	Κk
area (m²) m²	ı, A	m²	W/m2	K .	(W/I	<u>()</u>	kJ/m²-l	K kJ/	′K
Windows Type 1	9.56	_x 1	/[1/( 1.4 )+	0.04] =	12.67				(27
Windows Type 2	8.76	χ1	/[1/( 1.4 )+	0.04] =	11.61				(27
Walls Type1 61.09 18.32	42.77	7 X	0.18	= [	7.7		60	2566.2	(29
Walls Type2 3.86 0	3.86	X	0.17	=	0.65		60	231.6	(29
Roof 63.92 0	63.92	2 X	0.13	_ = [	8.31	$\neg$	9	575.28	(30
Total area of elements, m ²	128.8	7							— (31
Party wall	37.5	X	0	<b>—</b>	0	$\neg$ [	45	1687.5	(32
Party floor	63.92	2					40	2556.8	(32
Internal wall **	113.4	.7				[	9	1021.23	=
* for windows and roof windows, use effective windo			g formula 1	/[(1/U-valu	ıe)+0.04] a	ו ns given in			`
** include the areas on both sides of internal walls a	nd partitions								
Fabric heat loss, $W/K = S (A \times U)$			(26)(30)	+ (32) =				40.94	(33
Heat capacity Cm = S(A x k)				((28).	.(30) + (32	2) + (32a).	(32e) =	8638.61	(34
Thermal mass parameter (TMP = Cm ÷ T	•			` '	÷ (4) =			135.15	(35
For design assessments where the details of the colcan be used instead of a detailed calculation.	nstruction are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
Thermal bridges : S (L x Y) calculated usi	na Appendix I	K						8.3	(36)
if details of thermal bridging are not known (36) = 0.0	•							0.3	(50
Total fabric heat loss	( )			(33) +	(36) =			49.24	(37
Ventilation heat loss calculated monthly				(38)m	= 0.33 × (	25)m x (5	)		
Jan Feb Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 17.5 17.29 17.08 16.03 1	5.82 14.77	14.77	14.56	15.19	15.82	16.24	16.66		(38
Heat transfer coefficient, W/K	•			(39)m	= (37) + (37)	38)m		-	
	5.06 64.01	64.01	63.8	64.43	65.06	65.48	65.9		
					L Average =			65.2 ₂ age	_

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.04	1.04	1.04	1.02	1.02	1	1	1	1.01	1.02	1.02	1.03		
<u> </u>									Average =	Sum(40) ₁	12 /12=	1.02	(40)
Number of day		<del>- ` -</del>	<u> </u>	Max	1	11	A	Can		Nov	Dag		
(41)m= 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
(41)111= 31	20	31	30	31	30	31	31	30	31	30	31		(41)
1 Water been	ting one	ray roau	romonti								Id/Mb/ya	or.	
4. Water hea	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 ( ⁻	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								1 300	1 300	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		
_										ım(44) ₁₁₂ =	L	1006.06	(44)
Energy content of					190 x Vd,r					1			
(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	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	ım(45) ₁₁₂ =	<u> </u>	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	· ·												` ,
Storage volum	ne (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	-			_			, ,		(01.1	( 4 <b>-</b> )			
Otherwise if no Water storage		not wate	er (this in	iciuaes i	nstantar	neous co	ilod idmo	ers) ente	er 'U' in (	(47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m wate	storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-										
Hot water storal If community h	-			ie Z (KVV	n/IItre/da	iy)				0.	02		(51)
Volume factor	•									1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m wate	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	` , ` `	,								1.	.03		(55)
Water storage	loss cal	culated 1	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5		/)m = (56)	m where (	(H11) is fro	m Appendi	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				,		` '	, ,		41	-4-1			
(modified by							<del></del>	<u> </u>	1	<del>-                                    </del>	22.00		(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	0	0 0	00) + 3	03 × (41)	)   0	0	T 0	0	0	1	(61)
												J (59)m + (61)m	(- /
(62)m= 192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.0		<del>`                                    </del>	<del>`                                    </del>	187.72	]	(62)
Solar DHW input	<u> </u>											J	(/
(add additiona									ar contino	mon to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from w	ater hea	ter					<b>!</b>	ļ.			<u> </u>	J	
(64)m= 192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.0	)2 149.37	167.01	175.46	187.72	1	
	1	<u> </u>	<u> </u>	ļ.		Į	C	Output from v	vater heat	_ <b>I</b> er (annual)₁	112	1969.94	(64)
Heat gains fro	m water	heating,	kWh/me	onth 0.2	5 ′ [0.85	5 × (45)m	+ (61	)m] + 0.8	x [(46)n	n + (57)m	+ (59)m	1]	-
(65)m= 89.69	79.71	85.26	78.58	78.55	72.42	71.67	75.7	<del>`                                    </del>	81.37	83.35	88.26	]	(65)
include (57)	m in cald	culation of	of (65)m	only if c	vlinder	is in the	dwellir	ng or hot v	vater is	from com	munity h	ı neating	
5. Internal ga					,			<u> </u>			,	<u> </u>	
Metabolic gair	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g 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 gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m= 16.29	14.47	11.77	8.91	6.66	5.62	6.07	7.9	10.6	13.46	15.7	16.74	]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	lso see Ta	able 5	•	•	•	
(68)m= 182.71	184.61	179.83	169.66	156.82	144.75	136.69	134.	8 139.57	149.75	162.58	174.65	]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	e 5	•	-	-	
(69)m= 33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.4	5 33.45	33.45	33.45	33.45	]	(69)
Pumps and fa	ns gains	(Table 5	ōa)					•	•			•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)			•	•	•	•	•	
(71)m= -83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	-83.6	6 -83.6	-83.6	-83.6	-83.6	]	(71)
Water heating	gains (T	able 5)		-		-		-	-	-	-	-	
(72)m= 120.56	118.62	114.6	109.13	105.58	100.58	96.34	101.7	78 103.71	109.37	115.76	118.63	]	(72)
Total internal	gains =				(66	)m + (67)m	ı + (68)	m + (69)m +	(70)m + (	71)m + (72)	)m	-	
(73)m= 373.91	372.05	360.55	342.05	323.41	305.31	293.45	298.8	32 308.23	326.92	348.4	364.37	]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	ciated equa	itions to	convert to t	he applica	able orienta	tion.		
Orientation:			Area		Flu			g_ Table 6b	_	FF		Gains	
_	Table 6d		m²			ble 6a		Table 60	) — -	Table 6c		(W)	,
Northeast _{0.9x}	0.77	Х	9.5	56	x	11.28	x	0.63	x	0.7	=	32.96	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	22.97	X	0.63	x	0.7	=	67.1	(75)
Northeast 0.9x	0.77	X	9.5	56	X	41.38	X	0.63	x	0.7	=	120.89	(75)
Northeast 0.9x	0.77	Х	9.5	56	X	67.96	X	0.63	x	0.7	=	198.54	(75)
Northeast _{0.9x}	0.77	X	9.5	56	X	91.35	X	0.63	Х	0.7	=	266.88	(75)

N		_			_		1 1				_		<b>一</b>						
Northeast _{0.9x}	0.77	×	9.5	56	X 9	97.38	X	0.63	_  ×	0.7	=	284.52	(75)						
Northeast _{0.9x}	0.77	X	9.5	56	X	91.1	X	0.63	×	0.7	=	266.17	(75)						
Northeast _{0.9x}	0.77	X	9.5	56	X	72.63	X	0.63	×	0.7	=	212.19	(75)						
Northeast _{0.9x}	0.77	X	9.5	56	x .	50.42	X	0.63	X	0.7	=	147.31	(75)						
Northeast _{0.9x}	0.77	X	9.5	56	X	28.07	X	0.63	X	0.7	=	82	(75)						
Northeast _{0.9x}	0.77	X	9.5	56	x	14.2	X	0.63	X	0.7	=	41.48	(75)						
Northeast _{0.9x}	0.77	X	9.5	56	х	9.21	X	0.63	x	0.7	=	26.92	(75)						
Southeast 0.9x	0.77	X	8.7	76	x :	36.79	X	0.63	x	0.7	=	98.5	(77)						
Southeast 0.9x	0.77	X	8.7	76	X (	62.67	X	0.63	x	0.7	=	167.79	(77)						
Southeast 0.9x	0.77	X	8.7	76	x 8	35.75	x	0.63	x	0.7	=	229.57	(77)						
Southeast _{0.9x}	0.77	X	8.7	76	x 1	06.25	x	0.63	х	0.7	=	284.45	(77)						
Southeast _{0.9x}	0.77	x	8.7	76	x 1	19.01	x	0.63	x	0.7	=	318.61	(77)						
Southeast _{0.9x}	0.77	x	8.7	76	x 1	18.15	x	0.63	x	0.7	=	316.31	(77)						
Southeast 0.9x	0.77	x	8.7	76	x 1	13.91	х	0.63	x	0.7	=	304.95	(77)						
Southeast _{0.9x}	0.77	x	8.7	76	x 1	04.39	х	0.63	×	0.7		279.47	(77)						
Southeast _{0.9x}	0.77	x	8.7	76	x 9	92.85	X	0.63	= x	0.7		248.58	(77)						
Southeast 0.9x	0.77	X	8.7	76	x (	69.27	X	0.63	x	0.7		185.44	(77)						
Southeast 0.9x	0.77	×	8.7	76	x .	44.07	X	0.63	×	0.7		117.98	(77)						
Southeast 0.9x	0.77	x	8.7			31.49	)   X	0.63	= x	0.7	= -	84.3	(77)						
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																			
(83)m= 131.47		350.47	483	585.49	600.83	571.12	491	<del>-                                    </del>	267.44	159.46	111.22		(83)						
Total gains – i	nternal and	d solar	(84)m =	= (73)m ·	+ (83)m	, watts				-1	<u> </u>	ı							
(84)m= 505.38	606.94	711.02	825.05	908.91	906.14	864.57	790	.48 704.13	594.37	507.86	475.59		(84)						
7. Mean inter	nal tempe	rature	heating	season	)														
	•		`		,	from Tal	ole 9	Th1 (°C)				21	(85)						
Utilisation fac	•	•			•		J.O 0,	Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)											
Jan	Feb Feb	Mar	Apr	<del>, , , , , , , , , , , , , , , , , , , </del>	(300 10						•		_						
(86)m= 0.96	<del>                                     </del>			l Mav	Jun	<del></del>	I Ai	ua Sep	Oct	Nov	Dec								
	0.93	0.87	0.76	May 0.6	Jun 0.44	Jul	<del>-</del>	ug Sep	Oct	Nov 0.94	Dec 0.97		(86)						
NA - an intana		0.87	0.76	0.6	0.44	Jul 0.32	0.3	6 0.58		+	Dec 0.97		(86)						
Mean interna	l temperat	ure in I	0.76 iving are	0.6 ea T1 (fo	0.44 ollow ste	Jul 0.32	0.3	able 9c)	0.82	0.94	0.97								
(87)m= 19.5	l temperat	ure in l 20.19	0.76 iving are 20.61	0.6 ea T1 (fo	0.44 ollow ste 20.97	Jul 0.32 eps 3 to 7 20.99	0.3 7 in T 20.9	able 9c) 20.91		0.94			(86)						
(87)m= 19.5 Temperature	l temperat 19.8 during hea	ure in I 20.19 ating p	0.76  iving are 20.61  eriods ir	0.6 ea T1 (fo 20.86 rest of	0.44 ollow ste 20.97 dwelling	Jul 0.32 eps 3 to 7 20.99 from Ta	0.3 7 in T 20.9 able 9	able 9c) 99 20.91 9, Th2 (°C)	0.82	0.94	0.97		(87)						
(87)m= 19.5	l temperat 19.8 during hea	ure in l 20.19	0.76 iving are 20.61	0.6 ea T1 (fo	0.44 ollow ste 20.97	Jul 0.32 eps 3 to 7 20.99	0.3 7 in T 20.9	able 9c) 99 20.91 9, Th2 (°C)	0.82	0.94	0.97								
(87)m= 19.5 Temperature	during hea	ure in 1 20.19 ating p	0.76 iving are 20.61 eriods in	0.6 ea T1 (for 20.86 rest of 20.07	0.44 ollow ste 20.97 dwelling 20.08	Jul 0.32 eps 3 to 7 20.99 g from Ta 20.08	0.37 in T 20.9	able 9c) 99 20.91 9, Th2 (°C)	0.82	0.94	0.97		(87)						
(87)m= 19.5 Temperature (88)m= 20.05	during hea	ure in 1 20.19 ating p	0.76 iving are 20.61 eriods in	0.6 ea T1 (for 20.86 rest of 20.07	0.44 ollow ste 20.97 dwelling 20.08	Jul 0.32 eps 3 to 7 20.99 g from Ta 20.08	0.37 in T 20.9	Fable 9c) 99	0.82	0.94	0.97		(87)						
(87)m= 19.5  Temperature (88)m= 20.05  Utilisation fact (89)m= 0.96	during head 20.05 ctor for gain 0.92	ure in I 20.19 ating p 20.05 ns for r	0.76 iving are 20.61 eriods in 20.07 est of di 0.73	0.6 ea T1 (for 20.86 n rest of 20.07 welling, 0.55	0.44  ollow ster 20.97  dwelling 20.08  h2,m (ser 0.38	Jul 0.32 eps 3 to 7 20.99 g from Ta 20.08 ee Table 0.26	0.37 in T 20.9 able 9 20.0 9a) 0.2	Fable 9c) 99   20.91 9, Th2 (°C) 08   20.08	0.82 20.55 20.07	0.94 19.96 20.06	0.97 19.45 20.06		(87)						
(87)m= 19.5  Temperature (88)m= 20.05  Utilisation fac	during head 20.05 ctor for gain 0.92 ltemperat	ure in I 20.19 ating p 20.05 ns for r	0.76 iving are 20.61 eriods in 20.07 est of di 0.73	0.6 ea T1 (for 20.86 n rest of 20.07 welling, 0.55	0.44  ollow ster 20.97  dwelling 20.08  h2,m (ser 0.38	Jul 0.32 eps 3 to 7 20.99 g from Ta 20.08 ee Table 0.26	0.37 in T 20.9 able 9 20.0 9a) 0.2	Fable 9c)  99   20.91  9, Th2 (°C)  08   20.08  19   0.51  10 7 in Tabl	0.82 20.55 20.07	0.94 19.96 20.06	0.97 19.45 20.06		(87)						
(87)m= 19.5  Temperature (88)m= 20.05  Utilisation fact (89)m= 0.96  Mean internal	during head 20.05 ctor for gain 0.92 ltemperat	ure in I 20.19 ating p 20.05 ns for r 0.85 ure in t	0.76 iving are 20.61 eriods in 20.07 est of do 0.73 the rest	0.6 ea T1 (for 20.86 n rest of 20.07 welling, 0.55 of dwelli	0.44  collow sterms 20.97  dwelling 20.08  h2,m (serms 0.38  ng T2 (f	Jul 0.32 eps 3 to 7 20.99 g from Ta 20.08 ee Table 0.26 follow ste	0.37 in T 20.59 able 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9 20.6 9	Fable 9c) 99   20.91 9, Th2 (°C) 08   20.08  to 7 in Table 08   20	0.82 20.55 20.07 0.79 e 9c) 19.55	0.94 19.96 20.06	0.97 19.45 20.06 0.96	0.38	(87) (88) (89)						
(87)m= 19.5  Temperature (88)m= 20.05  Utilisation fact (89)m= 0.96  Mean internation (90)m= 18.07	during head 20.05 ctor for gain 0.92 ltemperate 18.48	ure in 1 20.19 ating p 20.05 ns for r 0.85 ure in t	0.76 iving are 20.61 eriods ir 20.07 est of d 0.73 the rest 19.61	0.6 ea T1 (for 20.86 n rest of 20.07 welling, 0.55 of dwelling, 19.92	0.44  collow stee 20.97  dwelling 20.08  h2,m (so 0.38  ng T2 (fo 20.05)	Jul 0.32 eps 3 to 7 20.99 g from Ta 20.08 ee Table 0.26 follow ste 20.08	0.37 in T 20.92 20.0 9a) 0.22 20.0	Fable 9c) 99   20.91 0), Th2 (°C) 08   20.08 109   0.51 100   7 in Table 100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100	0.82 20.55 20.07 0.79 e 9c) 19.55	0.94 19.96 20.06 0.92	0.97 19.45 20.06 0.96		(87) (88) (89) (90)						
(87)m= 19.5  Temperature (88)m= 20.05  Utilisation fac (89)m= 0.96  Mean interna (90)m= 18.07	during head 20.05 ctor for gain 18.48 ltemperat	ure in I 20.19 ating pr 20.05 ns for r 0.85 ure in t 19.03 ure (fo	0.76 iving are 20.61 eriods in 20.07 est of do 0.73 the rest 19.61 r the wh	0.6 ea T1 (for 20.86 n rest of 20.07 welling, 0.55 of dwelling, 19.92	0.44  ollow sterm 20.97  dwelling 20.08  h2,m (serm 0.38)  ng T2 (from 20.05)	Jul 0.32  pps 3 to 7 20.99  g from Ta 20.08  pee Table 0.26  collow ste 20.08	0.3 7 in T 20.9 able 9 20.0 9a) 0.2 eps 3 20.0	able 9c) 99   20.91 9, Th2 (°C) 08   20.08  10   20.08  10   7   10   Table 10   20   fabre 10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 10   Table 1	0.82 20.55 20.07 0.79 e 9c) 19.55 LA = Liv	0.94 19.96 20.06 0.92 18.73 ing area ÷ (-	0.97 19.45 20.06 0.96		(87) (88) (89) (90) (91)						
(87)m= 19.5  Temperature (88)m= 20.05  Utilisation fact (89)m= 0.96  Mean internation (90)m= 18.07	during head 20.05 ctor for gain 18.48 ltemperat 18.98	ure in 1 20.19 ating p 20.05 ns for r 0.85 ure in t 19.03 ure (fo	0.76 iving are 20.61 eriods ir 20.07 est of d 0.73 the rest 19.61 r the wh	0.6 ea T1 (for 20.86 n rest of 20.07 welling, 0.55 of dwelling 19.92 cole dwe 20.28	0.44  billow ster 20.97  dwelling 20.08  h2,m (so 0.38  ng T2 (f 20.05)	Jul 0.32 eps 3 to 7 20.99 g from Ta 20.08 ee Table 0.26 follow ste 20.08  LA × T1 20.42	0.3 7 in T 20.9 able 9 20.0 9a) 0.2 eps 3 20.0 + (1	Fable 9c) 99   20.91 0), Th2 (°C) 08   20.08  9   0.51 to 7 in Tabl 08   20 f	0.82  20.55  20.07  0.79  e 9c)  19.55  LA = Liv	0.94 19.96 20.06 0.92 18.73 ing area ÷ (-	0.97 19.45 20.06 0.96		(87) (88) (89) (90)						

			•		•	•					· · · · · · · · · · · · · · · · · · ·	ı	
(93)m= 18.61	18.98	19.47	19.99	20.28	20.4	20.42	20.42	20.34	19.93	19.2	18.55		(93)
8. Space hea													
Set Ti to the the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l		· ·				_ 3						
(94)m= 0.94	0.91	0.84	0.72	0.56	0.4	0.28	0.32	0.53	0.78	0.91	0.95		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m			•						
(95)m= 476.23	549.73	597.81	595.72	513.13	361.46	242.67	253.25	375.54	465.92	462.07	452.07		(95)
Monthly aver			<del></del>		r	Ī						l	
(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	i	an intern	al tempe			<del>-``</del>	<del>- `                                   </del>	<u> </u>		700.40	045.04		(07)
(97)m= 955.2	936.83			558.12	371.3	244.8 th = 0.03	256.62	402.24	607.14	792.19	945.94		(97)
Space heatin (98)m= 356.35	260.14	195.33	92.11	33.47	0	0.02	0	0	105.06	237.69	367.43		
(66)=	200.11	100.00	02.11	00.11				l per year			<u> </u>	1647.58	(98)
Space bootin	a roquir	omont in	k\\/\b/m2	Woor			7010	i poi youi	(mm) you	) = <b>Ga</b> m( <b>G</b>	0)15,912		╡``
Space heatin	•											25.78	(99)
9b. Energy red	•		The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	Ĭ						., ,			
This part is used for space heating, space cooling or water heating provided by a community scheme.  Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none										0	(301)		
										╡`			
Fraction of space heat from community system 1 – (301) =											1	(302)	
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.													
Fraction of hea		-			,							1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	1	(304a)
Factor for conf	trol and	charging	method	(Table	4c(3)) fo	r commi	unity hea	iting syst	tem			1	(305)
Distribution los	ss factor	(Table 1	2c) for a	commun	ity heatii	ng syste	m					1.05	(306)
Space heating	α											kWh/yea	
Annual space	_	requiren	nent									1647.58	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1729.96	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	נ												
Annual water		equirem	ent									1969.94	
If DHW from c													<del>-</del>
Water heat fro		•		)				(64) x (30	03a) x (30	=	2068.44	(310a)	
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	37.98	(313)		
Cooling System	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p							200011				i		7,000
mechanical ve	ntilation	- paland	ea, extr	act or po	sitive in	put from	outside					135.98	(330a)

warm air heating system fans				0	(330b)					
pump for solar water heating				0	(330g)					
Total electricity for the above, kWh/year		135.98	(331)							
Energy for lighting (calculated in Appendix L)		287.67	(332)							
Electricity generated by PVs (Appendix M) (negative quantity		-108.82	(333)							
Total delivered energy for all uses (307) + (309) + (310) + (3	312) + (315) + (331) + (33	32)(237b) =		4113.22	(338)					
12b. CO2 Emissions – Community heating scheme										
	Energy kWh/year	Emission facto		nissions ı CO2/year						
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)	IP) using two fuels repeat (363) to	(366) for the second to	fuel	280	(367a)					
CO2 associated with heat source 1 [(30	7b)+(310b)] x 100 ÷ (367b) x	0.52	=	704.06	(367)					
Electrical energy for heat distribution	[(313) x	0.52	=	19.71	(372)					
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	723.77	(373)					
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)					
CO2 associated with water from immersion heater or instant	taneous heater (312) x	0.22	=	0	(375)					
Total CO2 associated with space and water heating	(373) + (374) + (375) =			723.77	(376)					
CO2 associated with electricity for pumps and fans within dv	velling (331)) x	0.52	=	70.57	(378)					
CO2 associated with electricity for lighting	(332))) x	0.52	=	149.3	(379)					
Energy saving/generation technologies (333) to (334) as applitem 1	olicable	0.52 x 0.01	= [	-56.48	(380)					
Total CO2, kg/year sum of (376)(382) =				887.17	(383)					
Dwelling CO2 Emission Rate (383) ÷ (4) =				13.88	(384)					

El rating (section 14)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:03

Project Information:

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

Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 60.34m² **Plot Reference:** Site 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 28.92 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.95 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) 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 - Heat pump

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	10.070	<u> </u>
Continuous supply and extract system		
· · · · · · · · · · · · · · · · · · ·	0.47	
Specific fan power:	• • • • • • • • • • • • • • • • • • • •	214
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	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	
vermanon rate.	0.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	• · · · · · · · · · · · · · · · · · · ·	
Photovoltaic array		

		Hear	Details:								
A a a a a a a a a a Maria a a	Nail le place	USEI		- M	L		CTDO	040040			
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50			
Property Address: 04 - H											
Address :		·									
1. Overall dwelling dime	ensions:										
Ground floor		Ar	ea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)		
	a) . (4 b) . (4 a) . (4 d) . (4 a) .	(4p)		(1a) x		65	(2a) =	159.9	(Sa)		
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	F(1n)	60.34	(4)	) (O.) (O.)	I) (O )	(0.)		_		
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	159.9	(5)		
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	r		
Number of allipsychia	heating he	ating		,			40 =		_		
Number of chimneys			0	] = [	0			0	(6a)		
Number of open flues	0 +	0 +	0	] = [	0		20 =	0	(6b)		
Number of intermittent fa				Ĺ	0		10 =	0	(7a)		
Number of passive vents	<b>;</b>			L	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)+(7b)	+(7c) =	Г	0		÷ (5) =	0	(8)		
'	peen carried out or is intended,			ontinue fr			. (0) =	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			•	ruction			0	(11)		
deducting areas of openii		inding 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		0	(15)					
Infiltration rate	aEO avaraged in subje	motros nor l	(8) + (10)	, , ,	, , ,	, ,	oroo	0	(16)		
If based on air permeabil	q50, expressed in cubic $(18) = (17)$	•	•	•	etre or e	envelope	area	3	(17)		
	es if a pressurisation test has b				is being u	sed	ļ	0.15	(18)		
Number of sides sheltere			,	·	· ·			0	(19)		
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			1	(20)		
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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				
		<del></del>						•			

Adjusted infiltr	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.19 Calculate effe	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		•	iale ioi l	пе аррп	Cable Ca	30						0.5	(23
If exhaust air h	eat pump u	sing Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(231
If balanced with	n heat recov	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				75.65	(230
a) If balance	ed mecha	nical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(24
b) If balance	d mecha	inical ve	entilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)	•	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24)
c) If whole h if (22b)r	ouse extended on $< 0.5 \times$			•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)r	ventilatio n = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air	change r	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	x (25)	-	-	-		
(25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(25)
3. Heat losse	s and he	at loss p	paramete	er:									
ELEMENT	Gros: area (	S	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²·l		X k /K
Windows Type	e 1				4.7	x1.	/[1/( 1.4 )+	0.04] =	6.23	Ì			(27)
Windows Type	2				6.09	x1.	/[1/( 1.4 )+	0.04] =	8.07				(27)
Windows Type	e 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		60	2345.4	(29)
Walls Type2	27.3	1	0		27.3	1 x	0.17	<u> </u>	4.59		60	1638.6	(29)
Roof	60.34	4	0		60.34	1 ×	0.13	<u> </u>	7.84		9	543.06	(30)
Total area of e	elements,	m²			140.4	5							(31)
Party wall					16.88	3 x	0		0		45	759.6	(32)
Party floor					60.34	1					40	2413.6	(32
Internal wall **					107.9	1				Ī	9	971.190	1 (32
* for windows and ** include the area						lated using	ı formula 1	l/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2	_
Fabric heat los	ss, W/K =	S (A x	U)				(26)(30)	) + (32) =				37.64	(33)
Heat capacity	Cm = S(A)	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	8671.45	(34
Thermal mass	paramet	er (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			143.71	(35)
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	,	,		• .	•	K						7.99	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	11)			(22) -	(26)				¬,
Total fabric he		loulotoo	l month!	,				. ,	· (36) =	25\m v (F)	\	45.63	(37
Ventilation hea					lun	1,.1	۸۰۰۰	<del>- ` ` ` </del>	= 0.33 x (	<u>, , , , , , , , , , , , , , , , , , , </u>	_	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	I	

(30)	16.22	16.12	15 12	14.02	12.04	12.04	12.75	14.24	14.02	45.22	15.70		(38)
(38)m= 16.52	16.32	16.12	15.13	14.93	13.94	13.94	13.75	14.34	14.93	15.33	15.72		(36)
Heat transfer (39)m= 62.15	61.95	61.75	60.76	60.56	59.57	59.57	59.38	(39)m 59.97	= (37) + (3 60.56	38)m 60.96	61.35		
(39)11= 02.13	01.93	01.75	00.70	00.50	39.37	39.37	39.30			Sum(39) ₁	<u> </u>	60.71	(39)
Heat loss para	ameter (l	HLP), W	m²K						= (39)m ÷				<b>」</b> ` ′
(40)m= 1.03	1.03	1.02	1.01	1	0.99	0.99	0.98	0.99	1	1.01	1.02		_
Number of day	vs in mo	nth (Tab	le 1a)					/	Average =	Sum(40) ₁	12 /12=	1.01	(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	rgy requi	rement:								kWh/ye	ar:	
Assumed occu	ınancv	N								1	99		(42)
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (T	ΓFA -13.		.99		(42)
Annual averag	•	ater usaç	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		81	.49		(43)
Reduce the annuance not more that 125	-				-	-	to achieve	a water us	se target o	f			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i						<u> </u>		Sep	Oct	INOV	Dec		
(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		
	!	!				<u> </u>	<u> </u>	-	Γotal = Su	<u> </u>	=	977.9	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mon	th (see Ta	ables 1b, 1	c, 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		_
If instantaneous v	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Γotal = Su	m(45) ₁₁₂ =	= [	1282.18	(45)
(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)
Water storage	loss:	<u> </u>											
Storage volum	` '					•		ame ves	sel		0		(47)
If community hotherwise if no	_			_			. ,	ore) onto	or 'Ο' in <i>(</i>	<b>47</b> )			
Water storage		not wate	i (uno ii	iciuues i	iistaiitai	ieous cc	יווטט טטוויונ	ers) erite	51 U III (	41)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-				(48) x (49)	) =		1	10		(50)
b) If manufact Hot water stor			-								02		(51)
If community h	•			C 2 (KVV)	1711110700	·y /				0.	02		(31)
Volume factor	from Ta	ble 2a								1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		.03		(54)
Enter (50) or	. , .	,	or oook	month			//E6\~ '	FF) (44\-	<b>m</b>	1.	.03		(55)
Water storage					00.00		((56)m = (						(FC)
(56)m= 32.01 If cylinder contain	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0). else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01	ix H	(56)
		r				32.01					1	•	(57)
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(37)

Primary circuit loss (annual) from	om Table 3			0		(58)
Primary circuit loss calculated		(58) ÷ 365 × (41	)m			
(modified by factor from Tab	ole H5 if there is solar wa	ater heating and	a cylinder 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 2	23.26	(59)
Combi loss calculated for each	n month (61)m = (60) ÷ 3	365 × (41)m				
(61)m= 0 0 0	0 0 0	0 0	0 0	0	0	(61)
Total heat required for water h	neating calculated for ea	ch month (62)m :	= 0.85 × (45)m +	(46)m + (5	 7)m + (59)m + (61)m	
(62)m= 188.21 166.19 175.25	158.09 155.64 140.1	135.53 147.37	146.69 163.88	<del>ì í</del>	184.02	(62)
Solar DHW input calculated using App			I L  O' if no solar contribut	ļļ_	l neating)	
(add additional lines if FGHRS	· · · · · ·					
(63)m = 0 0 0	0 0 0	0 0	0 0	0	0	(63)
Output from water heater		<u> </u>	1	ļl		
(64)m= 188.21 166.19 175.25	158.09 155.64 140.1	135.53 147.37	146.69 163.88	172.05 1	184.02	
(0.7)	1	<del>-</del>	put from water heate			(64)
Heat gains from water heating	. kWh/month 0.25 ′ [0.8					], ,
(65)m= 88.42 78.6 84.11	77.57 77.59 71.59	70.91 74.84	73.78 80.33		87.03	(65)
` '	<del>! ! !</del>			<u> </u>		(00)
include (57)m in calculation	. ,	is in the aweiling	or not water is if	om commu	unity neating	
5. Internal gains (see Table !	,					
Metabolic gains (Table 5), Wa		1 1 .				
Jan Feb Mar	Apr May Jun	Jul Aug	Sep Oct	Nov	Dec	(0.0)
(66)m= 99.56 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 A	<del>``                                     </del>	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 1	15.93	(67)
Appliances gains (calculated in	n Appendix L, equation I	L13 or L13a), als	o see Table 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 1	166.13	(68)
Cooking gains (calculated in A	ppendix L, equation L15	5 or L15a), also s	ee Table 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	32.96	(69)
Pumps and fans gains (Table	5a)	•				
(70)m= 0 0 0	0 0 0	0 0	0 0	0	0	(70)
Losses e.g. evaporation (nega	ative 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	79.65	(71)
Water heating gains (Table 5)	.1 1		ļ l	I		
(72)m= 118.85 116.96 113.06	107.74 104.29 99.43	95.3 100.59	102.47 107.97	114.19 1	116.97	(72)
Total internal gains =	<del>                                     </del>	<u> </u>	+ (69)m + (70)m + (7	<u> </u>		
(73)m= 361.01 359.2 348.18	<del>, , , , , , , , , , , , , , , , , , , </del>	<del>, , , , , , , , , , , , , , , , , , , </del>	298.19 316.08	<u> </u>	351.9	(73)
6. Solar gains:	9:210:   200:0	200.00	200.10	000.00	50.1.0	
Solar gains are calculated using sola	ar flux from Table 6a and asso	ciated equations to c	onvert to the applicat	ole orientation	1.	
Orientation: Access Factor		ux	g_	FF	Gains	
Table 6d				able 6c	(W)	
Southeast 0.9x 0.77 x	6.09 ×	36.79 ×	0.63 ×	0.7	= 68.48	(77)
Southeast 0.9x 0.77 x		62.67 X	0.63 x	0.7	= 116.65	](77)
0.11 ×		<u></u> "		0.7		7, ,

Jan	Feb	Mar	Apr	May	Ju		Α	ug Se	ер	Oct	Nov	Dec	]	
Temperature of Utilisation fact	_	•			-		ole 9	Th1 (°C	<b>;</b> )				21	(85)
7. Mean interr														
(84)m= 492.41	586.37	667.88	741.48	786.63	771.	86 740.9	698	.24 649.	.37	569.55	494.64	463.96	]	(84)
Total gains – in	iternal ar	nd solar	(84)m =	(73)m -	+ (83	m , watts							-	
(83)m= 131.4	227.17	319.7		473.96	476.	51 456.92	409			253.46	157.99	112.06		(83)
Solar gains in v	vatts, ca	lculated	I for each	month			(83)m	ı = Sum(74	l)m	.(82)m				
Northwest _{0.9x}	0.77	X	2.92	2	x	9.21	X	0.63	3	X	0.7	=	8.22	(81)
Northwest 0.9x	0.77	×	2.92		x _	14.2	X	0.63		]	0.7	=	12.67	(81)
Northwest 0.9x	0.77	X	2.92		×	28.07	X	0.63		] × [	0.7	=	25.05	(81)
Northwest 0.9x	0.77	X	2.92	2	x	50.42	X	0.63	3	] x [	0.7	=	44.99	(81)
Northwest 0.9x	0.77	x	2.92	2	x	72.63	X	0.63	3	x [	0.7	=	64.81	(81)
Northwest 0.9x	0.77	X	2.92		x	91.1	x	0.63	3	_ x [	0.7	=	81.3	(81)
Northwest 0.9x	0.77	X	2.92	2	x	97.38	x	0.63	3	x [	0.7	=	86.9	(81)
Northwest _{0.9x}	0.77	x	2.92	2	x	91.35	x	0.63	3	_ x [	0.7	=	81.52	(81)
Northwest _{0.9x}	0.77	x	2.92	2	x $\Box$	67.96	x	0.63	3	_ x [	0.7		60.64	(81)
Northwest _{0.9x}	0.77	x	2.92	2	x 🗀	41.38	x	0.63	3	] × [	0.7	_ =	36.93	(81)
Northwest _{0.9x}	0.77	x	2.92		x $\Box$	22.97	x	0.63	3	] x [	0.7		20.5	(81)
Northwest 0.9x	0.77	x	2.92	2	x	11.28	x	0.63	3	] x [	0.7	=	10.07	(81)
Southwest _{0.9x}	0.77	x	4.7		x $\Box$	31.49	j	0.63	3	] x [	0.7	=	45.23	(79)
Southwest _{0.9x}	0.77	x	4.7		x	44.07	ĺ	0.63	3	] x [	0.7	=	63.3	(79)
Southwest _{0.9x}	0.77	x	4.7		x	69.27	ĺ	0.63	3	] × [	0.7	=	99.49	(79)
Southwest _{0.9x}	0.77	x	4.7		x –	92.85	1	0.63		]	0.7	=	133.37	(79)
Southwest _{0.9x}	0.77	x	4.7		x	104.39	1	0.63		]	0.7	=	149.94	(79)
Southwest _{0.9x}	0.77	×	4.7		x [	113.91	]	0.63		] ^ L ] x [	0.7	= =	163.62	(79)
Southwest _{0.9x}	0.77	$=$ $\stackrel{\wedge}{}$	4.7		`	118.15	]	0.63		」^L ] _x 「	0.7	= =	169.71	(79)
Southwest _{0.9x}	0.77	$=$ $\stackrel{\wedge}{}$	4.7		^	119.01	]	0.63		」^L ] x 「	0.7	$\dashv$	170.94	(79)
Southwest _{0.9x}	0.77	$=$ $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$	4.7		`	106.25	] ]	0.63		」^L 1 _× 「	0.7	<del>-</del> -	152.62	(79)
Southwest _{0.9x}	0.77	-   ` x	4.7		x L	62.67 85.75	] ]	0.63		」	0.7		90.02	(79)
Southwest _{0.9x}	0.77	×	4.7		×	36.79	] ]	0.63		」× ] _× 「	0.7	=	52.85	(79)
Southwest _{0.9x}	0.77	×	6.09	<u>'</u>	×	31.49	]	0.63		」 × L ¬ , г	0.7	╡ -	58.6	(77)
Southeast 0.9x	0.77	×	6.09		×	44.07	] X ] ,	0.63		]	0.7	=	82.02	(77)
Southeast 0.9x	0.77	x	6.09	<del></del>	×	69.27	] X ] ,	0.63		]	0.7	=	128.92	(77)
Southeast 0.9x	0.77	X	6.09	<del></del>	× _	92.85	] X ]	0.63		]	0.7	=	172.81	(77)
Southeast 0.9x	0.77	X	6.09		x _	104.39	] x ]	0.63		]	0.7	=	194.29	(77)
Southeast 0.9x	0.77	X	6.09		x	113.91	] X ]	0.63		]	0.7	=	212.01	(77)
Southeast 0.9x	0.77	X	6.09	<del></del>	x _	118.15	] X	0.63		]	0.7	=	219.9	(77)
Southeast 0.9x	0.77	×	6.09		x _	119.01	X	0.63		]	0.7	=	221.5	(77)
Southeast 0.9x	0.77	X	6.09		x	106.25	X	0.63	3	] x [	0.7	=	197.75	(77)
O		$\neg$		=	$\vdash$		ī			╡╞		=		=

(86)m= 0.96	0.93	0.88	0.78	0.64	0.47	0.35	0.38	0.59	0.82	0.94	0.97		(86)
Mean intern	al temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	' in Table	e 9c)					
(87)m= 19.63	19.91	20.25	20.62	20.85	20.96	20.99	20.99	20.92	20.61	20.06	19.59		(87)
Temperatur	e during h	neating p	eriods i	n rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)					
(88)m= 20.06	20.06	20.06	20.08	20.08	20.09	20.09	20.1	20.09	20.08	20.07	20.07		(88)
Utilisation fa	ctor for a	ains for	rest of d	welling,	h2,m (se	e Table	9a)					•	
(89)m= 0.96	0.92	0.86	0.75	0.59	0.41	0.28	0.31	0.52	0.79	0.92	0.96		(89)
Mean intern	al temper	ature in	the rest	of dwelli	ina T2 (f	ollow ste	ens 3 to 7	7 in Tabl	le 9c)	!	•		
(90)m= 18.25		19.13	19.63	19.93	20.06	20.09	20.09	20.02	19.63	18.88	18.19		(90)
	-1	!	<u>!</u>	!	!	ļ		1	fLA = Livin	g area ÷ (	4) =	0.44	(91)
Mean intern	al temner	ature (fo	or the wh	ole dwe	lling) – f	ΙΔ <b>ν</b> Τ1	⊥ (1 _ fl	Δ) <b>v</b> T2					_
(92)m= 18.86	<del></del>	19.63	20.07	20.34	20.46	20.49	20.49	20.42	20.06	19.4	18.81		(92)
Apply adjust		ļ			l .			<u> </u>	<u> </u>				, ,
(93)m= 18.86		19.63	20.07	20.34	20.46	20.49	20.49	20.42	20.06	19.4	18.81		(93)
8. Space he	ating req	uirement											
Set Ti to the			•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
the utilisatio	1						_				_	İ	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	0.91	0.85	0.75	0.61	0.44	0.31	0.34	0.55	0.79	0.91	0.95		(94)
Useful gains		ļ			0.44	0.01	0.04	0.00	0.73	0.51	0.55		(0.)
(95)m= 465.42	·	568.62	555.14	476.73	338.83	229.49	239.5	355.24	448.51	451.25	442.25		(95)
Monthly ave	rage exte	rnal tem	peratur	e from Ta	able 8							l	
(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 ra	te for me	an intern	al temp	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]	•			
(97)m= 905.09	886.1	810.68	678.77	523.24	349.29	231.66	242.68	378.9	573.15	750.09	896.33		(97)
Space heati	1	ement fo	r each r	nonth, k	Wh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m	•	•	
(98)m= 327.12	2 237.01	180.1	89.01	34.61	0	0	0	0	92.73	215.16	337.84		_
							Tota	l per year	(kWh/year	r) = Sum(9	08)15,912 =	1513.58	(98)
Space heati	ng requir	ement in	kWh/m	²/year								25.08	(99)
9b. Energy re	quiremer	nts – Coi	mmunity	heating	scheme	;							
This part is u			• .		_		<b>.</b>	•		unity scl	neme.		_
Fraction of sp	ace heat	from se	condary	/supplen	nentary l	heating (	Table 1	1) '0' if n	one			0	(301)
Fraction of sp	ace heat	from co	mmunity	/ system	1 – (30	1) =						1	(302)
The community	scheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and	up to four	other heat	sources; t	he latter	
includes boilers,		_			rom powe	r stations.	See Appei	ndix C.					(2020)
Fraction of he			•									1	(303a)
Fraction of to	tal space	heat fro	m Comr	nunity he	eat pump	)			(3	02) x (303	sa) =	1	(304a)
Factor for cor	ntrol and	charging	method	l (Table	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distribution lo	ss factor	(Table 1	12c) for (	commun	ity heati	ng syste	m					1.05	(306)
Space heating	ng											kWh/yea	' r
Annual space	_	requiren	nent									1513.58	
													_

Space heat from Community heat pump	(08) v (304a)	x (305) x (306) =	1589.26	(307a)
	, , , ,			``´ 
Efficiency of secondary/supplementary heating system		,	0	(308
Space heating requirement from secondary/supplement	ntary system (98) x (301) x	x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1933.02	]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a)	x (305) x (306) =	2029.67	(310a)
Electricity used for heat distribution	0.01 × [(307a)(3	07e) + (310a)(310e)] =	36.19	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = (107) ÷ (31	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f mechanical ventilation - balanced, extract or positive in			128.36	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	30b) + (330g) =	128.36	(331)
Energy for lighting (calculated in Appendix L)			273.64	(332)
Electricity generated by PVs (Appendix M) (negative quality	uantity)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310	) + (312) + (315) + (331) + (3	332)(237b) =	3912.12	(338)
Total delivered energy for all uses (307) + (309) + (310 12b. CO2 Emissions – Community heating scheme	) + (312) + (315) + (331) + (3	332)(237b) =	3912.12	(338)
	) + (312) + (315) + (331) + (3 Energy kWh/year	Emission factor		(338)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (n	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(338)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (n	Energy kWh/year ot CHP)	Emission factor kg CO2/kWh	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (n Efficiency of heat source 1 (%)	Energy kWh/year ot CHP) s CHP using two fuels repeat (363)	Emission factor kg CO2/kWh	Emissions kg CO2/year	](367a)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (n Efficiency of heat source 1 (%)  CO2 associated with heat source 1	Energy kWh/year ot CHP) s CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 =	Emissions kg CO2/year  280 670.8 18.78	(367a) (367)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (n Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	Energy kWh/year ot CHP) s CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 =	Emissions kg CO2/year  280 670.8 18.78 689.58	(367a) (367) (372)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	Energy kWh/year ot CHP) s CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	Emissions kg CO2/year  280 670.8 18.78 689.58	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)	Energy kWh/year ot CHP) s CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	Emissions kg CO2/year  280 670.8 18.78 689.58	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or incompanies.	Energy kWh/year ot CHP) s CHP using two fuels repeat (363) [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x enstantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	Emissions kg CO2/year  280 670.8 18.78 689.58 0 689.58	(367a) (367) (372) (373) (374) (375)
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CO2 from other sources of space and water heating (n Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or in Total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans with	Energy kWh/year ot CHP) s CHP using two fuels repeat (363) [(307b)+(310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(3 (309) × instantaneous heater (312) × (373) + (374) + (375) = inin dwelling (331)) × (332))) ×	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	Emissions kg CO2/year  280 670.8 18.78 689.58 0 689.58 66.62	(367a) (367) (372) (373) (374) (375) (376) (378)
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CO2 from other sources of space and water heating (n Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or in Total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans with CO2 associated with electricity for lighting  Energy saving/generation technologies (333) to (334) a litem 1	Energy kWh/year ot CHP) s CHP using two fuels repeat (363) [(307b)+(310b)] × 100 ÷ (367b) × [(313) × (363)(366) + (368)(3 (309) × instantaneous heater (312) × (373) + (374) + (375) = inin dwelling (331)) × (332))) × as applicable	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 =  0.52 =  0.52 =  0.22 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52	Emissions kg CO2/year  280 670.8 18.78 689.58 0 689.58 66.62 142.02	(367a) (367) (372) (373) (374) (375) (376) (378) (379) (380)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:01

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 22.44 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.86 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 - Heat pump

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	10.070	<u> </u>
Continuous supply and extract system		
	0.54	
Specific fan power:		014
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	
ventilation rate.	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	<b>5</b> 11/111	
Photovoltaic array		

		Hear I	Details:						
Access an Name	No: Usahan	USELL		. Nivera	<b>L</b>		CTDO	040042	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 n: 1.0.5.50	
		Property	Address:						
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor			a(m²) 03.81	(1a) x		ight(m) 65	(2a) =	Volume(m ³	<b>)</b>   (3a)
	a) ((1b) ((1a) ((1d) ((1a) )					.00	(2a) –	2/5.1	(Ja)
Total floor area TFA = (1	a)+(1b)+(1b)+(1d)+(1e)+.	(111)	03.81	(4)	) . (2-) . (2-	4) . (2 -) .	(2-)		_
Dwelling volume				(3a)+(3b)	)+(3C)+(3C	d)+(3e)+	.(3n) =	275.1	(5)
2. Ventilation rate:	main seco	ondary	other		total			m³ per hou	r
Number of chimneys	heating hea	ting		1 = [			40 =	-	_
•		<u> </u>	0	]	0		20 =	0	(6a)
Number of open flues		0 +	0	] ⁻	0			0	(6b)
Number of intermittent fa				Ļ	0		10 =	0	(7a)
Number of passive vents				Ļ	0		10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)+	(6b)+(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	peen carried out or is intended, p	proceed to (17),	otherwise c	ontinue fr			` ′	<u> </u>	<b></b> _`
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	.25 for steel or timber fra	me or 0 35 fo	r maconn	v constr	uction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value correspor			*	uction			0	(11)
deducting areas of openin	• / /	\ -= 0.4 /I	l\ -l				ı		<b>_</b>
If no draught lobby, en	floor, enter 0.2 (unsealed	) or 0.1 (sear	ea), eise (	enter U				0	(12)
• •	s and doors draught strip	ped						0	(14)
Window infiltration	γ	r	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) +	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	-							0.15	(18)
Air permeability value applie  Number of sides sheltere	es if a pressurisation test has be	een done or a de	gree air per	meability	is being u	sed	ı		7(40)
Shelter factor	eu .		(20) = 1 - [	0.075 x (1	9)] =			0	(19)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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								
	<del></del>	0.95 0.95	0.92	1	1.08	1.12	1.18		
	- + +							İ	

Adjusted infilt	ration rat	e (allowi	ina for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		•	rate for t	he appli	cable ca	se			ı			I	<b>_</b>
If mechanic			andiv N. (C	93h) — (93 <i>a</i>	a) v Emy (	aguatian (I	VEVV otho	muiaa (22h	) - (220)			0.5	(23a)
If exhaust air h									) = (23a)			0.5	(23b)
a) If balance		-	-	_					2h\m . /	22h) v [	1 (22a)	74.8	(23c)
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3	<del>-</del> 100]	(24a)
b) If balance	ļ		<u> </u>	<u> </u>	Į		<u>Į</u>	ļ	<u>l</u>	ļ	0.0		, ,
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	nouse ex	tract ver	tilation o	r positiv	/e input	ı ventilatio	on from (	utside	<u> </u>			l	
,	m < 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)ı	ventilation = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	r change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	d) in bo	x (25)	-	-	-		
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25)
3. Heat losse	es and he	eat loss	paramet	er:									
ELEMENT	Gros area	SS	Openin		Net Ar A ,r		U-val W/m2		A X U (W/l		k-value kJ/m²-l		X k /K
Windows Typ		` ,			13.2	x1	/[1/( 1.4 )+	0.04] =	17.51	,			(27)
Windows Typ	e 2				5.5	x1	/[1/( 1.4 )+	0.04] =	7.29				(27)
Windows Typ	e 3				4.61	x1	/[1/( 1.4 )+	0.04] =	6.11	一			(27)
Walls Type1	76.1	16	23.3	2	52.84	1 X	0.18		9.51		60	3170.4	4 (29)
Walls Type2	49.7	77	0		49.77	7 X	0.17	=	8.36		60	2986.2	2 (29)
Total area of	elements	, m²			125.9	3							(31)
Party wall					12.14	1 X	0	=	0		45	546.3	(32)
Party floor					103.8	1					40	4152.4	(32a)
Party ceiling					103.8	1				Ī	30	3114.3	(32b)
Internal wall *	*				193.1	7				Ī	9	1738.5	(32c)
* for windows and ** include the are						lated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
Fabric heat lo	ss, W/K :	= S (A x	U)				(26)(30	) + (32) =				48.78	(33)
Heat capacity	Cm = S	(A x k )						((28)	.(30) + (32	2) + (32a).	(32e) =	15708.13	(34)
Thermal mass	s parame	eter (TMI	P = Cm -	: TFA) ir	n kJ/m²K			= (34)	÷ (4) =			151.32	(35)
For design asses can be used inste				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	jes : S (L	x Y) cal	culated	using Ap	pendix	K						9.77	(36)
if details of therm		are not kr	own (36) =	= 0.05 x (3	31)			(00)	(26)				7,50
Total fabric he		alaulata :	l manthi					, ,	(36) =	'0E\m × (E)		58.55	(37)
Ventilation he	Feb	Mar	· ·	<u> </u>	Jun	Jul	Aug	Sep	= 0.33 × (	Nov	Dec	]	
Jan	Len	I IVIAI	Apr	May	Juli	l Jui	Aug	l seb	Oct	INOV	l nec	I	

(00)	00.0	00.40	00.40	00.40	00.00	04.07	04.07	04.00	05.00	00.00	00.70	07.44		(20)
(38)m=	28.8	28.46	28.12	26.42	26.08	24.37	24.37	24.03	25.06	26.08	26.76	27.44		(38)
Heat tr (39)m=	87.35	oefficier 87.01	1t, VV/K 86.67	84.97	84.63	82.93	82.93	82.59	(39)m 83.61	= (37) + (3 84.63	38)m 85.31	85.99		
(39)111=	67.33	67.01	00.07	04.97	04.03	02.93	02.93	02.39			Sum(39) ₁	<u> </u>	84.89	(39)
Heat Id	ss para	meter (F	HLP), W	m²K			_	_		= (39)m ÷		27		<b></b>  ` ′
(40)m=	0.84	0.84	0.83	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83		_
Numbe	er of day	rs in mor	nth (Tab	le 1a)					1	Average =	Sum(40) ₁	12 /12=	0.82	(40)
rtuinot	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 ener	gy requi	rement:								kWh/ye	ear:	
Λ			\.											
		ipancy, I 9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x (	ΓFA -13.		77		(42)
if TF	A £ 13.9	9, N = 1			`	,	•	, , <del>-</del>	,					
								(25 x N) to achieve		se target o		0.04		(43)
		•		0,	ater use, l	Ū	Ū			J J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	110.04	106.04	102.04	98.04	94.04	90.03	90.03	94.04	98.04	102.04	106.04	110.04		
En a rou .	aantant of	hat water	used sel	aulatad m	anthly 1	100 v Vd n	n nm F	Tm / 2600			m(44) ₁₁₂ =	L	1200.45	(44)
					,		1	OTm / 3600		,				
(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	4572.00	(45)
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotai = Su	m(45) ₁₁₂ =	• [	1573.98	(43)
(46)m=	24.48	21.41	22.09	19.26	18.48	15.95	14.78	16.96	17.16	20	21.83	23.71		(46)
Water	storage	loss:						ļ						
Ū		` ,		•			Ū	within sa	ame ves	sel		0		(47)
	•	_			elling, e			, ,	a = a \ a = a + a	· · · (O) : · · · (	47\			
	vise ii no storage		not wate	er (triis ir	iciudes i	nstantar	ieous co	mbi boil	ers) ente	er o in (	47)			
	•		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
•			storage	-				(48) x (49)	) =		1	10		(50)
,				•	oss fact									(= 4)
		_	ee secti		e 2 (kW	n/litre/da	ıy)				0.	02		(51)
	-	from Ta		JII 4.0							1.	.03		(52)
Tempe	erature fa	actor fro	m Table	2b							<b>—</b>	.6		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	03		(54)
Enter	(50) or (	54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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 Appendi	хН	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

		1
Primary circuit loss (annual) from Table 3	0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	otot)	
(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	22.51 23.26	(59)
	22.01 20.20	(66)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		1 (04)
(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 × (45)m +	<del>` ` ` ` ` ` </del>	1 ` ′ ′
(62)m= 218.46 192.65 202.56 181.9 178.48 159.81 153.79 168.33 167.89 188.6	199.03 213.32	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribut	ion to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		l (63)
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater		1
(64)m= 218.46 192.65 202.56 181.9 178.48 159.81 153.79 168.33 167.89 188.6	199.03 213.32	0004.00 (64)
Output from water heate		2224.82 (64)
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$	<del></del>	1
(65)m= 98.48 87.4 93.19 85.49 85.19 78.15 76.98 81.81 80.83 88.55	91.18 96.77	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is fr	om community h	leating
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	
(66)m= 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61	138.61 138.61	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		_
(67)m= 23.39 20.77 16.89 12.79 9.56 8.07 8.72 11.34 15.21 19.32	22.55 24.04	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 262.34 265.07 258.21 243.6 225.17 207.84 196.26 193.54 200.4 215.01	233.44 250.77	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5		
(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 5a)	•	'
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)		ı
(71)m= -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88	-110.88 -110.88	(71)
Water heating gains (Table 5)		I
(72)m= 132.37 130.06 125.26 118.73 114.5 108.53 103.47 109.96 112.27 119.02	126.65 130.07	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m$	1)m + (72)m	l
(73)m= 482.68 480.48 464.94 439.71 413.81 389.03 373.03 379.42 392.47 417.93	447.22 469.45	(73)
6. Solar gains:		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicab	ole orientation.	
Orientation: Access Factor Area Flux g_	FF	Gains
	able 6c	(VV)
Southeast 0.9x 0.77 x 5.5 x 36.79 x 0.63 x	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= 22 Total gain	26.28	390.73 ternal ar	548.6	3 lar	for each mor 703.29 809.1 (84)m = (73)1 1143 1223.	2   8 M +	812.79 (83)m	779.69	699		97 43	35.62 53.54	-	193.03	_		(83)
(83)m= 22	26.28	390.73	548.6	3	703.29 809.3	2 8		779.69	<del></del>				272	193.03	3		(83)
				$\neg$		_			<del></del>				_		_		
Solar gair										- Cum(74)	(O	22)m					
140111111111111111111111111111111111111	U.9X	0.77		X	4.61	X		9.21	X	0.63		x	0.7	=		12.98	(81)
Northwest Northwest	_	0.77	$\dashv$	X	4.61	」× T √		14.2	] × ] _v	0.63	$\blacksquare$	X L	0.7	┥ :	$\vdash$	20	(81)
Northwest	<u> </u>	0.77	_	X	4.61	X		8.07	X	0.63		X L	0.7	_ =	$\vdash$	39.54	(81)
Northwest	<u> </u>	0.77	_	X	4.61	X		0.42	X	0.63		x L	0.7	_  =	Ļ	71.04	(81)
Northwest	<u> </u>	0.77		X	4.61	X	7	2.63	X	0.63		x L	0.7	=	Ļ	102.32	(81)
Northwest	<u> </u>	0.77		X	4.61	x	9	91.1	x	0.63		×	0.7	=		128.35	(81)
Northwest	느	0.77		X	4.61	x	9	7.38	x	0.63		x	0.7	=		137.2	(81)
Northwest	t 0.9x	0.77		X	4.61	x	9	1.35	x	0.63		x	0.7			128.7	(81)
Northwest	t 0.9x	0.77		X	4.61	x	6	7.96	x	0.63		x [	0.7			95.74	(81)
Northwest	t 0.9x	0.77		X	4.61	j x	4	1.38	x	0.63		x [	0.7			58.3	(81)
Northwest	t 0.9x	0.77		X	4.61	x	2	2.97	x	0.63		× [	0.7			32.36	(81)
Northwest	t 0.9x	0.77		X	4.61	×	1	1.28	x	0.63		x	0.7	= =	F	15.9	(81)
Southwest	t _{0.9x}	0.77	$\exists$	X	13.21	i x	3	1.49	ĺ	0.63	$\overline{}$	x [	0.7		F	127.12	(79)
Southwest	<u> </u>	0.77		X	13.21	X		4.07	ĺ	0.63		x [	0.7		片	177.92	(79)
Southwest	<u> </u>	0.77	$\dashv$	X	13.21	X		9.27	i	0.63	$\dashv$	×	0.7	╡ -	$\vdash$	279.64	(79)
Southwest		0.77	=	X	13.21	] ^ ] x		2.85	]	0.63		× [	0.7	╡ -	H	374.86	(79)
Southwest	<u> </u>	0.77	$\dashv$	X	13.21	] ^ ] x		04.39	] ]	0.63	$\dashv$	^ L × Г	0.7	=	H	421.44	(79)
Southwest	<u> </u>	0.77	_	X	13.21	」^ ]		13.91	] ]	0.63	_	^ L х [	0.7	╡ :	$\vdash$	459.87	(79)
Southwest	<u> </u>	0.77	$\dashv$	x x	13.21	」× ] x		19.01 18.15	] ]	0.63	$\blacksquare$	x L	0.7	$\dashv$	H	480.46 476.99	(79)
Southwest	<u> </u>	0.77		X	13.21	」× ┐、		06.25	] 1	0.63		× L	0.7	╡ :	H	428.95	(79)
Southwest Southwest	<u> </u>	0.77	$\blacksquare$	X	13.21	」× ┐,		5.75	] 1	0.63		× L	0.7	_ = =	$\vdash$	346.2	$= \frac{(79)}{(70)}$
Southwest		0.77	$\blacksquare$	X	13.21	_ ×		2.67	] 1	0.63	$\blacksquare$	X L	0.7	_ = -	H	253.02	(79)
Southwest	<u> </u>	0.77	_	X	13.21	X	3	6.79	]	0.63		x L	0.7	=	Ļ	148.54	(79)
Southeast	<u> </u>	0.77		X	5.5	X	3	1.49	X	0.63		x [	0.7	=	Ļ	52.93	(77)
Southeast	<u> </u>	0.77		X	5.5	X	4	4.07	X	0.63		x	0.7	=		74.08	(77)
Southeast	느	0.77		X	5.5	X	6	9.27	X	0.63		x	0.7	=	L	116.43	(77)
Southeast	<u> </u>	0.77		X	5.5	X	9	2.85	X	0.63		x	0.7	=		156.07	(77)
Southeast	<u> </u>	0.77		X	5.5	X	10	04.39	x	0.63		x	0.7	=		175.47	(77)
Southeast	느	0.77		X	5.5	×	1	13.91	x	0.63		x	0.7	=		191.47	(77)
Southeast	t 0.9x	0.77		X	5.5	X	1	18.15	x	0.63		x [	0.7	=		198.6	(77)
Southeast	t 0.9x	0.77		x	5.5	x	1	19.01	x	0.63		x	0.7	=		200.04	(77)
Southeast	t 0.9x	0.77		X	5.5	X	10	06.25	x	0.63		x [	0.7		⋷┌	178.6	(77)

												_	
(86)m= 0.9	8 0.95	0.89	0.77	0.61	0.44	0.32	0.35	0.56	0.83	0.95	0.98		(86)
Mean inte	nal temper	rature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	' in Table	e 9c)					
(87)m= 19.	9 20.18	20.49	20.79	20.94	20.99	21	21	20.97	20.75	20.28	19.86		(87)
Temperatu	ıre during h	neating p	eriods i	n rest of	dwelling	from Ta	ıble 9, Ti	h2 (°C)					
(88)m= 20.2	22 20.22	20.22	20.24	20.24	20.25	20.25	20.26	20.25	20.24	20.23	20.23		(88)
Utilisation	factor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						
(89)m= 0.9	7 0.94	0.87	0.74	0.57	0.39	0.26	0.29	0.5	0.8	0.94	0.98		(89)
Mean inte	nal temper	rature in	the rest	of dwelli	ing T2 (f	ollow ste	ps 3 to 7	7 in Tabl	le 9c)				
(90)m= 18.7	75 19.14	19.58	19.99	20.18	20.25	20.25	20.26	20.22	19.95	19.3	18.69		(90)
	•	•			•			1	fLA = Livin	g area ÷ (	4) =	0.38	(91)
Mean inte	nal temper	rature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m= 19.1	_ <del>-</del>	19.93	20.3	20.47	20.53	20.54	20.54	20.51	20.26	19.68	19.14		(92)
Apply adju	stment to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 19.1	9 19.54	19.93	20.3	20.47	20.53	20.54	20.54	20.51	20.26	19.68	19.14		(93)
8. Space h	eating req	uirement											
	ne mean in		•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
	ion factor fo				1	11	A	Can	004	Nov	Daa		
Ja Utilisation	n Feb factor for g	Mar lains hm	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m= 0.9	<u>_</u>	0.86	0.74	0.58	0.4	0.28	0.32	0.52	0.8	0.94	0.97		(94)
` '	ns, hmGm	, W = (9	1——— 4)m x (8	1 4)m	ļ								
(95)m= 684.	1	876.63	848.5	708.01	486.63	325.87	340.61	519.7	681.17	673.32	644.36		(95)
Monthly av	erage exte	ernal tem	perature	e from Ta	able 8			ı		•	•		
(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 temp	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]		,	•	
(97)m= 1300				742.05	491.85	326.66	341.91	535.72	817.5	1073.07	1284.7		(97)
	ting require	1				Î		T .	Î			I	
(98)m= 458.	37 311.36	213.82	86.23	25.32	0	0	0	0	101.43	287.82	476.41		7(00)
							Tota	l per year	(kWh/yeaı	r) = Sum(9	18)15,912 =	1960.76	(98)
Space hea	ting require	ement in	kWh/m ²	²/year								18.89	(99)
9b. Energy	requiremer	nts – Coi	mmunity	heating	scheme								
This part is			• .		_		<b>.</b>	•		unity sch	neme.		7(204)
Fraction of	•		•		•		Table T	1) 'U' If N	one			0	(301)
Fraction of	space heat	from co	mmunity	/ system	1 – (30	1) =						1	(302)
The communit		-							up to four	other heat	sources; t	he latter	
Fraction of		-			ioni powe	stations.	осс Арреі	idix C.				1	(303a)
Fraction of	total space	heat fro	m Comr	nunity he	eat pum	)			(3	02) x (303	a) =	1	(304a)
Factor for c	•			•			unity hea	iting sys	tem			1	(305)
Distribution				,	,		•	0 ,				1.05	(306)
Space hear		,	,		, , , , , , , , , , , , , , , , , , , ,	J = 7 = = 0						kWh/yea	
Annual spa	_	requiren	nent									1960.76	
		1	-									1 223 2	

Space heat from Community heat pump	(08) v (304a)	x (305) x (306) =	2058.8	(307a)
	, , , ,			」` ´
Efficiency of secondary/supplementary heating system	`	•	0	(308
Space heating requirement from secondary/supplement	ntary system (98) x (301) x	( 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2224.82	]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a)	x (305) x (306) =	2336.06	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	07e) + (310a)(310e)] =	43.95	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = $(107) \div (31)$	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 41 mechanical ventilation - balanced, extract or positive in	•		253.73	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	30b) + (330g) =	253.73	(331)
Energy for lighting (calculated in Appendix L)			412.99	(332)
Electricity generated by PVs (Appendix M) (negative q	uantity)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310	0) + (312) + (315) + (331) + (3	332)(237b) =	4952.76	(338)
Total delivered energy for all uses (307) + (309) + (310 12b. CO2 Emissions – Community heating scheme	0) + (312) + (315) + (331) + (3	332)(237b) =	4952.76	(338)
	0) + (312) + (315) + (331) + (3 Energy kWh/year	Emission factor		(338)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (r	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (r	Energy kWh/year not CHP)	Emission factor kg CO2/kWh	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%)	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%)  CO2 associated with heat source 1	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 =	Emissions kg CO2/year  280  814.62  22.81	(367a) (367)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (r Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 =	Emissions kg CO2/year  280 814.62 22.81 837.43	(367a) (367) (372)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	280 814.62 22.81 837.43	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	280  814.62  22.81  837.43	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or in	Energy kWh/year not CHP) s CHP using two fuels repeat (363) of [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x nstantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	280 814.62 22.81 837.43 0 837.43	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or intotal CO2 associated with space and water heating	Energy kWh/year not CHP) s CHP using two fuels repeat (363) of [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x nstantaneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.22 = 0.22 = 0.22	280 280 814.62 22.81 837.43 0 837.43 131.68	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (refficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or in the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the cont	Energy kWh/year not CHP) s CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(3 (309) x Instantaneous heater (312) x (373) + (374) + (375) = thin dwelling (331)) x (332))) x	Emission factor kg CO2/kWh  to (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.22 = 0.22 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0	280 814.62 22.81 837.43 0 837.43 131.68	(367a) (367) (372) (373) (374) (375) (376) (378)
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Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:43:00

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: 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 27.22 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.14 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) 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 - Heat pump

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 electric heat pump		
Photovoltaic array		

		Heart	Details:						
A No	NI a il Lia ada a ua	USELL		. NI	l		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa	-				010943 on: 1.0.5.50	
Contware Hame.	01101110 1 07 11 20 12	Property	Address:		31011.		7 01010	71. 110.0.00	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			ea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	-) . (4  - ) . (4 -) . (4 -) . (4 -) .			(1a) x		.65	(2a) =	165.78	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(1h)	62.56	(4)	. (0.) (0	n (O )	(0.)		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	165.78	(5)
2. Ventilation rate:	main sec	ondary	other		total			m³ per hou	r
Number of altimospess	heating hea	ating		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					0		10 =	0	(7a)
Number of passive vents				L	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	0		÷ (5) =	0	(8)
•	peen carried out or is intended,			ontinue fr			- (0) =	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			*	uction			0	(11)
deducting areas of openii		iding to the grea	ilei wali area	i (aitei					
If suspended wooden f	floor, enter 0.2 (unsealed	l) 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 augusta augusta		(8) + (10) +		, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic	•	•	•	etre oi e	envelope	area	3	(17)
•	es if a pressurisation test has be				is beina u	sed		0.15	(18)
Number of sides sheltere			3	,	<b>J</b>			0	(19)
Shelter factor			(20) = 1 - [	0.075 x (1	9)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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								
	<del></del>	0.95 0.95	0.92	1	1.08	1.12	1.18	]	
· · · — — — — — — — — — — — — — — — — —					<u> </u>		ı	J	

Adjusted infiltra	ation rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effect		-	rate for t	he appli	cable ca	se	-		-	-			
If exhaust air he			endix N (2	3b) = (23a	a) × Fmv (e	equation (N	NS)) other	wise (23h	) = (23a)			0.5	(238
If balanced with		0 11		, ,	, ,	. ,	,, .	,	) = (20a)			0.5	(231
		•	•	_					26\m . /	22h) [:	1 (22.5)	74.8	(230
a) If balance (24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3	<del>-</del> 100] 	(24a
b) If balance					<u> </u>	l	l				0.0	J	(=
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole h	-			-	ļ	<u> </u>						J	•
if (22b)m				•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural v				•	•				0.5]	-			
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	•	•	•	•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25)
3. Heat losses	and he	at lose r	naramete	ar.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e A	Χk
	area	-	m		A ,r		W/m2		(W/		kJ/m²-l		J/K
Vindows Type	1				12.71	x1.	/[1/( 1.4 )+	0.04] =	16.85				(27)
Windows Type	2				3.46	x1.	/[1/( 1.4 )+	0.04] =	4.59				(27)
Walls Type1	46.7	'2	16.1	7	30.55	, x	0.18	= [	5.5		60	1833	(29)
Walls Type2	13.7	<b>'</b> 5	0		13.75	x	0.17	_ = [	2.31	$\neg$ [	60	825	(29)
Total area of el	ements	, m²			60.47	<del>,</del>							(31)
Party wall					30.32	<u>x</u>	0	=	0		45	1364	4 (32)
Party floor					62.56	5					40	2502	4 (32
Party ceiling					62.56					Ī	30	1876	8 (32)
nternal wall **					100.8	<u> </u>				Ī	9	907.	=
for windows and it include the area					alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] a	as given in			`
abric heat los				o ana pan	1110110		(26)(30)	+ (32) =				29.25	(33
leat capacity (		•	• ,					((28)	(30) + (32	2) + (32a).	(32e) =	9308.8	(34)
Thermal mass	`	,	P = Cm -	- TFA) ir	n kJ/m²K			***	÷ (4) =	_,	(0=0)	148.8	(35)
For design assess can be used instea	ments wh	ere the de	tails of the	•			ecisely the	` '	. ,	TMP in Ta	able 1f	140.0	(00)
hermal bridge				usina Ap	pendix ł	<						7.08	(36
f details of therma					-							7.00	(00
Total fabric hea	at loss							(33) +	(36) =			36.33	(37
entilation hea	t 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= 17.36	17.15	16.95	15.92	15.72	14.69	14.69	14.48	15.1	15.72	16.13	16.54		(38
Heat transfer c	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
39)m= 53.68	53.48	53.27	52.25	52.04	51.01	51.01	50.81	51.42	52.04	52.45	52.86		
		-								-			

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.86	0.85	0.85	0.84	0.83	0.82	0.82	0.81	0.82	0.83	0.84	0.84		
						!			Average =	Sum(40) ₁	12 /12=	0.83	(40)
Number of day	<u> </u>	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 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		05		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed			se target o		96		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 222	1 000	1			
(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		
. ,		!				ļ	<u> </u>		I Total = Su	ım(44) ₁₁₂ =	=	995.51	(44)
Energy content of	f 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= 135.33	118.36	122.14	106.48	102.17	88.17	81.7	93.75	94.87	110.56	120.69	131.06		
									Total = Su	im(45) ₁₁₂ =	=	1305.27	(45)
If instantaneous v	vater heati	ing 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 volum		) includir	na anv e	olar or M	WHDS	etoraga	within co	ama vac	വ				(47)
· ·	•	•				· ·		airie ves	361		0		(47)
If community hotherwise if no	•			_			. ,	ers) ente	er '0' in <i>(</i>	(47)			
Water storage			(					,		( )			
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-										
Hot water stor	-			e 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community he Volume factor	_		011 4.3							1	03		(52)
Temperature f			2b							-	.6		(52)
Energy lost fro				ear			(47) x (51)	) x (52) x (	(53) =		03		(54)
Enter (50) or		_	, 1	Jui			(11)11(21)	, (==, (	,/		.03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (	(55) × (41)	m				, ,
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain												ix H	(00)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(57)m= 32.01	20.92	32.01	30.96	32.01	30.96	32.01	32.01	30.96	32.01	<u> </u>	<u> </u>		, ,
Primary circuit	•	,			<b>50</b> \	(EQ) = =					0		(58)
Primary circuit				,	•		, ,		r tharma	otat)			
(modified by		1	ı —	ı —	ı —		<del></del>	<u> </u>	1	<del>-                                    </del>	22.22		(59)
(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		(38)

Combi loss ca	lculated f	or each	month (	61)m =	(60) ÷ 3	65 × (41	)m							
(61)m= 0	0	0	0	0	0	0 0	)   0		0	0	0	0	1	(61)
	uired for	water he	eating ca	alculated	L for eac	h month	(62)ı	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 190.61	168.29	177.41	159.97	157.45	141.66	136.98	149.	_	148.36	165.84	174.18	186.34	]	(62)
Solar DHW input	L L L L L L L L L L L L L L L L L L L	using App	endix G or	Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	J	
(add additiona												-		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from w	ater heat	er				•	•				•	!	•	
(64)m= 190.61	168.29	177.41	159.97	157.45	141.66	136.98	149	.03	148.36	165.84	174.18	186.34	]	
						•		Outp	ut from wa	ater heate	er (annual)	12	1956.11	(64)
Heat gains fro	m water l	heating,	kWh/mo	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	ı] + 0.8 x	((46)m	+ (57)m	+ (59)m	]	
(65)m= 89.22	79.3	84.83	78.2	78.19	72.11	71.39	75.3	39	74.34	80.98	82.92	87.8	]	(65)
include (57)	m in calc	ulation o	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 ga	ains (see	Table 5	and 5a	):										
Metabolic gair	ns (Table	5). Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(66)m= 102.65	102.65	102.65	102.65	102.65	102.65	102.65	102	.65	102.65	102.65	102.65	102.65	1	(66)
Lighting gains	(calculat	ed in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso s	ee T	Table 5				•	
(67)m= 15.99	14.2	11.55	8.74	6.54	5.52	5.96	7.7	'5	10.4	13.21	15.42	16.43	]	(67)
Appliances ga	ins (calcu	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5			•	
(68)m= 179.35	181.22	176.53	166.54	153.94	142.09	134.18	132	.32	137.01	146.99	159.59	171.44	]	(68)
Cooking gains	(calculat	ted in Ap	pendix	L, equat	ion L15	or L15a	), als	o se	e Table	5			-	
(69)m= 33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.2	27	33.27	33.27	33.27	33.27	]	(69)
Pumps and fa	ns gains	(Table 5	ia)										•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(70)
Losses e.g. ev	/aporatio	n (negat	ive 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 heating	gains (T	able 5)											-	
(72)m= 119.92	118	114.02	108.61	105.1	100.15	95.95	101.	.34	103.25	108.85	115.17	118.01	]	(72)
Total internal	gains =				(66	)m + (67)m	า + (68	8)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	-	
(73)m= 369.06	367.21	355.89	337.69	319.37	301.56	289.88	295	5.2	304.45	322.84	343.98	359.68	]	(73)
6. Solar gains	s:													
Solar gains are		ŭ	r flux from	Table 6a	and assoc	ciated equa	tions 1	to co	nvert to th	e applica		tion.		
Orientation:		actor	Area m²		Flu	ıx ble 6a		т	g_ able 6b	т	FF able 6c		Gains	
_	Table 6d					DIE 0a		1	able ob	_ '	able oc		(W)	,
Northeast 0.9x	0.77	X	12.	71	X	11.28	X		0.63	×	0.7	=	43.83	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	22.97	X		0.63	x	0.7	=	89.21	(75)
Northeast 0.9x	0.77	X	12.	71	X .	41.38	X		0.63	x	0.7	=	160.73	(75)
Northeast 0.9x	0.77	×	12.	71	X	67.96	X		0.63	x	0.7	=	263.96	(75)
Northeast _{0.9x}	0.77	X	12.	71	X	91.35	X		0.63	X	0.7	=	354.82	(75)

Northeast 0,50	Nawth a a a 4		_			_		7		_		_		<b>–</b> ,,
Northeast 0.9x	Northeast _{0.9x}	0.77	×	12.	71	×	97.38	X	0.63	×	0.7	=	378.27	(75)
Northwest 0.8x	Ļ	0.77	X	12.	71	X _	91.1	X	0.63	X	0.7	=	353.87	(75)
Northwest 0.9x	Ļ	0.77	X	12.	71	x _	72.63	X	0.63	X	0.7	=	282.11	(75)
Northeast 0.8	Northeast _{0.9x}	0.77	X	12.	71	x	50.42	X	0.63	X	0.7	=	195.85	(75)
Northwest 0, 9x	<u>L</u>	0.77	X	12.	71	X	28.07	X	0.63	X	0.7	=	109.02	(75)
Northwest 0, sk	Northeast _{0.9x}	0.77	X	12.	71	X	14.2	X	0.63	X	0.7	=	55.15	(75)
Northwest 0, 9x	Northeast 0.9x	0.77	X	12.	71	x	9.21	X	0.63	X	0.7	=	35.79	(75)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	3.4	-6	X	11.28	X	0.63	X	0.7	=	11.93	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	X	3.4	-6	x	22.97	X	0.63	X	0.7	=	24.29	(81)
Northwest 0,9 x	Northwest 0.9x	0.77	X	3.4	-6	x	41.38	X	0.63	X	0.7	=	43.75	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	6	x	67.96	X	0.63	х	0.7	=	71.86	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	6	x	91.35	X	0.63	x	0.7		96.59	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	-6	x	97.38	X	0.63	x	0.7	=	102.98	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	6	x	91.1	x	0.63	х	0.7	=	96.33	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	x	3.4	6	x	72.63	X	0.63	х	0.7	=	76.8	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	×	3.4	6	x	50.42	X	0.63	x	0.7	_ =	53.32	(81)
Solar gains in watts, calculated for each month   (83)m = Sum(74)m (82)m	Northwest 0.9x	0.77	×	3.4	6	x	28.07	X	0.63	x	0.7	<del>=</del>	29.68	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m  (83)m = 55.76	Northwest 0.9x	0.77	×	3.4	6	x	14.2	X	0.63	x	0.7		15.01	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = \$5.76	Northwest 0.9x	0.77	×	3.4	6	x	9.21	X	0.63	×	0.7		9.74	(81)
(83)m= 55.76   113.5   204.48   335.82   451.41   481.25   450.2   358.9   249.17   138.7   70.16   45.53    Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 424.81   480.71   560.38   673.51   770.78   782.81   740.09   654.1   553.62   461.54   414.13   405.21   (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	_							_						_
(83)m= 55.76   113.5   204.48   335.82   451.41   481.25   450.2   358.9   249.17   138.7   70.16   45.53    Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)m= 424.81   480.71   560.38   673.51   770.78   782.81   740.09   654.1   553.62   461.54   414.13   405.21   (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	Solar gains in	watts, calcu	ulated	for eacl	h month	l		(83)m	n = Sum(74)m	(82)m				
Ref	(83)m= 55.76	113.5 20	04.48	335.82	451.41	481.2	5 450.2	358	3.9 249.17	138.7	70.16	45.53		(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= 0.98 0.96 0.91 0.78 0.59 0.41 0.3 0.35 0.6 0.87 0.96 0.98 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.85 20.04 20.37 20.75 20.94 20.99 21 21 21 20.95 20.66 20.2 19.82 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.24 20.19 19.83 19.18 18.63 (90)  ## ILA = Living area + (4) = 0.43 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2  (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	Total gains – i	nternal and	solar	(84)m =	(73)m	+ (83)	m , 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= 0.98 0.96 0.91 0.78 0.59 0.41 0.3 0.35 0.6 0.87 0.96 0.98 0.98 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.85 20.04 20.37 20.75 20.94 20.99 21 21 20.95 20.66 20.2 19.82 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.24 20.19 19.83 19.18 18.63 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.57 20.52 20.19 19.62 19.14 (92)	(84)m= 424.81	480.71 56	60.38	673.51	770.78	782.8	1 740.09	654	1.1 553.62	461.5	414.13	405.21		(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 tempera	ature (	heating	seasor	1)								
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Temperature	during hea	iting pe	eriods ir	the livi	ng are	a from Ta	ble 9	, Th1 (°C)				21	(85)
(86)m=	Utilisation fac	tor for gain	s for li	ving are	ea, h1,m	ı (see	Table 9a)							
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 19.85   20.04   20.37   20.75   20.94   20.99   21   21   20.95   20.66   20.2   19.82   (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.2   20.21   20.21   20.22   20.23   20.24   20.24   20.24   20.23   20.23   20.22   20.21   (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.97   0.95   0.9   0.76   0.55   0.36   0.25   0.3   0.55   0.84   0.95   0.98   (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.66   18.94   19.41   19.93   20.16   20.23   20.24   20.24   20.19   19.83   19.18   18.63   (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2  (92)m= 19.17   19.42   19.83   20.28   20.49   20.56   20.57   20.57   20.52   20.19   19.62   19.14   (92)	Jan	Feb	Mar	Apr	May	Jur	n Jul	Α	ug Sep	Oct	Nov	Dec		
(87)m=	(86)m= 0.98	0.96	0.91	0.78	0.59	0.41	0.3	0.3	35 0.6	0.87	0.96	0.98		(86)
(87)m=	Mean interna	l temperatu	ıre in li	iving are	ea T1 (f	ollow s	steps 3 to	7 in T	able 9c)	•	•	•	•	
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90)  ### Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)		· · ·			· •	1	_i	т —		20.66	20.2	19.82	]	(87)
(88)m= 20.2 20.21 20.21 20.22 20.23 20.24 20.24 20.24 20.23 20.23 20.22 20.21 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	Tomporatura	during hoo	ting n	oriodo ir	root of	dwalli	na from T	abla (		<u> </u>	<u>!</u>		ı	
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	· -					1	<del>-</del>	1	<del></del>	20.23	20.22	20.21	1	(88)
(89)m= 0.97 0.95 0.9 0.76 0.55 0.36 0.25 0.3 0.55 0.84 0.95 0.98 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 18.66 18.94 19.41 19.93 20.16 20.23 20.24 20.24 20.19 19.83 19.18 18.63 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)						<u> </u>		-	20.20	20.20	20.22	20.21		()
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= $\begin{bmatrix} 18.66 & 18.94 & 19.41 & 19.93 & 20.16 & 20.23 & 20.24 & 20.24 & 20.19 & 19.83 & 19.18 & 18.63 & (90) \\ & & & & & & & & & & & & & & & & & & $						1	`	T			T		1	(00)
	(89)m= 0.97	0.95	0.9	0.76	0.55	0.36	0.25	0.3	3 0.55	0.84	0.95	0.98		(89)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	Mean interna	l temperatu	ıre in t			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= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)	(90)m= 18.66	18.94 1	9.41	19.93	20.16	20.23	3 20.24	20.		<u> </u>		ļ		
(92)m= 19.17 19.42 19.83 20.28 20.49 20.56 20.57 20.57 20.52 20.19 19.62 19.14 (92)										fLA = Li\	ring area ÷ (	4) =	0.43	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	Mean interna	I temperatu	ıre (for	the wh	ole dwe	elling) =	= fLA × T1	+ (1	– fLA) × T2					
		<del> </del>	<del>`</del>			1	1	<del>1 `</del>	<del></del>	1	19.62	19.14		(92)

(93)m= 19.17	19.42	19.83	20.28	20.49	20.56	20.57	20.57	20.52	20.19	19.62	19.14		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l		<u> </u>		<u> </u>								
(94)m= 0.97	0.95	0.89	0.76	0.57	0.38	0.27	0.32	0.57	0.84	0.94	0.97		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	•								
(95)m= 410.32	454.37	499.35	510.31	436.71	300.96	201.78	210.63	315.05	388.63	390.91	393.37		(95)
Monthly avera		1	<del>-</del>	from T	T T							l	
(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		i	· ·		i	<del>-``</del>	· · ·	<u> </u>				1	(07)
(97)m= 798.2	776.21	709.91	594.7	457.66	303.93	202.28	211.64	330.02	499.01	656.71	789.76		(97)
Space heatin (98)m= 288.59	g require 216.28	156.66	60.76	15.58	/vn/mon	$\ln = 0.02$	24 X [(97)	)m – (95 0	)MJ X (4 82.12	1)m 191.38	294.91		
(96)111= 200.59	210.20	130.00	60.76	15.56		0				l .	<u> </u>	1306.29	(98)
				.,			TUld	l per year	(KVVII/yeai	) = Sum(9	O)15,912 =		╡``
Space heatin	g require	ement in	kvvh/m²	/year								20.88	(99)
9b. Energy red			· ·	Ĭ									
This part is use Fraction of spa										unity sch	neme.	0	(301)
·			•		-	_	(Table T	1) 0 11 11	OHE				╡`
Fraction of spa	ace neat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so includes boilers, h									up to four	other heat	sources; t	he latter	
Fraction of hea		-			rom power	stations.	ове Арреі	iuix C.				1	(303a)
Fraction of total			-		eat pump	)			(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for (	commun	ity heatii	ng syste	m					1.05	(306)
Space heating	q										ļ	kWh/yea	 r
Annual space	_	requiren	nent									1306.29	7
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	1371.61	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	1												
Annual water		equirem	ent									1956.11	
If DHW from c											,		_ 
Water heat fro		•		)						5) x (306) :		2053.91	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	34.26	(313)
Cooling System	_	•	•			. 0)		(10 <del>-</del> )	(2.4.1)			0	(314)
Space cooling	,			•		,		= (107) ÷	(314) =			0	(315)
Electricity for p mechanical ve							outeide				İ	450.04	(330a)
mechanical ve	rillialiOf1	- paiaii(	eu, exilî	aui ui pi	onuve III	put 110IM	outside					152.91	(330a)

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330l	o) + (330g) =	152.91	(331)
Energy for lighting (calculated in Appendix L)			282.38	(332)
Electricity generated by PVs (Appendix M) (negative	e quantity)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (3	310) + (312) + (315) + (331) + (33	32)(237b) =	3751.99	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating Efficiency of heat source 1 (%)	(not CHP) re is CHP using two fuels repeat (363) to	(366) for the second fu	el 280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	634.94	(367)
Electrical energy for heat distribution	[(313) x	0.52	17.78	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	652.72	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater of	or instantaneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		652.72	(376)
CO2 associated with electricity for pumps and fans v	within dwelling (331)) x	0.52	79.36	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	146.56	(379)
Energy saving/generation technologies (333) to (334 Item 1	4) as applicable	0.52 x 0.01 =	-56.48	(380)
Total CO2, kg/year sum of (376)	(382) =		822.16	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			13.14	(384)

El rating (section 14)

(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:42:59

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 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 12.86 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 - Heat pump

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 electric heat pump		
Photovoltaic array		

		l Iser-I	Details:						
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Strom Softwa	are Vei				010943 on: 1.0.5.50	
Address :	F	Property	Address	05 - C					
Overall dwelling dime	nsions:								
		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	<b>T</b> + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	0	x 1	10 =	0	(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 ho	our
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				0		÷ (5) =	0	(8)
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	ed to (17),	otherwise (	ontinue tr	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	y constr	uction			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 (	).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 $(18) = [(17) \div 20] +$		•	•	etre of e	envelope	area	3	(17)
•	s if a pressurisation test has been do				is being u	sed		0.15	(18)
Number of sides sheltere			,	,	Ū			0	(19)
Shelter factor			(20) = 1 -	0.075 x (1	9)] =			1	(20)
Infiltration rate incorporat	_		(21) = (18	x (20) =				0.15	(21)
Infiltration rate modified for	<del></del>	1	T .	_	T _	1	_	1	
L 1	Mar   Apr   May   Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		1 00	1 0.7	4	1 40	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		
Wind Factor (22a)m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ 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	_	_			
0.19 Calculate effe	0.19	0.18	0.16	0.16 he appli	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
If mechanica		-	ale for t	пе аррп	cable ca	30						0.5	(23
If exhaust air h	eat pump (	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				74.8	(23
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	_
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(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		(24
c) If whole h if (22b)r		tract ver (23b), t		•					.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r		on or wh en (24d)							0.5]			1	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)		•		•	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		X k
Windows Type		(111 )			12.71	<del></del>			16.85		NO/III I	τ πο/	(27
Windows Type					3.46	_	/[1/( 1.4 )+	Ļ	4.59	$\dashv$			(27
Walls Type1	72.6	2	16.1	7	56.45	=	0.18	= [	10.16	╡┌	60	3387	\(\begin{align*}(2) \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\
Walls Type1	17.7		0			=			2.99	륵 ¦		1066.8	= '
Total area of e					17.78	3 ×	0.17	[	2.99	[	60		(31
Party wall	Jonnon	,			90.4						AF	1264.4	`
Party floor					30.32	=	0	[	0	L	45	1364.4 2904.8	=
Party ceiling					72.62	=				L	40	-         -	=
Internal wall **					72.62	=				Ĺ	30	2178.6	=  `
* for windows and		owe uso c	effective wi	ndow I I ve	146.1		ı formula 1	/[/1/  L volu	(0) 1 0 041 4	e given in	9 naragraph	1315.50	3 (32
** include the area						ateu using	i ioiiiiuia i	/[( 1/ <b>O-</b> valu	1 <del>0</del> )+0.04] a	is giveri iii	i parayrapri	1 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				34.58	(33
Heat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	12217.13	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			168.23	(35
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		_
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix I	<						7.11	(36
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(22)	(20)				¬,,,_
Total fabric he		aloudoto -	l manthi	,					(36) =	(25)m + (F)	\	41.69	(37
Ventilation hea	Feb	i			lun	Jul	۸۰۰۰		= 0.33 × (	l	1	1	
(38)m= 20.15	19.91	Mar 19.67	Apr 18.48	May 18.24	Jun 17.05	Jui 17.05	Aug 16.81	Sep 17.53	Oct 18.24	Nov 18.72	Dec 19.19		(38
20.13			10.70	10.24	17.00	17.00	L 10.01	17.55	L 10.24	<u> </u>	13.13	i	,00
11								100	(07)	00\			
Heat transfer (39)m= 61.84	coefficier 61.6	nt, W/K 61.36	60.17	59.93	58.74	58.74	58.51	(39)m 59.22	= (37) + (37) 59.93	38)m 60.41	60.89	1	

eat loss pa	rameter (	HLP), W	m²K			1	1	(40)m	= (39)m ÷	· (4)			
0.85 O.85	0.85	0.84	0.83	0.83	0.81	0.81	0.81	0.82	0.83	0.83	0.84		_
umber of d	ave in mo	onth (Tah	le 1a)						Average =	Sum(40) ₁	12 /12=	0.83	(4
Jar	<u> </u>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
<u> </u>													
. Water he	ating ene	rgy requi	irement:								kWh/yea	ar:	
sumed oc	cupancy	N									04		()
if TFA > 1	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	TFA -13		31		(4
if TFA £ 13 inual aver	•	ator usar	na in litra	s nar da	v Vd av	orano –	(25 v NI)	± 36					(4
duce the ani									se target o		0.02		(-
t more that 1.	25 litres per	person per	day (all w	ater use, l	not and co	ld)			,				
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usag	<del>-</del>					1	· <i>'</i>			•			
)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		<b>—</b> ,
ergy content	of hot water	r used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x D	)Tm / 3600			m(44) ₁₁₂		1068.18	(4
)m= 145.2		131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63		
, 1.0.2	. 1	101.00	111.20	100.00	0 1.0	07.00	100.00		<u> </u>	m(45) ₁₁₂ =	<u> </u>	1400.56	(4
nstantaneous	s water heat	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(10)112	L		`
)m= 21.78	19.05	19.66	17.14	16.44	14.19	13.15	15.09	15.27	17.8	19.42	21.09		(4
ater storaç													
orage volu	•	•	•			_		ame ves	sel		0		(4
community herwise if	•			-			' '	ora) ant	or 'O' in <i>(</i>	<b>17</b> \			
ater storaç		not wate	וו פוווט) ול	iciuues i	IIStaiitai	ieous co	ווטט וטוווי	ers) erik	ei U iii (	47)			
If manufa		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(4
mperature	factor fro	om Table	2b								0		(4
ergy lost t	rom wate	r storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(5
If manufa			-										
t water st	•			e 2 (kW	h/litre/da	ıy)				0.	.02		(5
community Jume facto	_		011 4.3							1	03		(5
mperature			2b							<b></b>	.6		(!
ergy lost f				ear			(47) x (51)	) x (52) x (	53) =		.03		(!
nter (50) o		_	,								.03		(!
ater storaç	je loss ca	lculated t	for each	month			((56)m = (	(55) × (41)	m				
)m= 32.0°	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
ylinder conta		ed 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	Н	
7)m= 32.0°	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
mary circ	uit loss (a	nnual) fro	m Table	. 3				•	•		0		( !
mary circ	•	•			59)m = (	(58) ÷ 36	65 × (41)	ım					
modified				,		. ,	, ,		r thermo	stat)			

Combi loss calculate	d for each	month (	′61)m =	(60) ÷ 3	65 × (41	)m							
(61)m= 0 0	0	0	0	0	0	0		0	0	0	0	1	(61)
Total heat required for	r water he	eating ca	L	L I for eac	h month	(62)r	—— n =	0.85 × (	45)m +	. (46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 200.48 176.93		167.75	164.91	148.1	142.94	155.	_	155.29	173.91	182.99	195.9	]	(62)
Solar DHW input calculate	d using App	endix G oı	· Appendix	: H (negati	ve quantity	/) (ente	er '0'	if no sola	r contribu	tion to wate	er heating)		
(add additional lines											0,		
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from water he	ater				•	•				•	•	•	
(64)m= 200.48 176.93	186.33	167.75	164.91	148.1	142.94	155.	.87	155.29	173.91	182.99	195.9	1	
			•	•	•		Outp	ut from wa	ater heate	er (annual)	112	2051.4	(64)
Heat gains from water	r heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (6	1)m	ı] + 0.8 x	: [(46)m	n + (57)m	+ (59)m	۱]	
(65)m= 92.5 82.17	87.8	80.78	80.67	74.25	73.37	77.6	67	76.64	83.67	85.85	90.98	]	(65)
include (57)m in ca	lculation	of (65)m	only if c	ylinder i	s in the	dwelli	ing (	or hot w	ater is f	from com	munity h	neating	
5. Internal gains (se	e Table 5	and 5a	):										
Metabolic gains (Tab	le 5), Wat	ts											
Jan Feb		Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec	]	
(66)m= 115.4 115.4	115.4	115.4	115.4	115.4	115.4	115	.4	115.4	115.4	115.4	115.4	1	(66)
Lighting gains (calcul	ated in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee 7	Table 5			-	-	
(67)m= 18.13 16.1	13.09	9.91	7.41	6.26	6.76	8.7	9	11.79	14.97	17.48	18.63	]	(67)
Appliances gains (ca	culated in	Append	dix L, eq	uation L	13 or L1	3a), a	also	see Tal	ole 5	-	•	•	
(68)m= 203.33 205.44	200.13	188.81	174.52	161.09	152.12	150.	.01	155.32	166.64	180.93	194.36	]	(68)
Cooking gains (calcu	ated in A	ppendix	L, equat	ion L15	or L15a	), also	o se	e Table	5	•	-	•	
(69)m= 34.54 34.54	34.54	34.54	34.54	34.54	34.54	34.5	54	34.54	34.54	34.54	34.54	]	(69)
Pumps and fans gair	s (Table 5	ōa)			•							•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0	]	(70)
Losses e.g. evaporat	ion (negat	tive valu	es) (Tab	le 5)	-					-	-	-	
(71)m= -92.32 -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 gains	Table 5)				•		•			•		•	
(72)m= 124.33 122.28	118.01	112.2	108.43	103.13	98.61	104.	.39	106.45	112.46	119.24	122.28	]	(72)
Total internal gains	=			(66)	)m + (67)m	ı + (68	)m +	- (69)m + (	70)m + (	71)m + (72)	)m	•	
(73)m= 403.41 401.44	388.85	368.54	347.98	328.09	315.11	320.	.81	331.19	351.69	375.27	392.9	]	(73)
6. Solar gains:													
Solar gains are calculate	•	r flux from	Table 6a		•	itions t	0 CO	nvert to th	e applica		tion.		
Orientation: Access Table 6		Area m²		Flu	ıx ble 6a		т.	g_ able 6b	-	FF Table 6c		Gains (W)	
						1 1	1 (		_ '				1
Northeast 0.9x 0.7	7 ×	12.	71	X	11.28	X		0.63	_  ×	0.7	=	43.83	(75)
Northeast 0.9x 0.7		12.			22.97	X		0.63	x	0.7	=	89.21	(75)
Northeast 0.9x 0.7		12.		-	41.38	X		0.63	x	0.7	=	160.73	(75)
Northeast 0.9x 0.7		12.	71	-	67.96	X		0.63	x [	0.7	=	263.96	(75)
Northeast 0.9x 0.7	7 ×	12.	71	x (	91.35	x		0.63	X	0.7	=	354.82	(75)

Nawkaaak F					г					_				<b>–</b>					
Northeast _{0.9x}	0.77	×	12.	71	X	97.	.38	X	0.63	X	0.7	=	378.27	(75)					
Northeast _{0.9x}	0.77	X	12.	71	X	91	1.1	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	1.2	X	0.63	X	0.7	=	55.15	(75)					
Northeast _{0.9x}	0.77	X	12.	71	x	9.2	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	х	0.63	X	0.7	=	71.86	(81)					
Northwest _{0.9x}	0.77	x	3.4	16	x	91.	.35	x	0.63	x	0.7		96.59	(81)					
Northwest 0.9x	0.77	x	3.4	<del></del>	x	97.	.38	х	0.63	x	0.7	=	102.98	(81)					
Northwest 0.9x	0.77	x	3.4	<del></del>	x	91	1.1	х	0.63	x	0.7	=	96.33	(81)					
Northwest 0.9x	0.77	x	3.4	16	x	72.	.63	х	0.63	x	0.7	=	76.8	(81)					
Northwest 0.9x	0.77	×	3.4	16	x [	50.	.42	x	0.63	×	0.7	_ =	53.32	(81)					
Northwest 0.9x	0.77	×	3.4	16	x	28.	.07	х	0.63	×	0.7	=	29.68	(81)					
Northwest _{0.9x}	0.77	×	3.4	16	x [	14	1.2	x	0.63	×	0.7	_	15.01	(81)					
Northwest 0.9x	0.77	= x	3.4		x [	9.2		х	0.63	X	0.7	= =	9.74	(81)					
0.74 (01)																			
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																			
(83)m= 55.76		04.48	335.82	451.41	1	31.25	450.2	358		138.7	70.16	45.53		(83)					
Total gains – i	nternal and	d solar	(84)m =	- (73)m	+ (8	33)m , v	watts				-1	ļ	l						
(84)m= 459.17	514.94 5	93.33	704.36	799.39	80	9.34	765.31	679	.71 580.35	490.4	445.43	438.43		(84)					
7 Mean inter	nal temper	ature i	heating	seasor	)														
						area fro	om Tah	0	7. Mean internal temperature (heating season)										
Utilisation fac	•	•		Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)															
Jan	Feb	10 101 1	vina are	a h1 m	•			ые <u>9</u> ,	Th1 (°C)				21	(85)					
		Mar			n (se	ee Tab	le 9a)		, ,	Oct	Nov	Dec	21	(85)					
(86)m=   0.99		Mar 0.94	Apr 0.84	May	n (se		ole 9a) Jul	Aı	ug Sep	Oct		Dec 0.99	21	(85)					
(86)m= 0.99	0.98	0.94	Apr 0.84	May 0.65	n (se	ee Tab Jun .46	Jul 0.34	Aı 0.3	ug Sep 9 0.66	Oct 0.91	Nov 0.98		21						
Mean interna	0.98 I temperatu	0.94 ure in I	Apr 0.84 iving are	0.65 ea T1 (f	ollov	Jun Jun 0.46 w step:	ole 9a)  Jul  0.34  s 3 to 7	0.3 ' in T	ug Sep 9 0.66 able 9c)	0.91	0.98	0.99	21	(86)					
Mean interna (87)m= 19.91	0.98 I temperatu 20.08 2	0.94 ure in 1 20.38	Apr 0.84 iving are 20.74	May 0.65 ea T1 (for 20.93	ollov	Jun .46 w step:	ole 9a)  Jul  0.34  s 3 to 7	0.3 ' in T	ug Sep 9 0.66 Table 9c) 1 20.95		0.98		21						
Mean interna (87)m= 19.91 Temperature	0.98 I temperatu 20.08 2 during hea	0.94 ure in l 20.38 ating p	Apr 0.84 iving are 20.74 eriods ir	May 0.65 ea T1 (for 20.93	ollov	Jun  1.46  w step: 0.99  elling f	Jul 0.34 s 3 to 7 21	0.3 ' in T 2'	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C)	0.91 20.66	20.23	0.99	21	(86)					
Mean interna (87)m= 19.91	0.98 I temperatu 20.08 2 during hea	0.94 ure in 1 20.38	Apr 0.84 iving are 20.74	May 0.65 ea T1 (for 20.93	ollov	Jun .46 w step:	ole 9a)  Jul  0.34  s 3 to 7	0.3 ' in T	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C)	0.91	20.23	0.99	21	(86)					
Mean interna (87)m= 19.91 Temperature	0.98  I temperatu 20.08 2  during hea 20.21 2	0.94 ure in I 20.38 ating po	Apr 0.84 iving are 20.74 eriods ir 20.23	May 0.65 ea T1 (for 20.93) n rest of 20.23	ollow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow col	ee Tab Jun .46 w step: 0.99 elling f	Jul 0.34 s 3 to 7 21 from Ta 20.25	0.3 ' in T 2' ble 9	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C)	0.91 20.66	20.23	0.99	21	(86)					
Mean interna (87)m= 19.91  Temperature (88)m= 20.21	0.98 I temperatu 20.08	0.94 ure in I 20.38 ating po	Apr 0.84 iving are 20.74 eriods ir 20.23	May 0.65 ea T1 (for 20.93) n rest of 20.23	ollow 20 h2,r	ee Tab Jun .46 w step: 0.99 elling f	Jul 0.34 s 3 to 7 21 from Ta 20.25	0.3 ' in T 2' ble 9	ug Sep 19 0.66  Table 9c) 1 20.95 10, Th2 (°C) 25 20.24	0.91 20.66	20.23	0.99	21	(86)					
Mean interna (87)m= 19.91  Temperature (88)m= 20.21  Utilisation fac	0.98  I temperatu 20.08	0.94 ure in 1 20.38 ating p 20.21 ns for r 0.93	Apr 0.84 iving are 20.74 eriods ir 20.23 est of do 0.81	May 0.65 ea T1 (for 20.93 no rest of 20.23 welling, 0.61	ollow 20 dwee 20 h2,r	w step: 0.99 elling f 0.25 m (see	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28	Au 0.3  7 in T 2  ble 9  20.3  9a)  0.3	ug Sep 19 0.66  Table 9c) 1 20.95 20, Th2 (°C) 25 20.24	0.91 20.666 20.23	20.23	0.99	21	(86) (87) (88)					
Mean internal (87)m= 19.91  Temperature (88)m= 20.21  Utilisation fact (89)m= 0.98	0.98  I temperate 20.08  20.21  20.21  ctor for gair 0.97  I temperate	0.94 ure in 1 20.38 ating p 20.21 ns for r 0.93	Apr 0.84 iving are 20.74 eriods ir 20.23 est of do 0.81	May 0.65 ea T1 (for 20.93 no rest of 20.23 welling, 0.61	(se   0   0   0   0   0   0   0   0   0	w step: 0.99 elling f 0.25 m (see	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28	Au 0.3  7 in T 2  ble 9  20.3  9a)  0.3	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C) 25 20.24 13 0.6 10 7 in Table	0.91 20.666 20.23	0.98 20.23 20.23 0.97	0.99	21	(86) (87) (88)					
Mean interna (87)m= 19.91  Temperature (88)m= 20.21  Utilisation fac (89)m= 0.98  Mean interna	0.98  I temperate 20.08  20.21  20.21  ctor for gair 0.97  I temperate	0.94  ure in 1 20.38  ating p 20.21  ns for r 0.93  ure in t	Apr 0.84 iving are 20.74 eriods ir 20.23 est of dr 0.81 he rest	May 0.65 ea T1 (for 20.93) n rest of 20.23 welling, 0.61 of dwell	(se   0   0   0   0   0   0   0   0   0	w steps 0.99 elling f 0.25 m (see	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28	Ai 0.33   ' in T 2'   ble 9   20.3   9a)   0.3   ps 3	ug Sep 9 0.66  Table 9c) 1 20.95 0, Th2 (°C) 25 20.24  to 7 in Table 25 20.2	0.91 20.66 20.23 0.89 e 9c)	0.98 20.23 20.23 0.97	0.99 19.89 20.22 0.99	0.38	(86) (87) (88) (89)					
Mean interna (87)m= 19.91  Temperature (88)m= 20.21  Utilisation fact (89)m= 0.98  Mean interna (90)m= 18.74	0.98  I temperatu 20.08	0.94 ure in I 20.38 ating por 20.21 ns for r 0.93 ure in t 19.42	Apr 0.84 iving are 20.74 eriods ir 20.23 est of de 0.81 he rest 19.93	May 0.65 ea T1 (for 20.93 no rest of 20.23 welling, 0.61 of dwell 20.17	0.0 ollov 200 h2,r 0.1 lling 200	w steps 0.99 elling f 0.25 m (see	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28 llow ste	AI 0.3  ' in T 2  ble 9 20.3  9a) 0.3  ps 3 20.3	ug Sep 9 0.66  Table 9c) 1 20.95 0, Th2 (°C) 25 20.24  13 0.6  15 7 in Table 25 20.2	0.91 20.66 20.23 0.89 e 9c)	0.98 20.23 20.23 0.97	0.99 19.89 20.22 0.99		(86) (87) (88) (89)					
Mean interna (87)m= 19.91  Temperature (88)m= 20.21  Utilisation fac (89)m= 0.98  Mean interna (90)m= 18.74	0.98  I temperate 20.08 20.21 20.21 20.97  I temperate 18.99	0.94  ure in 1 20.38  ating p 20.21  ns for r 0.93  ure in t 19.42  ure (fo	Apr 0.84 iving are 20.74 eriods ir 20.23 est of dr 0.81 he rest 19.93	May 0.65 ea T1 (for 20.93 n rest of 20.23 welling, 0.61 of dwell 20.17	ollow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow collow col	w step: 0.99 elling f 0.25 m (see 0.41 T2 (fol 0.24	Jul 0.34 s 3 to 7 21 from Ta 20.25 e Table 0.28 llow ste 20.24	Ai 0.3 ' in T 2' bble § 20.3 9a) 0.3 ps 3 20.4	ug Sep 9 0.66 Table 9c) 1 20.95 9, Th2 (°C) 25 20.24  15 0.6 15 7 in Table 25 20.2	0.91  20.66  20.23  0.89  e 9c)  19.84  LA = Liv	0.98  20.23  20.23  0.97  19.23  ring area ÷ (-	0.99 19.89 20.22 0.99 18.72 4) =		(86) (87) (88) (89) (90) (91)					
Mean interna (87)m= 19.91  Temperature (88)m= 20.21  Utilisation fact (89)m= 0.98  Mean interna (90)m= 18.74	0.98  I temperatu 20.08	0.94 ure in I 20.38 ating pr 20.21 ns for r 0.93 ure in t 19.42 ure (fo 19.79	Apr 0.84 iving are 20.74 eriods ir 20.23 est of dr 0.81 he rest 19.93 r the wh	May	Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   Second   S	w step: 0.99 elling f 0.25 m (see 0.41 T2 (fol 0.24 0.53	Jul 0.34 s 3 to 7 21 from Ta 20.25 Table 0.28 llow ste 20.24 A × T1 20.53	Ai 0.33  'in T 2'  ble § 20.3  9a) 0.3  ps 3 20.3  + (1 20.4)	ug Sep 9 0.66  Table 9c) 1 20.95 9, Th2 (°C) 25 20.24  13 0.6 10 7 in Tabl 25 20.2 11  — fLA) × T2 154 20.49	0.91  20.66  20.23  0.89  e 9c)  19.84  LA = Liv	0.98  20.23  20.23  0.97  19.23  ring area ÷ (-	0.99 19.89 20.22 0.99		(86) (87) (88) (89)					

(93)m= 19.19 19.41 19.79 20.24 20.46 20.53 20.53 20.54 20.49 20.15 19.61 19	7 (93)
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 the utilisation factor for gains using Table 9a	alculate
	ec
Utilisation factor for gains, hm:	· <u>·</u>
(94)m= 0.98 0.97 0.93 0.81 0.62 0.43 0.3 0.35 0.62 0.88 0.96 0.	8 (94)
Useful gains, hmGm , W = (94)m x (84)m	<b>_</b>
(95)m= 449.99 497.58 549.78 572.64 498.55 344.88 230.65 240.9 360.02 433.61 429.81 43	.1 (95)
Monthly average external temperature from Table 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	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]	
(97)m= 920.89 893.8 815.46 682.31 525.12 348.22 231.14 241.92 378.27 572.65 755.98 91	39 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 350.35 266.26 197.66 78.97 19.77 0 0 0 103.45 234.84 357	<del></del>
Total per year (kWh/year) = Sum(98) _{15,8}	1608.62 (98)
Space heating requirement in kWh/m²/year	22.15 (99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community schemer Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	/
Fraction of space heat from community system 1 – (301) =	1 (302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sour includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	s; the latter
Fraction of heat from Community heat pump	1 (303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1 (304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1 (305)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year
Annual space heating requirement	1608.62
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1689.05 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0 (309)
Water heating	
Annual water heating requirement	2051.4
If DHW from community scheme:	(040-)
Water heat from Community heat pump $ (64) \times (303a) \times (305) \times (306) = $	2153.97 (310a)
Electricity used for heat distribution 0.01 x [(307a)(307e) + (310a)(310e)	
Cooling System Energy Efficiency Ratio	0 (314)
Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$	0 (315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	177.49 (330a)
Talances, extract of positive input from outdoor	(0000)

			_
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year =(330a) + (330b)	b) + (330g) =	177.49	(331)
Energy for lighting (calculated in Appendix L)		320.14	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-108.82	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (33	32)(237b) =	4231.84	(338)
12b. CO2 Emissions – Community heating scheme			
Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to	(366) for the second fue	280	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0.52	712.33	(367)
Electrical energy for heat distribution [(313) x	0.52	19.95	(372)
Total CO2 associated with community systems (363)(366) + (368)(372	2) =	732.28	(373)
CO2 associated with space heating (secondary) (309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water heating (373) + (374) + (375) =		732.28	(376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x	0.52	92.12	(378)
CO2 associated with electricity for lighting (332))) x	0.52	166.15	(379)
Energy saving/generation technologies (333) to (334) as applicable  Item 1	0.52 x 0.01 =	-56.48	(380)
Total CO2, kg/year sum of (376)(382) =		934.07	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =		12.86	(384)
El rating (section 14)		89.36	(385)

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50 Printed on 06 December 2021 at 10:42:58

Project Information:

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

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 53.96m² Site Reference :

**Plot Reference:** Highgate Road - GREEN 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 30.82 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.45 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** 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 0.13 (max. 0.20) 0.13 (max. 0.35) OK 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 **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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	12.07m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0.141/217	
Faity Walls O-value	0 W/m²K	

Photovoltaic array

		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: 05 - D  Address:													
1. Overall dwelling dime	nsions:												
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)				
Ground floor		;	53.96	(1a) x	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	0	x 1	10 =	0	(7a)				
Number of passive vents				Ī	0	x 1	10 =	0	(7b)				
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)				
				L									
				_			Air ch	anges per ho	our —				
•	ys, flues and fans = (6a)+(6b)+( een carried out or is intended, procee			ontinuo fr	0		÷ (5) =	0	(8)				
Number of storeys in the		iu io (17),	ourerwise (	onunue n	om (9) to	(10)		0	(9)				
Additional infiltration	<b>3</b> ( )					[(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)				
<del>-</del>	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	3	(17)				
•	s if a pressurisation test has been do				is being u	sed		0.15	(10)				
Number of sides sheltere	d							0	(19)				
Shelter factor			(20) = 1 -		19)] =			1	(20)				
Infiltration rate incorporat	_		(21) = (18	) x (20) =				0.15	(21)				
Infiltration rate modified for	<del></del>	T	1 .					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					,		•					
(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						

0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18	]	
Calculate effe		•	ate for t	he appli	cable ca	se							_
If mechanic												0.5	(2
If exhaust air h		0		, ,	,	. `	,, .	•	) = (23a)			0.5	(2
If balanced with		-	•	_								75.65	(2
a) If balance						•	<u> </u>	<u> </u>	<u> </u>		<u>`</u>	i ÷ 100]	
24a)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3		(2
b) If balance							<u> </u>	,	<u> </u>		1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00h	`			
	$0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 \times 0.5 $	(23b), tl	nen (240 0	$\frac{(230)}{0}$	o); otnerv	vise (24)	0 = (220)	0) m + 0.	5 × (230	0	0	1	(2
									U	U			(2
d) If natural if (22b)r		on or who en (24d)ı		•					0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
Effective air	change	rate - en	ter (24a	or (24b	o) or (240	c) or (24	d) in box	(25)				1	
25)m= 0.31	0.31	0.31	0.29	0.28	0.26	0.26	0.26	0.27	0.28	0.29	0.3	]	(2
0											•	•	
3. Heat losse		·			NI-t A-		Haral		A V I I		la combos	- ^ ^	/ L-
LEMENT	Gros area		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-l		
/indows		` ,			12.07	<del></del>	/[1/( 1.4 )+	0.04] =	` 16	, 			(2
/alls Type1	27.6	6	12.07	7	15.59	x	0.18	─ <b> </b>	2.81	=	60	935.4	$\bigcap_{i=1}^{n}$
Valls Type2	24.2	=	0	=	24.24	=	0.17	<b>=</b>	4.07	=	60	1454.4	٦ (2
oof	53.9		0	=	53.96	=	0.13	<u> </u>	7.01	<b>-</b>	9	485.64	╡
otal area of e					105.80	=	0.10		7.01				`` ;)
arty wall		,			31.67	=	0		0	<b>–</b> 1	45	1425.15	¬ `
•						_	0					╡	╡
					53.96	=				Ĺ	40	2158.4	=
•					95.03	·				L	9	855.27	(3
nternal wall **			ffactive wi	adout II u	البيمامي مياي		formula 1	/F/4/11 valu	01.0047	a air .a a in	naraarank		
nternal wall ** for windows and	roof windo					ated using	formula 1,	/[(1/U-valu	e)+0.04] a	s given in	paragraph	1 3.2	
nternal wall ** for windows and include the are	roof windo	sides of in	ternal wall				formula 1.		e)+0.04] a	s given in	paragraph	29.89	<b>]</b> (:
nternal wall ** for windows and include the area abric heat los	roof windo as on both ss, W/K =	sides of in	ternal wall					+ (32) =	e)+0.04] a				=
nternal wall ** for windows and include the area abric heat los	roof windo as on both ss, W/K = Cm = S(	sides of in = S (A x A x k)	ternal wali U)	s and part	titions			+ (32) = ((28)				29.89	] (:
nternal wall ** for windows and include the area abric heat los leat capacity hermal mass	roof windons on both ss, W/K = Cm = S( parame	sides of in = S (A x A x k ) ter (TMF	ternal wall U) P = Cm ÷	s and part	titions n kJ/m²K		(26)(30)	+ (32) = ((28) = (34)	.(30) + (32 ÷ (4) =	?) + (32a).	(32e) =	29.89 7314.26	] (:
nternal wall ** for windows and include the area abric heat los leat capacity hermal mass or design assess an be used inste	roof windons on both ss, W/K = Cm = S( parame sments who ad of a det	sides of in  = S (A x   A x k )  ter (TMF)  ere the detailed calculates.	ternal wall U) P = Cm ÷ tails of the	s and part - TFA) in	n kJ/m²K ion are not	known pr	(26)(30)	+ (32) = ((28) = (34)	.(30) + (32 ÷ (4) =	?) + (32a).	(32e) =	29.89 7314.26 135.55	
nternal wall ** for windows and include the area abric heat los leat capacity hermal mass or design assess an be used inste	roof windons on both  SS, W/K =  Cm = S(  parame  sments who ad of a det  es : S (L	sides of in  = S (A x k)  A x k)  ter (TMP  ere the det  tailed calcu  x Y) calcu	ternal wall  U)  P = Cm ÷ tails of the lation. culated t	s and part - TFA) in constructi	n kJ/m²K ion are not pendix h	known pr	(26)(30)	+ (32) = ((28) = (34)	.(30) + (32 ÷ (4) =	?) + (32a).	(32e) =	29.89 7314.26	
ternal wall ** for windows and include the area abric heat los leat capacity hermal mass or design assess an be used inste hermal bridg details of therma	roof windons on both ss, W/K = Cm = S( parame sments who ad of a det es : S (L al bridging	sides of in  = S (A x k)  A x k)  ter (TMP  ere the det  tailed calcu  x Y) calcu	ternal wall  U)  P = Cm ÷ tails of the lation. culated t	s and part - TFA) in constructi	n kJ/m²K ion are not pendix h	known pr	(26)(30)	+ (32) = ((28) = (34) • indicative	.(30) + (32	?) + (32a).	(32e) =	29.89 7314.26 135.55	
nternal wall ** for windows and include the area abric heat los leat capacity hermal mass or design assess an be used inste hermal bridg details of therma otal fabric he	roof windons on both  SS, W/K =  Cm = S(  parame  sments who ad of a det  es : S (L  al bridging  at loss	sides of in  = S (A x   A x k )  ter (TMP  ere the det tailed calcu x Y) calcu are not know	ternal wall U) P = Cm ÷ tails of the llation. culated to	s and part TFA) in constructi using Ap	n kJ/m²K ion are not pendix h	known pr	(26)(30)	+ (32) = ((28) = (34) e indicative (33) +	.(30) + (32) $\div (4) =$ values of $.(36) =$	?) + (32a). TMP in Ta	(32e) = able 1f	29.89 7314.26 135.55	
for windows and include the area abric heat loss leat capacity thermal mass for design assess an be used instead thermal bridg details of thermal fotal fabric hermal centilation hear	roof windons on both ss, W/K = Cm = S( parame sments who ad of a det es : S (L al bridging at loss at loss ca	sides of in  = S (A x A x k)  ter (TMF ere the det tailed calcu x Y) calcu are not known	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	s and part TFA) in constructi using Ap	kJ/m²K ion are not pendix k	known pr	(26)(30)	+ (32) = ((28) = (34) • indicative (33) + (38)m	.(30) + (32) $\div (4) =$ values of (36) = $= 0.33 \times (30)$	2) + (32a). TMP in Ta 25)m x (5)	(32e) = able 1f	29.89 7314.26 135.55	
for windows and include the area abric heat loss leat capacity thermal mass for design assessan be used instead details of thermal bridg details of thermal fotal fabric heat lation heat land	roof windons on both ss, W/K = Cm = S( parame sments who ad of a det es : S (L al bridging at loss at loss ca	sides of in  = S (A x   A x k )  ter (TMF ere the detailed calculated  Mar	ternal wall  O = Cm ÷ tails of the ulation. culated u own (36) =  monthly	s and part TFA) in constructi using Ap 0.05 x (3	kJ/m²K ion are not pendix k 1)	known pr	(26)(30) ecisely the	+ (32) = ((28) = (34) • indicative (33) + (38)m Sep	.(30) + (32 ÷ (4) = values of (36) = = 0.33 × (1)	2) + (32a).  TMP in Ta  25)m x (5)  Nov	(32e) = able 1f  Dec	29.89 7314.26 135.55	
for windows and include the area abric heat loss leat capacity hermal mass or design assessan be used instead details of thermal total fabric hermal bridg details of thermal otal fabric here total fabric hermal bridg leating the details of thermal total fabric hermal bridg leating total fabric hermal bridg leating to the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of the details of th	roof windons on both ss, W/K = Cm = S( parame sments who ad of a det es : S (L al bridging at loss at loss ca Feb 14.59	sides of in  = S (A x   A x k )  ter (TMF) ere the detailed calculated are not known alculated  Mar  14.42	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	s and part TFA) in constructi using Ap	kJ/m²K ion are not pendix k	known pr	(26)(30)	+ (32) = ((28) = (34) * indicative (33) + (38)m Sep 12.82	.(30) + (32 ÷ (4) = values of (36) = = 0.33 × (1) Oct 13.35	2) + (32a).  TMP in Ta  25)m x (5)  Nov  13.71	(32e) = able 1f	29.89 7314.26 135.55	
	roof windons on both ss, W/K = Cm = S( parame sments who ad of a det es : S (L al bridging at loss at loss ca Feb 14.59	sides of in  = S (A x   A x k )  ter (TMF) ere the detailed calculated are not known alculated  Mar  14.42	ternal wall  O = Cm ÷ tails of the ulation. culated u own (36) =  monthly	s and part TFA) in constructi using Ap 0.05 x (3	kJ/m²K ion are not pendix k 1)	known pr	(26)(30) ecisely the	+ (32) = ((28) = (34) * indicative (33) + (38)m Sep 12.82	.(30) + (32 ÷ (4) = values of (36) = = 0.33 × (1)	2) + (32a).  TMP in Ta  25)m x (5)  Nov  13.71	(32e) = able 1f  Dec	29.89 7314.26 135.55	

leat lo	ss para	meter (F	ILP), W	m²K					(40)m	= (39)m ÷	- (4)			
0)m=	0.95	0.94	0.94	0.92	0.92	0.9	0.9	0.9	0.91	0.92	0.93	0.93		
umba	or of dov	o in moi	nth (Tab	lo 1o\					,	Average =	Sum(40) ₁	12 /12=	0.92	(4
umbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30 30	31	30	31		(4
.,	<u> </u>		<b>.</b>		<b>.</b>			<u> </u>		<u> </u>		<u> </u>		`
1 \//	tor boot	ing once	gy requi	romont:								kWh/ye	or:	
+. VV <i>c</i>	ilei neal	ing ener	gy requi	rement.								KVVII/ye	ai.	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		81		(4
nnua	averag	e hot wa						(25 x N)				1.11		(4
		_		usage by : day (all w		-	-	to achieve	a water us	se target d	of .			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate				ach month					Seb	<u> </u>	INOV	Dec		
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		
,									<u> </u>		m(44) ₁₁₂ =	L	925.35	(4
nergy (	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)		
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		
										Total = Su	m(45) ₁₁₂ =		1213.27	(4
instani	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 ₎	) to (61)					
6)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		(4
	storage e volum		includin	na anv sa	olar or M	///HRS	storane	within sa	ame ves	امء		0		(4
_		, ,		nk in dw			_		21110 100	001		0		(-
	-	_			_			mbi boil	ers) ente	er '0' in (	(47)			
	storage			`					,	·	,			
) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(4
empe	rature fa	actor fro	m Table	2b								0		(4
			_	, kWh/ye				(48) x (49)	) =		1	10		(5
•				ylinder l										
		•	ee secti	om Tabl	e z (KVVI	n/iitre/ua	iy)				0.	02		(5
	-	from Tal		JII 4.5							1.	03		(5
			m Table	2b								.6		(5
neray	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1	03		(5
٠.		54) in (5	•									03		(5
ater	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41):	m				
6)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
												m Appendi	хН	
7)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
•						<u> </u>	<u> </u>	<u> </u>				0		` (5
	•	•	•	m Table for each		50)m - 1	'58\ <u>-</u> 36	65 × (41)	m			U		(5
	-				•	•	. ,	ng and a		r thermo	stat)			
(mod														

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0	0	0	0 0	00) + 0	0 7 (41	) o	0	0	0	0	1	(61)
		-	-									J · (59)m + (61)m	(- /
(62)m= 181.07	159.94	168.8	152.47	150.25	135.45		142.4	_	158.05	165.67	177.1	1	(62)
Solar DHW input c									ļ			]	(- )
(add additional										morrio wan	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from wa	ater heat	ter				1	·	<b>I</b>	!	1	!	1	
(64)m= 181.07	159.94	168.8	152.47	150.25	135.45	131.22	142.4	12 141.68	158.05	165.67	177.1	1	
	'						C	Output from w	ater heat	er (annual)	112	1864.11	(64)
Heat gains fror	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61	)m] + 0.8	x [(46)m	n + (57)m	+ (59)m	]	-
(65)m= 86.05	76.52	81.97	75.7	75.8	70.04	69.47	73.2	72.12	78.39	80.1	84.73	]	(65)
include (57)r	n in calc	culation of	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is f	from com	munity h	neating	
5. Internal ga			. ,		•						•		
Metabolic gains	s (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.3	4 90.34	90.34	90.34	90.34		(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e 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 gai	ns (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a), a	lso see Ta	ble 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	(calcula	ted in A	opendix	L, equat	ion L15	or L15a	), also	see Table	5	•	-	•	
(69)m= 32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.0	3 32.03	32.03	32.03	32.03		(69)
Pumps and far	ns gains	(Table 5	āa)					•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-	-	-	•	
(71)m= -72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.2	7 -72.27	-72.27	-72.27	-72.27		(71)
Water heating	gains (T	able 5)		-		-		-		-	-	•	
(72)m= 115.65	113.87	110.17	105.15	101.88	97.28	93.38	98.3	8 100.16	105.37	111.24	113.88		(72)
Total internal	gains =				(60	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (	71)m + (72)	)m	•	
(73)m= 337.3	335.58	325.44	309.18	292.9	277.01	266.54	271.4	9 279.71	296.15	315.03	328.97		(73)
6. Solar gains	):												
Solar gains are c	alculated ı	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to the	ne applica	ble orienta	tion.		
Orientation: A		actor	Area			UX		g_ Table 6b	-	FF		Gains	
_	able 6d		m²		- 18	able 6a		Table 6b	_ '	Table 6c		(W)	_
Northeast _{0.9x}	0.77	X	12.	07	x	11.28	X	0.63	x	0.7	=	41.62	(75)
Northeast _{0.9x}	0.77	x	12.	07	х	22.97	X	0.63	x	0.7	=	84.72	(75)
Northeast _{0.9x}	0.77	X	12.	07	x	41.38	X	0.63	x	0.7	=	152.64	(75)
Northeast _{0.9x}	0.77	Х	12.	07	X	67.96	X	0.63	x	0.7	=	250.67	(75)
Northeast _{0.9x}	0.77	X	12.	07	X	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.	07	x	91.1	x		0.63	x	0.7	=	336.05	(75)
Northeast _{0.9x}	0.77	х	12.	07	x	72.63	x		0.63	x	0.7	=	267.9	(75)
Northeast _{0.9x}	0.77	х	12.	07	х	50.42	x [		0.63	х	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	х	14.2	Īx		0.63	x	0.7		52.37	(75)
Northeast 0.9x	0.77	x	12.	07	х	9.21	i x		0.63	_ x [	0.7	=	33.99	(75)
'					_		- '							_
Solar gains in	watts, ca	alculated	for eac	h month			(83)m	ı = Su	ım(74)m .	(82)m				
(83)m= 41.62	84.72	152.64	250.67	336.95	359.2	3 336.05	267	7.9	185.99	103.53	52.37	33.99		(83)
Total gains -	internal a	and solar	(84)m =	= (73)m	+ (83)r	n , watts								
(84)m= 378.92	420.3	478.07	559.85	629.86	636.2	4 602.59	539.	.39	465.7	399.68	367.4	362.95		(84)
7. Mean inte	rnal temp	perature	(heating	season	)									
Temperature			`		,	a from Ta	ble 9,	Th1	I (°C)				21	(85)
Utilisation fa	_				_				, ,					
Jan	Feb	Mar	Apr	May	Jun	<del></del>	Au	ug	Sep	Oct	Nov	Dec		
(86)m= 0.97	0.96	0.92	0.82	0.65	0.47	0.35	0.4	<del>-  </del>	0.65	0.88	0.95	0.97		(86)
Mean interna	al tompor	aturo in	living or	00 T1 /f/	llow c	tone 2 to	7 in T	L	00)		1	1		
(87)m= 19.6	19.79	20.14	20.58	20.85	20.97	<del>-i</del>	20.9		20.9	20.52	20	19.57		(87)
` '	ļ	<u> </u>		<u> </u>		<u> </u>				20.02		10.07		(- /
Temperature	<del></del>			ı	1	Ť	Т		` ,	00.45	1 00 45	T 00.44	1	(00)
(88)m= 20.13	20.13	20.13	20.15	20.15	20.17	20.17	20.1	17	20.16	20.15	20.15	20.14		(88)
Utilisation fa	ctor for g	ains for i	rest of d	welling,	h2,m (	see Table	9a)				<del> </del>	т	İ	
(89)m= 0.97	0.95	0.9	0.79	0.61	0.42	0.29	0.3	34	0.59	0.85	0.94	0.97		(89)
Mean interna	al temper	ature in	the rest	of dwell	ing T2	(follow ste	eps 3	to 7	in Tabl	e 9c)				
(90)m= 18.26	18.54	19.03	19.64	20	20.14	20.16	20.1	16	20.06	19.58	18.84	18.22		(90)
									f	LA = Livir	ng area ÷ (	4) =	0.47	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1 -	– fL/	A) × T2					
(92)m= 18.89	19.13	19.56	20.08	20.4	20.53		20.5		20.46	20.02	19.39	18.86		(92)
Apply adjust	ment to t	he mean	interna	l temper	ature f	rom Table	e 4e, v	whe	re appro	priate		1		
(93)m= 18.89	19.13	19.56	20.08	20.4	20.53	20.55	20.5	55	20.46	20.02	19.39	18.86		(93)
8. Space hea	ating requ	uirement			•									
Set Ti to the					ned at	step 11 of	Table	e 9b	, so tha	t Ti,m=(	76)m an	id re-cald	culate	
the utilisation	1			i		T	1 .		_	_	1	I _	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	ug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g			0.62	I 0.44	1 0 22	1 00	, T	0.64	0.05	0.02	0.06		(94)
(94)m= 0.96		0.89	0.79	<u> </u>	0.44	0.32	0.3	» <i>1</i>	0.61	0.85	0.93	0.96		(94)
Useful gains (95)m= 362.43		426.56	439.99	391.78	280.7	190.8	198.	37	285.09	337.91	343.31	349		(95)
Monthly ave				l		130.0	1 130.	.57	200.00	337.31	040.01	J 343		(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 rat	1			l	l		1					<u> </u>		, ,
(97)m= 744.25	1	661.41	556.62	431.6	288.8	<del></del>	201.	<del></del>	311.87	467.27	613.87	737.48		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Wh/mc	onth = $0.02$	24 x [	(97)ı	m – (95	)m] x (4	1)m	-	ı	
(98)m= 284.07	Ť	174.73	83.98	29.63	0	0	0	Ť	0	96.24	194.8	289.02		
<u> </u>	-			!			-				-		1	

Space heating requirement in kWh/m²/year   Space heating requirement in kWh/m²/year   Space heating requirements — Community heating scheme   This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none   Traction of space heat from community system 1 — (301)					
Sb. Energy requirements — Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) 0' if none Fraction of space heat from secondary/supplementary heating (Table 11) 0' if none Fraction of space heat from community system 1 — (301) = 1 , 302) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources: the initiation of the four power stations. See Appendix C. Fraction of heat from Community heat promper stations. See Appendix C. Fraction of the first from Community heat promper stations. See Appendix C. Fraction of the first from Community heat promper stations of the first fraction of the first from Community heat promper stations of the first fraction of the first from Community heat promper stations of the first fraction of the first from Community heat promper stations are stationary and the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the first fraction of the firs		Total per year (kWh/	year) = Sum(98) _{15,912} =	1373.7	(98)
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) 0' if none  7 Fraction of space heat from community system 1 − (301) =  7 Fraction of space heat from community system 1 − (301) =  7 Fraction of total space heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes bollers, heat pumps, geothermal and water heat from power stations. Seve Appendix C.  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heating system  Distribution loss factor (Table 12c) for community heating system  Distribution loss factor (Table 12c) for community heating system  Distribution loss factor (Table 12c) for community heating system  Packer heating  Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Distribution grequirement from secondary/supplementary system  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x (301) x 100+ (308) =  (98) x	Space heating requirement in kWh/m²/year			25.46	(99)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to low other heat sources; the lather includes bolivors. heat pumps, goothermal and vaste heat from power stations. See Appendix C.  Fraction of heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction for control and charging method (Table 4c(3)) for community heating system  Space heating  Annual space heating requirement  Space heating requirement  Fifchiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system (98) x (301) x 100 + (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heating requirement  If DHW from community scheme:  Water heating remained (64) x (303a) x (305) x (306) =  Water heating from Community heat pump  (64) x (303a) x (305) x (306) =  Water heating from Community heat pump  (64) x (303a) x (305) x (306) =  Water heating from Community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water heating from community scheme:  Water					
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources: the latter includes bollers. heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Fraction of total space heating requirement  Space heating requirement  Fraction of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Fraction of the stating requirement from secondary/supplementary system  Fraction of secondary/supplementary system  Fraction of secondary/supplementary system (88) x (301) x 100 + (308) =  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Table 4a or Appendix E)  Fraction of secondary/supplementary system in % (from Ta			mmunity scheme.	0	(301)
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump Fractor for control and charging method (Table 4c(3)) for community heating system  Fractor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community heat pump  (38) x (304a) x (305) x (306)   1442.38   307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (88) x (301) x 100 + (308)   0   308  Space heating requirement from secondary/supplementary system  (89) x (301) x 100 + (308)   0   308  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heating  Water heating  Water heating the string the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the string of the strin	Fraction of space heat from community system 1 – (301) =	·	<u> </u>	1	] (302)
Fraction of heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heat pump  Fraction of total space heat from Community heating system  Distribution loss factor (Table 12c) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system (98) x (301) x 104 + (208) =  O  Space heating  Annual swater heating requirement from secondary/supplementary system (98) x (301) x 104 + (208) =  O  Space heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) =  (64) x (303a) x (305) x (306) =  (78) x (304a) x (305) x (306) =  (78) x (304a) x (305) x (306) =  (78) x (304a) x (305) x (306) =  (78) x (304a) x (305) x (306) =  (78) x (304a) x (305) x (306) =  (78) x (304a) x (305) x (306) =  (78) x (304a) x (305) x (306) x (306) =  (78) x (304a) x (305) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306) x (306)		s for CHP and up to f	L our other heat sources; th	ne latter	_
Fraction of total space heat from Community heat pump (302 × (303a) = 1 (304a) Factor for control and charging method (Table 4c(3)) for community heating system		Appendix C.	Г	1	7 _(303a)
Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) = 1442.38 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  O (308)  Space heating requirement from secondary/supplementary system (98) x (301) x 100 + (308) = 0 (308)  Water heating  Annual water heating requirement from secondary/supplementary system (98) x (301) x 100 + (308) = 0 (308)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1957.32 (310a)  Electricity used for heat distribution  0.01 x ((307a)(307e) + (310a)(310e)] = 34 (313)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) + (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f):  mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  10 (330b)  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 114.79 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions - Community heating scheme  Energy kWh/year kg CO2/kWh kg CO2/kwh  KWh/year kg CO2/kwh  Rimissions (g CO2/year kg)  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two luels repeat (363) to (366) for the second fuel 280 (367a)	·		(302) x (303a) =		╡
Distribution loss factor (Table 12c) for community heating system   1.05   (306)		heating system			_
Space heating         kWh/year           Annual space heat from Community heat pump         (98) x (304a) x (305) x (306) =         1442.38         (307a)           Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)         0         (308e)           Space heating requirement from secondary/supplementary system         (98) x (301) x 100 + (308) =         0         (309)           Water heating           Annual water heating requirement         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.1		meaning eyetem	L		4
Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) = 1442.38 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) = 0 (309)  Water heating  Annual water heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) = 0 (309)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community scheme:  Water heat from Community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1957.32 (310a)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 34 (313)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f):  mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 1144.79 (330a)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year Emission factor kg CO2/kWh kg CO2/kWh  kg CO2/kWh kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh  kg CO2/kWh			L		
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	•		[		
Water heating         (98) x (301) x 100 ÷ (308) =         0         (309)           Water heating         Annual water heating requirement         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864.11         1864	Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1442.38	(307a)
Water heating       Annual water heating requirement       1864.11         If DHW from community scheme:       (64) x (303a) x (305) x (306) =       1957.32       (310a)         Electricity used for heat distribution       0.01 x [(307a)(307e) + (310a)(310e)] =       34       (313)         Cooling System Energy Efficiency Ratio       0       (314)         Space cooling (if there is a fixed cooling system, if not enter 0)       = (107) ÷ (314) =       0       (315)         Electricity for pumps and fans within dwelling (Table 4f):       —       0       (330b)         mechanical ventilation - balanced, extract or positive input from outside       114.79       (330a)         warm air heating system fans       0       (330b)         pump for solar water heating       0       (330b)         Total electricity for the above, kWh/year       =(330a) + (330b) + (330b) + (330g) =       114.79       (331)         Energy for lighting (calculated in Appendix L)       247.96       (332)         Electricity generated by PVs (Appendix M) (negative quantity)       -108.82       (333)         Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =       3653.64       (338)         12b. CO2 Emissions – Community heating scheme       Energy kWh/year       Emission factor kg CO2/kwh       Emissions kg CO2/kwh	Efficiency of secondary/supplementary heating system in % (from T	able 4a or Appen	idix E)	0	(308
Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) = 1957.32 (310a)  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 34 (313)  Cooling System Energy Efficiency Ratio  0 (314)  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330a)  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 114.79 (332)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor kg CO2/kWh  Emissions kg CO2/kWh  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  280 (367a)	Space heating requirement from secondary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
If DHW from community scheme:       (64) x (303a) x (305) x (306) =       1957.32       (310a)         Electricity used for heat distribution       0.01 x [(307a)(307e) + (310a)(310e)] =       34       (313)         Cooling System Energy Efficiency Ratio       0       (314)         Space cooling (if there is a fixed cooling system, if not enter 0)       = (107) ÷ (314) =       0       (315)         Electricity for pumps and fans within dwelling (Table 4f):       mechanical ventilation - balanced, extract or positive input from outside       114.79       (330a)         warm air heating system fans       0       (330b)         pump for solar water heating       0       (330g)         Total electricity for the above, kWh/year       =(330a) + (330b) + (330g) =       114.79       (331)         Energy for lighting (calculated in Appendix L)       247.96       (332)         Electricity generated by PVs (Appendix M) (negative quantity)       -108.82       (333)         Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =       3653.64       (338)         12b. CO2 Emissions – Community heating scheme       Energy ky (202/kwh       Emission factor ky (202/kwh       Emissions ky (202/kwh       Emissions ky (202/kwh       (367a)         CO2 from other sources of space and water heating (not CHP)       If there is CHP using two fuels repeat (3			_		_
Water heat from Community heat pump  (64) x (303a) x (305) x (306) = 1957.32 (310a)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 34 (313)  Cooling System Energy Efficiency Ratio  0 (314)  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330a)  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 114.79 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy				1864.11	
Cooling System Energy Efficiency Ratio 0 (314)  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside 114.79 (330a)  warm air heating system fans 0 (330b)  pump for solar water heating 0 (330g)  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 114.79 (331)  Energy for lighting (calculated in Appendix L) 247.96 (332)  Electricity generated by PVs (Appendix M) (negative quantity) -10a.82 (333)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] × 100 + (367b) × 0.52 = 630.16 (367)	•	(64) x (303a) x	(305) x (306) =	1957.32	(310a)
Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside 114.79 (330a)  warm air heating system fans 0 (330b)  pump for solar water heating 0 (330g)  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 114.79 (331)  Energy for lighting (calculated in Appendix L) 247.96 (332)  Electricity generated by PVs (Appendix M) (negative quantity) -108.82 (333)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/kwh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 (%) [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	34	(313)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330a)  pump for solar water heating  Total electricity for the above, kWh/year  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year  Energy kmission factor kg CO2/kwh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	Cooling System Energy Efficiency Ratio			0	(314)
mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  0 (330b)  pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 114.79 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year Emission factor kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
warm air heating system fans  0 (330b) pump for solar water heating  Total electricity for the above, kWh/year =(330a) + (330b) + (330g) = 114.79 (331) Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/year  CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	• · · ·	side	Γ	114.79	7(330a)
pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) = 114.79 (331)  Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy kWh/year kg CO2/kWh kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)			L [		_
Energy for lighting (calculated in Appendix L)  Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	• •			0	╡
Electricity generated by PVs (Appendix M) (negative quantity)  Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	114.79	] (331)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) = 3653.64 (338)  12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	Energy for lighting (calculated in Appendix L)		<u> </u>	247.96	(332)
12b. CO2 Emissions – Community heating scheme  Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	Electricity generated by PVs (Appendix M) (negative quantity)		[	-108.82	(333)
Energy kWh/year Emission factor Emissions kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 280 (367a)  CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	Total delivered energy for all uses (307) + (309) + (310) + (312) + (3	315) + (331) + (33	32)(237b) =	3653.64	(338)
kWh/year kg CO2/kWh kg CO2/year  CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel  280 (367a)  CO2 associated with heat source 1  [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)	12b. CO2 Emissions – Community heating scheme		L		
Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (366) for the second fuel $ 280 $ (367a)  CO2 associated with heat source 1 $ [(307b)+(310b)] \times 100 \div (367b) \times 0.52 $ = 630.16 (367)					
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52 = 630.16 (367)		fuels repeat (363) to	(366) for the second fuel	280	(367a)
		o)] x 100 ÷ (367b) x	0.52 =		_
			0.52 =	17.64	_

Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	647.8	(373)
CO2 associated with space heating (secondary)	(309) x	0	-	0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	-	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			647.8	(376)
CO2 associated with electricity for pumps and fans within dw	elling (331)) x	0.52	-	59.58	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	-	128.69	(379)
Energy saving/generation technologies (333) to (334) as app Item 1		0.52 x 0.01 =		-56.48	(380)
Total CO2, kg/year sum of (376)(382) =				779.6	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				14.45	(384)
El rating (section 14)				89.44	(385)

#### **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 10:42:57

Project 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 26.56 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.29 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)

 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 - Heat pump

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	. 5.676	<u> </u>
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	ОК
MVHR efficiency:	88%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
Based on:	· ·	
Overshading:	Average or unknown	
Windows facing: North East	15.46m²	
Windows facing: South West	5.57m²	
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 electric heat pump Photovoltaic array	5. 1.1111	

User Details:	
Assessor Name: Neil Ingham Stroma Number: STRO01 Software Name: Stroma FSAP 2012 Software Version: Version:	10943 1.0.5.50
Property Address: 05 - E  Address:	
1. Overall dwelling dimensions:	
· · · · · · · · · · · · · · · · · · ·	Volume(m³)
Ground floor 86.78 (1a) x 2.65 (2a) =	229.97 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 86.78 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	229.97 (5)
2. Ventilation rate:	
main secondary other total heating heating	m³ per 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  0 x 10 =	0 (7a)
Number of passive vents  0 x 10 =	0 (7b)
Number of flueless gas fires  0	0 (7c)
Air char	nges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$	0 (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 $0.25 - [0.2 \times (14) \div 100] =$	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	3 (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	0.15 (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) =	0.15 (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 $(22a)m = (22)m \div 4$	

0.19	Adjusted infiltr	ation rate	e (allowi	ng for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
If mechanical ventilation:		1 1		l		i -	· ·	0.14	0.15	0.16	0.17	0.18		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =  a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100]  24a)m = 0.32			•	iale ioi l	пе аррп	Cable Ca	SE						0.5	(23
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100]	If exhaust air h	eat pump u	sing Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
24a)m	If balanced with	n heat recov	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				74.8	(23
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 0 0 0 0 0 0 0 0 0	a) If balance	ed mecha	ınical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [1	1 – (23c)	÷ 100]	_
Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   Carbon   C	24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(24
o) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  44c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	b) If balance	ed mecha	ınical ve	entilation	without	heat red	covery (I	ЛV) (24b	m = (22)	2b)m + (2	23b)		_	
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)  24d)m	24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
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)m² x 0.5]  [24d)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,				•					.5 × (23b	o)			
If (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air change rate - enter (24a) or (24b) or (24d) in box (25)  25]m= 0.32  0.31  0.31  0.29  0.29  0.27  0.27  0.26  0.28  0.29  0.29  0.3  3. Heat losses and heat loss parameter:  ELEMENT Gross area (m²) Openings A , m²  W/m2K  (W/K) kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/m²-K kJ/	,					•				0.5]			-	
3. Heat losses and heat loss parameter:  ELEMENT Gross Openings area (m²) M² Net Area W/m² (W/K) KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²-K KJ/m²	24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
3. Heat losses and heat loss parameter:  ELEMENT Gross Openings Net Area W/m2K (W/K) k-value kJ/m²-k kJ/ Windows Type 1	Effective air	change r	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
Net Area   U-value   A X U   K-value   A X U   K-value   A X U   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value   K-value	25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
Net Area area (m²)	3. Heat losse	s and he	at loss p	paramet	er:									
Vindows Type 2  Vindows Type 3  5.9  Vill(1/(1.4) + 0.04] = 7.38  Valls Type 1 62.71  26.93  35.78  Valls Type 2 20.9  0 20.9  0 20.9  0 1254  Roof 86.78  0 86.78  0 86.78  0 11.28  Party wall  26.3  Valls Type 2 26.3  Valls Type 2 20.9  170.39  Party wall  26.3  Valls Type 3  Valls Type 2 20.9  0 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  0 1254  Valls Type 2 20.9  Valls Type 2 20.9  Valls Type 2 20.9  Val		Gross	s	Openin	gs						<b>〈</b> )			X k /K
Valls Type 1   62.71   26.93   35.78   x   0.18   = 6.44   60   2146.8     Valls Type 2   20.9   0   20.9   x   0.17   = 3.51   60   1254     Roof   86.78   0   86.78   x   0.13   = 11.28   9   781.02     Party wall   26.3   x   0   = 0   45   1183.5     Party floor   86.78   40   3471.2     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   9   1521.18     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Internal wall **   169.02   169.02     Interna	Vindows Type	e 1				15.46	₃ x1	/[1/( 1.4 )+	0.04] =	20.5				(27
Valls Type1	Vindows Type	∍ 2				5.57	x1	/[1/( 1.4 )+	0.04] =	7.38				(27
Valls Type2   20.9   0   20.9   x   0.17   = 3.51   60   1254	Vindows Type	∍ 3				5.9	x1	/[1/( 1.4 )+	0.04] =	7.82				(27
Roof 86.78 0 86.78 $\times$ 0.13 = 11.28 9 781.02  Fotal area of elements, m² 170.39  Party wall 26.3 $\times$ 0 = 0 45 1183.5  Party floor 86.78 9 1521.18  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  Fabric heat loss, W/K = S (A $\times$ U) (26)(30) + (32) = 56.93  Heat capacity Cm = S(A $\times$ K) ((28)(30) + (32) + (32a)(32e) = 10357.7  Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K = (34) $\div$ (4) = 119.36  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f the and be used instead of a detailed calculation.  Thermal bridges: S (L $\times$ Y) calculated using Appendix K  **Idetails of thermal bridging are not known (36) = 0.05 $\times$ (31)  Fotal fabric heat loss (33) + (36) = 65.44	Valls Type1	62.71	1	26.9	3	35.78	3 x	0.18	=	6.44		60	2146.8	8 (29
Fotal area of elements, $m^2$	Valls Type2	20.9		0		20.9	X	0.17	=	3.51		60	1254	(29
Party wall  26.3 $\times$ 0 = 0 45  1183.5  Party floor  86.78  40  3471.2  1521.18  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  Fabric heat loss, W/K = S (A x U)  (26)(30) + (32) =  (28)(30) + (32) + (32a)(32e) =  (19357.7)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  (28)(30) + (32) + (32a)(32e) =  (34) ÷ (4) =  (34) ÷ (4) =  (35) 1183.5  (36) 1183.5  (37) 129 129  (37) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (39) 1521.18  (28) 129 129  (39) 1521.18  (30) 129 129  (31) 129 129  (32) 129 129  (33) 129 129  (34) 129 129  (35) 129 129  (36) 129 129  (37) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (38) 129 129  (3	Roof	86.78	3	0		86.78	3 x	0.13	=	11.28		9	781.02	2 (30
Party floor  the nternal wall ** $169.02$ $1521.18$ If or 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  Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$ $(26)(30) + (32) =$ $(28)(30) + (32) + (32a)(32e) =$ $(33) + (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$ $(34) \div (4) =$	Total area of e	elements,	m²			170.3	9							(31
Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wall **  Internal wa	Party wall					26.3	X	0	=	0		45	1183.5	5 (32
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  Fabric heat loss, W/K = S (A x U)  (26)(30) + (32) =  (28)(30) + (32) + (32a)(32e) =  10357.7  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K  for details of thermal bridging are not known (36) = 0.05 x (31)  Fotal fabric heat loss  (33) + (36) =  65.44	Party floor					86.78	3					40	3471.2	2 (32
Tabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x K)  Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1ftean be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K  f details of thermal bridging are not known (36) = 0.05 x (31)  Total fabric heat loss  (26)(30) + (32) =  (128)(30) + (32) + (32a)(32e) =  10357.7  119.36  119.36  119.36  119.36  119.36  119.36  119.36  119.36  119.36  119.36  119.36  119.36  119.36	nternal wall **	•				169.0	2					9	1521.1	8 (32
Heat capacity Cm = S(A x k) $ ((28)(30) + (32) + (32a)(32e) = 10357.7 $ Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K $ = (34) \div (4) = 119.36 $ For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (33) + (36) = 10357.7 $ $ (34) + (32) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) + (32a) +$							ated using	ı formula 1	l/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	1 3.2	
Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m²K = $(34) \div (4)$ = 119.36  For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f the san be used instead of a detailed calculation.  Thermal bridges: S (L x Y) calculated using Appendix K  If details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = 65.44	abric heat los	ss, W/K =	S (A x	U)				(26)(30)	) + (32) =				56.93	(33
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f than be used instead of a detailed calculation.  Thermal bridges: $S(L \times Y)$ calculated using Appendix K  for details of thermal bridging are not known (36) = 0.05 x (31)  Total fabric heat loss  (33) + (36) = 65.44	Heat capacity	Cm = S(A)	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	10357.7	(34
Thermal bridges: S (L x Y) calculated using Appendix K  **details of thermal bridging are not known (36) = 0.05 x (31)  **Total fabric heat loss**  (33) + (36) = 65.44	hermal mass	paramet	er (TMF	P = Cm -	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			119.36	(35
f details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = 65.44	J				construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
(33) + (36) =	_	,	,		• .	•	<						8.51	(30
33			are not kn	own (36) =	= 0.05 x (3	11)			(00)	(26)				<b>_</b>
rennianon nearioss calculated monitoly RXIM = 0.33 ¥ (251M ¥ (5)			louloto -	l manthi	,				. ,	` '	25\m \: (5\		65.44	(3
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		1 1		· ·		1	11	۸	<del>- ` ` ` </del>	<u> </u>	<u> </u>		1	

(20)	00.70	00.54	22.00	24.0	20.20	20.20	1 20 00	20.05	24.0	00.07	22.04		(38)
(38)m= 24.08	23.79	23.51	22.08	21.8	20.38	20.38	20.09	20.95	21.8	22.37	22.94		(36)
Heat transfer of 89.52	89.24	188.95	87.53	87.24	85.82	85.82	85.54	(39)m 86.39	= (37) + ( 87.24	38)m 87.81	88.38		
(39)111= 03.32	09.24	00.93	07.33	07.24	03.02	03.02	00.04			Sum(39) ₁	<u> </u>	87.46	(39)
Heat loss para	meter (H	HLP), W	m²K				_		= (39)m ÷				<b></b> _` ′
(40)m= 1.03	1.03	1.03	1.01	1.01	0.99	0.99	0.99	1	1.01	1.01	1.02		_
Number of day	s in mo	nth (Tab	le 1a)					/	Average =	Sum(40) ₁	12 /12=	1.01	(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	ar:	
Assumed occu	inancy	N									.58		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (1	ΓFA -13		.50		(42)
if TFA £ 13.9 Annual averag	•	ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		95	5.45		(43)
Reduce the annua	ıl average	hot water	usage by	5% if the $a$	lwelling is	designed			se target o				(10)
not more that 125		· ·				<u> </u>				T			
Jan Hot water usage ir	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 105	101.18	97.36	93.54	89.72	85.91	85.91	89.72	93.54	97.36	101.18	105		
(44)111= 103	101.10	97.30	93.34	09.72	05.91	05.91	09.72			m(44) ₁₁₂ =	<del></del>	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			· /	_		` ′
(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 instantaneous w	ator hoati	na at noint	of use (no	hot water	r storaga)	enter () in	hoves (46		Γotal = Su	m(45) ₁₁₂ =	=	1501.83	(45)
(46)m= 23.36	20.43	21.08	18.38	17.63	15.22	14.1	16.18	16.37	19.08	20.83	22.62		(46)
Water storage		21.00	10.30	17.03	13.22	14.1	10.10	10.37	19.00	20.03	22.02		(10)
Storage volum	e (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			-			. ,			\			
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		-	-				(48) x (49)	) =		1	10		(50)
b) If manufact Hot water stora			-								00		(51)
If community h	_			G Z (KVV	ii/iiti <del>c</del> /ua	iy <i>)</i>				0.	02		(51)
Volume factor	_									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	, ,	•	ا سما	ma a 41-			(/50)	EE) (44)	_	1.	.03		(55)
Water storage							((56)m = (				05.7		(FC)
(56)m= 32.01 If cylinder contains	28.92	32.01	30.98	32.01	30.98 x [(50) = (	32.01 H11)1 ÷ (5	32.01 0) else (5)	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01	ιH	(56)
		r		1	ı					r			(E7\
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primary circuit loss (annual) from Table 3	3		0	(58)
Primary circuit loss calculated for each n		365 × (41)m		1
(modified by factor from Table H5 if the	ere is solar water hea	ating and a cylinder thermo	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 (6	61)m = (60) ÷ 365 × (4	<b>l</b> 1)m		
(61)m= 0 0 0 0	0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calc	culated for each mon	th $(62)$ m = $0.85 \times (45)$ m +	(46)m + (57)m +	(59)m + (61)m
	172.83 154.94 149.2	<del>-                                    </del>	192.36 206.07	(62)
Solar DHW input calculated using Appendix G or A	Appendix H (negative quan	tity) (enter '0' if no solar contribu	tion to water heating)	ı
(add additional lines if FGHRS and/or W	/WHRS applies, see A	Appendix G)		
(63)m= 0 0 0 0	0 0 0	0 0 0	0 0	(63)
Output from water heater				ı
(64)m= 210.98 186.11 195.81 176.01	172.83 154.94 149.2	8 163.15 162.65 182.49	192.36 206.07	
	'	Output from water heate	er (annual) ₁₁₂	2152.67 (64)
Heat gains from water heating, kWh/mor	nth 0.25 ´ [0.85 × (45)	m + (61)m] + 0.8 x [(46)m	+ (57)m + (59)m	]
	83.31 76.52 75.48	1 1 1	88.97 94.36	(65)
include (57)m in calculation of (65)m o	only if cylinder is in the	e dwelling or hot water is f	rom 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	
	128.95 128.95 128.9	<del>                                     </del>	128.95 128.95	(66)
Lighting gains (calculated in Appendix L,	equation L9 or L9a)	also see Table 5	<u> </u>	
(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	x Leguation I 13 or I		<u> </u>	
(68)m= 233.03 235.45 229.35 216.38	200 184.61 174.3		207.36 222.75	(68)
Cooking gains (calculated in Appendix L	equation I 15 or I 15	ia) 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	35.9 35.9	(69)
Pumps and fans gains (Table 5a)		1 1 1		, ,
(70)m= 0 0 0 0	0 0 0	0 0 0	0 0	(70)
Losses e.g. evaporation (negative values				( - /
	-103.16 -103.16 -103.1	6 -103.16 -103.16 -103.16	-103.16 -103.16	(71)
Water heating gains (Table 5)	100.10   100.10   100.1	0 100.10 100.10 100.10	100.10	\
	111.97 106.28 101.4	5 107.64 109.85 116.29	123.56 126.83	(72)
` '	I	m + (68)m + (69)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (7	<u> </u>	(, 2)
Total internal gains = (73)m= 444.51 442.4 428.28 405.44	382.16 359.75 345.2		412.63 432.61	(73)
(73)m= 444.51 442.4 428.28 405.44 6. Solar gains:	362.10 359.75 345.2	1 351.51 305.00 366.12	412.03 432.01	(13)
Solar gains are calculated using solar flux from To	able 6a and associated ed	uations to convert to the applica	ble orientation.	
Orientation: Access Factor Area	Flux	g_	FF	Gains
Table 6d m²	Table 6a		able 6c	(W)
Northeast 0.9x 0.77 x 15.46	6 × 11.28	x 0.63 x	0.7 =	53.31 (75)
Northeast 0.9x 0.77 x 15.46	=	x 0.63 x	0.7 =	108.51 (75)
0.7.			<b></b>	

Temperature Utilisation fac	_				•		oie 9,	ini (°C)		_		21	(85)
7. Mean interr						from To	ble C	Th4 (00)					
(84)m= 626.8	770.61	924.39	1098.97	1230.92	1234.03	1174.94	1060.	39 926.76	761.54	634.2	586.52	]	(84)
Total gains – ir	nternal a	nd sola	r (84)m =	(73)m -	+ (83)m	, watts						_	
(83)m= 182.29	328.21	496.1	693.53	848.77	874.28	829.73	709.0		375.42	221.56	153.91	1	(83)
Solar gains in v	watte ca	lculate	d for each	month			(83)m	= Sum(74)m	(82)m				
Southwest _{0.9x}	0.77	×	5.9		<b>x</b>	31.49	J L	0.63	X	0.7	=	56.78	(79)
Southwest _{0.9x}	0.77	×			x	31.49	֡֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֡֓	0.63	x	0.7	=	53.6	(79)
Southwest _{0.9x}	0.77	×	5.9		x	44.07	] [	0.63	x	0.7	=	79.46	(79)
Southwest _{0.9x}	0.77	×	5.57	7	x	44.07	] [	0.63	x	0.7	=	75.02	(79)
Southwest _{0.9x}	0.77	×	5.9		x	69.27	] [	0.63	x	0.7	=	124.9	(79)
Southwest _{0.9x}	0.77	×	5.57	7	x	69.27	֓֞֓֞֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֡֓֡֓֓֡֓֓	0.63	x	0.7	=	117.91	(79)
Southwest _{0.9x}	0.77	×	5.9		x	92.85	įį	0.63	x	0.7	=	167.42	(79)
Southwest _{0.9x}	0.77	×		===	-	92.85	j j	0.63	x	0.7	=	158.06	(79)
Southwest _{0.9x}	0.77	×	5.9		x	104.39	ij	0.63	x	0.7		188.23	(79)
Southwest _{0.9x}	0.77	x				104.39	j þ	0.63	×	0.7	=	177.7	(79)
Southwest _{0.9x}	0.77	x			-	113.91	j	0.63	x	0.7		205.39	(79)
Southwest _{0.9x}	0.77	^		_		113.91	, <u> </u>	0.63	= ^	0.7	= =	193.9	(79)
Southwest _{0.9x}	0.77	×			=	118.15	j	0.63	×	0.7	= =	213.04	(79)
Southwest _{0.9x}	0.77	×		==		118.15	, <u> </u>	0.63	×	0.7		201.12	(79)
Southwest _{0.9x}	0.77	^				119.01	] [	0.63	^	0.7	= =	214.59	(79)
Southwest _{0.9x}	0.77	^ ^				119.01	] [	0.63	<b>┤</b>	0.7	= -	202.59	(79)
Southwest _{0.9x}	0.77	<b>─</b> │ ^			-	106.25	] [ ] [	0.63	╣	0.7	╡ -	191.58	(79)
Southwest _{0.9x}	0.77				x L	106.25	] [ ] [	0.63	x	0.7	= =	180.87	(79)
Southwest _{0.9x}	0.77	×			×	85.75 85.75	] [ ] [	0.63		0.7	=	145.97	(79) (79)
Southwest _{0.9x}	0.77	×		==	×	62.67	]	0.63	X	0.7	╡ -	113.01	(79)
Southwest _{0.9x} Southwest _{0.9x}	0.77	×		_	×	62.67	]   	0.63	X	0.7	=	106.69	(79)
Southwest _{0.9x}	0.77	×			x	36.79	]	0.63	X	0.7	=	66.34	(79)
Southweste a	0.77	×			X	36.79	]	0.63	×	0.7	=	62.63	(79)
Northeast 0.9x	0.77	×		<del></del>	x	9.21	] x [	0.63	×	0.7	=	43.54	(75)
Northeast 0.9x	0.77	×	15.4	6	x	14.2	] x [	0.63	×	0.7	=	67.08	(75)
Northeast 0.9x	0.77	×	15.4	6	x	28.07	] x [	0.63	x	0.7	=	132.61	(75)
Northeast 0.9x	0.77	×	15.4	6	X	50.42	X	0.63	X	0.7	=	238.23	(75)
Northeast 0.9x	0.77	×	15.4	6	x	72.63	] x [	0.63	×	0.7	=	343.15	(75)
Northeast 0.9x	0.77	X	15.4	6	X	91.1	×	0.63	X	0.7	=	430.43	(75)
Northeast _{0.9x}	0.77	×	15.4	6	X	97.38	] x	0.63	x	0.7	=	460.12	(75)
Northeast _{0.9x}	0.77	X	15.4	6	X	91.35	_ x [	0.63	X	0.7	=	431.59	(75)
Northeast _{0.9x}	0.77	X	15.4	6	X	67.96	_ x [	0.63	x	0.7	=	321.08	(75)
Northeast _{0.9x}	0.77	X	15.4	ь	x	41.38	X	0.63	X	0.7	=	195.51	(75)

(86)m=	0.96	0.93	0.87	0.75	0.59	0.43	0.32	0.36	0.58	0.82	0.94	0.97		(86)
Mean ir	nternal	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.29	19.62	20.06	20.54	20.83	20.96	20.99	20.98	20.88	20.46	19.79	19.24		(87)
Tempe	rature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, Ti	h2 (°C)					
(88)m=	20.06	20.06	20.06	20.08	20.08	20.09	20.09	20.1	20.09	20.08	20.07	20.07		(88)
Utilisati	ion fact	or for g	ains for I	est of d	welling, l	h2,m (se	e Table	9a)						
(89)m=	0.96	0.92	0.85	0.72	0.54	0.37	0.25	0.29	0.52	0.79	0.92	0.96		(89)
Mean ir	nternal	temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.78	18.25	18.88	19.53	19.9	20.06	20.08	20.08	19.98	19.45	18.51	17.71		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean_ir	nternal	temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
` ′	18.55	18.95	19.48	20.05	20.37	20.51	20.54	20.54	20.44	19.96	19.16	18.49		(92)
· · · · -							m Table							(00)
` /	18.55	18.95	19.48	20.05	20.37	20.51	20.54	20.54	20.44	19.96	19.16	18.49		(93)
			uirement ernal ter	nneratur	e obtain	ed at ste	ep 11 of	Table 9	n so tha	t Ti m=(	76)m an	d re-calc	ulate	
			or gains					1 4510 51	J, 30 tria				diato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	T		ains, hm			<b>I</b>					I			(0.4)
` ′	0.94	0.9	0.84	0.71	0.56	0.4	0.28	0.33	0.54	0.79	0.91	0.95		(94)
_	9ams, 590.72	696.66	W = (94)	785.01	686.06	490.24	334.19	347.32	501.44	599.93	577.95	557.72		(95)
` ′			rnal tem				30	0 11 102	•••••	000.00	000	301112		()
(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 lo	ss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m= 1	1275.65	1253.55	1154.83	975.65	756.71	507.51	338.52	354.11	547.61	816.8	1059.45	1262.67		(97)
· –							h = 0.02			<u> </u>	ŕ	504.40		
(98)m=	509.59	374.23	284.08	137.26	52.57	0	0	0 Tota	0	161.35	346.68	524.48	2390.24	(98)
0	h 4!			1-10/15/2				Tota	i per year	(Kvvii/yeai	r) = Sum(9	0)15,912 =		╡
·		•	ement in		•								27.54	<u>(99)</u>
9b. Ener				· ·	Ĭ				المالة عالي					
This part Fraction											unity scr	neme.	0	(301)
Fraction	•			•		•	•		,				1	] (302)
The comm	•			•	•	,	,	allows for	CHP and ı	up to four (	other heat	sources: ti		」` ′
includes b	ooilers, he	eat pumps	s, geothern	nal and wa	aste heat f					.,,				_
Fraction	of hea	t from C	commun	ity heat _l	oump								1	(303a)
Fraction	of tota	l space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	1	(304a)
Factor fo	or conti	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distribut	tion los	s factor	(Table 1	2c) for c	ommun	ity heatir	ng syste	m					1.05	(306)
Space h	neating	I											kWh/year	_
Annual s	_		requirem	ent									2390.24	
												•		_

Space heat from Community heat pump		(09) v (3045) v	(305) x (306) =	0500.70	(307a)
		, , , , ,		2509.76	]
Efficiency of secondary/supplementary h			,	0	(308
Space heating requirement from second	lary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2152.67	]
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x	(305) x (306) =	2260.31	(310a)
Electricity used for heat distribution	0	.01 × [(307a)(307	'e) + (310a)(310e)] =	47.7	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extra	<b>.</b> ,	de		212.1	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	212.1	(331)
Energy for lighting (calculated in Append	dix L)			366.89	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-108.82	(333)
Tatal dal' and language (007)	. (200) . (240) . (242) . (24	IE) . (224) . (26	20) (0071)	E240.22	_ ] [220]
Total delivered energy for all uses (307)	+ (309) + (310) + (312) + (31	15) + (331) + (33	32)(237b) =	5240.23	(338)
12b. CO2 Emissions – Community heati		15) + (331) + (33	32)(237b) =	5240.23	(336)
	ng scheme	Energy kWh/year	Emission factor		(336)
	ng scheme E	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heati	ng scheme  E  k  ater heating (not CHP)  If there is CHP using two form	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating CO2 from other sources of space and w Efficiency of heat source 1 (%)	ng scheme  E  k  ater heating (not CHP)  If there is CHP using two form	Energy xWh/year uels repeat (363) to 1 x 100 ÷ (367b) x	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1	ng scheme  Example And American Scheme  ater heating (not CHP)  If there is CHP using two for [(307b)+(310b)]  [(313) 100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   10	Energy xWh/year uels repeat (363) to 1 x 100 ÷ (367b) x	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =	Emissions kg CO2/year	(367a) (367)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	ng scheme  Example And Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews Andrews	Energy xWh/year uels repeat (363) to   x 100 ÷ (367b) x x(366) + (368)(372	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =	280 884.17 24.76 908.92	(367a) (367) (372)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy	ng scheme  Example 1	Energy (XWh/year uels repeat (363) to [x 100 ÷ (367b) x x x(366) + (368)(372	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =	280 884.17 24.76 908.92	(367a) (367) (372) (373)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (sec	ng scheme  Example 1	Energy (XWh/year uels repeat (363) to [x 100 ÷ (367b) x x x(366) + (368)(372	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0.52 =	280  884.17  24.76  908.92	(367a) (367) (372) (373) (374)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community so CO2 associated with space heating (see CO2 associated with water from immers)	ater heating (not CHP)  If there is CHP using two for [(307b)+(310b)]  [(313) 2  yestems (363)  condary) (309) x  ion heater or instantaneous heater heating (373) 4	Energy xWh/year uels repeat (363) to [x 100 ÷ (367b) x x x(366) + (368)(372 x(374) + (375) =	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0.52 =	280  884.17  24.76  908.92  0  908.92	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with space heating (see CO2 associated with water from immers) Total CO2 associated with space and water	ater heating (not CHP)  If there is CHP using two for [(307b)+(310b)]  [(313) 2  yestems (363)  condary) (309) x  ion heater or instantaneous for ater heating (373) 4  be and fans within dwelling (3	Energy (363) to uels repeat (363) to   x 100 ÷ (367b) x x   x (366) + (368)(372 x eneater (312) x   eneater (374) + (375) = 331)) x	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =	280  884.17  24.76  908.92  0  908.92	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and we Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (see CO2 associated with water from immers)  Total CO2 associated with space and we CO2 associated with electricity for pump	ater heating (not CHP)  If there is CHP using two for [(307b)+(310b)]  [(313)  yestems (363)  condary) (309) x  ion heater or instantaneous for ater heating (373) 4  os and fans within dwelling (332)))	Energy (363) to uels repeat (363) to   x 100 ÷ (367b) x x   x (366) + (368)(372 x eneater (312) x   eneater (374) + (375) = 331)) x	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =	280  884.17  24.76  908.92  0  908.92  110.08	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community second co2 associated with space heating (second co2 associated with water from immerse co2 associated with space and we co2 associated with electricity for pump co2 associated with electricity for lighting Energy saving/generation technologies of	ater heating (not CHP)  If there is CHP using two for [(307b)+(310b)]  [(313)  yestems (363)  condary) (309) x  ion heater or instantaneous for ater heating (373) 4  os and fans within dwelling (332)))	Energy (363) to uels repeat (363) to   x 100 ÷ (367b) x x   x (366) + (368)(372 x eneater (312) x   eneater (374) + (375) = 331)) x	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =	280  884.17  24.76  908.92  0  908.92  110.08  190.41	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community second co2 associated with space heating (second co2 associated with water from immerse co2 associated with space and we co2 associated with electricity for pump co2 associated with electricity for lighting Energy saving/generation technologies (light conditions)	ater heating (not CHP)  If there is CHP using two for [(307b)+(310b)]  [(313)  yestems (363)  condary) (309) x  ion heater or instantaneous for ater heating (373) + (323)  os and fans within dwelling (332)))  (333) to (334) as applicable	Energy (363) to uels repeat (363) to   x 100 ÷ (367b) x x   x (366) + (368)(372 x eneater (312) x   eneater (374) + (375) = 331)) x	Emission factor kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =	280  884.17  24.76  908.92  0  0  908.92  110.08  190.41	(367a) (367) (372) (373) (374) (375) (376) (378) (379)

#### **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 10:42:56

Project Information:

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

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 103.81m² **Plot Reference:** Site Reference : Highgate Road - GREEN 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 25.05 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.25 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 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 - Heat pump

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	10.070	<u> </u>
Continuous supply and extract system		
· · · · · · · · · · · · · · · · · · ·	0.54	
Specific fan power:		014
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	
ventilation rate.	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	<b>5</b> 11/111	
Photovoltaic array		

		Lleo	r Details:						
Access Name	Nail la abare	Use		- M	<b>L</b>		CTDO	010010	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012	•	Stroma Softwa					010943 on: 1.0.5.50	
			ty Address:						
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor		A	103.81	(1a) x		ight(m) .65	(2a) =	Volume(m ³	(3a)
	a) . (1b) . (1a) . (1d) . (1a)					.00	(2α) -	275.1	(Ja)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)-	+(111)	103.81	(4)	) . (2-) . (2-	1) . (2 -) .	(2-)		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	l)+(3e)+	.(3h) =	275.1	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of chimneys	heating he	ating		1 = [			40 =	-	_
•		<del></del>	0	]	0		20 =	0	(6a)
Number of open flues		0 +	0	」 ⁻ └	0			0	(6b)
Number of intermittent fa				Ļ	0		10 =	0	(7a)
Number of passive vents				Ļ	0		10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)	)+(6b)+(7a)+(7b	o)+(7c) =	Г	0		÷ (5) =	0	(8)
•	een carried out or is intended			continue fr			` '	<u> </u>	``
Number of storeys in the	ne dwelling (ns)							0	(9)
Additional infiltration	25 for stool or timber fr	omo or 0.25	for magazin	v oonatr	ruotion	[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)
deducting areas of openir	ngs); if equal user 0.35						ı		_
•	floor, enter 0.2 (unseale	d) or 0.1 (se	aled), else	enter 0				0	(12)
If no draught lobby, en	s and doors draught stri	nned						0	$=$ $\frac{(13)}{(14)}$
Window infiltration	s and doors draught stir	ppeu	0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate			(8) + (10)		_	+ (15) =		0	(16)
	q50, expressed in cubic	c metres per	hour per s	uare m	etre of e	envelope	area	3	(17)
If based on air permeabil	·	•	•	•		'		0.15	(18)
•	es if a pressurisation test has l				is being u	sed			
Number of sides sheltere	ed							0	(19)
Shelter factor			(20) = 1 -		[9)] =			1	(20)
Infiltration rate incorporat			(21) = (18)	x (20) =				0.15	(21)
Infiltration rate modified f	<del></del>	<del></del>				<del></del>		1	
Jan Feb	Mar   Apr   May	Jun Ju	I Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	1 1	00 1 00				<u> </u>		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 = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m = $(22a)$ m =	2)m ÷ 4							_	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95 0.99	5 0.92	1	1.08	1.12	1.18		

Adjusted infilt	ration rate	e (allow	ina for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		•	rate for t	he appli	cable ca	se						I	<b>_</b>
If mechanic			andiv N. (C	93h) — (93 <i>a</i>	a) v Emy (	aguatian (I	VEVV otho	muiaa (22h	) - (22a)			0.5	(23a)
If exhaust air h									) = (23a)			0.5	(23b)
		-	-	_					Oh)m ı (	22h) v [	1 (22a)	74.8	(23c)
a) If balance (24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3	+ 100j	(24a)
b) If balance			Į	<u> </u>	Į	ļ	ļ	ļ	ļ	ļ	0.0		,
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h	nouse ext	tract ver	ntilation o	r positiv	/e input	ventilatio	n from o	utside	ļ	ļ	ļ	I	
,	m < 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)	ventilation			•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	d) in bo	x (25)	-	-	-		
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25)
3. Heat losse	es and he	at loss	paramet	er:									
ELEMENT	Gros area	ss	Openir m	ıgs	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²-l		X k I/K
Windows Typ		` ,			13.2	x1	/[1/( 1.4 )+	0.04] =	17.51	,			(27)
Windows Typ	e 2				5.5	x1	/[1/( 1.4 )+	0.04] =	7.29				(27)
Windows Typ	e 3				4.61	x1	/[1/( 1.4 )+	0.04] =	6.11	Ħ			(27)
Walls Type1	76.1	6	23.3	2	52.84	1 X	0.18		9.51		60	3170.	4 (29)
Walls Type2	49.7	7	0		49.77	7 X	0.17	=	8.36		60	2986.	2 (29)
Roof	103.8	31	0		103.8	1 X	0.13	=	13.5		9	934.2	9 (30)
Total area of	elements	, m²			229.7	4							(31)
Party wall					12.14	1 x	0	=	0		45	546.3	(32)
Party floor					103.8	1					40	4152.	4 (32a)
Internal wall *	*				193.1	7				Ī	9	1738.5	(32c)
* for windows and ** include the are						lated using	formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	1 3.2	_
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30	) + (32) =				62.28	(33)
Heat capacity	Cm = S(	Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	13528.12	(34)
Thermal mass	s parame	ter (TMI	⊃ = Cm -	: TFA) ir	n kJ/m²K	•		= (34)	÷ (4) =			130.32	(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	K						10.29	(36)
if details of therm		are not kr	nown (36) :	= 0.05 x (3	31)			(0.5)	(0.6)				_
Total fabric he		alas Isr	d 1 - 1 - 1					, ,	(36) =	(OE) (E)		72.57	(37)
Ventilation he	1		<u> </u>	<u> </u>	1	11	Λ <del></del>	<del>``</del>		(25)m x (5)		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(20)	00.40	00.40	00.40	00.00	04.07	04.07	1 24 02	25.00	20.00	00.70	07.44		(38)
(38)m= 28.8	28.46	28.12	26.42	26.08	24.37	24.37	24.03	25.06	26.08	26.76	27.44		(36)
Heat transfer (39)m= 101.37	101.03	nt, W/K 100.69	98.99	98.65	96.94	96.94	96.6	(39)m 97.63	98.65	38)m 99.33	100.01		
(59)111= 101.37	101.03	100.09	90.99	90.03	90.94	90.94	90.0			Sum(39) ₁	1	98.9	(39)
Heat loss para	meter (l	HLP), W	/m²K				_		= (39)m ÷				`
(40)m= 0.98	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.96	0.96		_
Number of day	/s in mo	nth (Tab	le 1a)					/	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 hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occu	inancy	N									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.		.77		(42)
if TFA £ 13.5 Annual average	,	ater usad	ne in litre	es ner da	ıv Vd av	erane –	(25 x N)	+ 36		10	0.04		(43)
Reduce the annua	al average	hot water	usage by	5% if the $a$	welling is	designed t			se target o		0.04		(40)
not more that 125		person pei T		rater use, l ı	not and co	<u> </u>							
Jan Hot water usage i	Feb	Mar r day for ea	Apr	May	Jun	Jul Table 10 x	Aug	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)m= 110.04	106.04	102.04	96.04	94.04	90.03	90.03	94.04			m(44) ₁₁₂ =	<del></del>	1200.45	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /	L		
(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 v	vater heati	na at noint	of use (no	n hot water	r storaga)	enter∩in	hoves (16		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)
(46)m= 24.48 Water storage	l	22.09	19.20	10.40	15.95	14.70	10.90	17.16	20	21.03	23.71		(40)
Storage volum	ne (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	-			_			. ,						
Otherwise if no Water storage		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stor</li></ul>			-								20		(E4)
If community h	•			IE Z (KVV	ii/iitie/ua	iy <i>)</i>				0.	.02		(51)
Volume factor	_									1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	0.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	.03		(54)
Enter (50) or	. ,	•	<b>.</b>				((50)	==> (44)		1.	.03		(55)
Water storage							((56)m = (			ı			(==)
(56)m= 32.01 If cylinder contain	28.92	32.01	30.98	32.01 m = (56)m	30.98 x [(50) = (	32.01 H11)1 ÷ (5	32.01 0) else (5)	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01	x H	(56)
			1			1						X 1 1	/E7\
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

		1									
Primary circuit loss (annual) from Table 3	0	(58)									
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	otot)										
(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	22.51 23.26	(59)									
	22.01 20.20	(66)									
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		1 (04)									
(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 × (45)m +	<del>` ` ` ` ` ` </del>	1 ` ′ ′									
(62)m= 218.46 192.65 202.56 181.9 178.48 159.81 153.79 168.33 167.89 188.6	199.03 213.32	(62)									
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribut	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 0											
Output from water heater		1									
(64)m= 218.46 192.65 202.56 181.9 178.48 159.81 153.79 168.33 167.89 188.6	199.03 213.32	0004.00 (64)									
Output from water heate		2224.82 (64)									
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$	<del></del>	1									
(65)m= 98.48 87.4 93.19 85.49 85.19 78.15 76.98 81.81 80.83 88.55	91.18 96.77	(65)									
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is fr	om community h	leating									
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										
(66)m= 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61 138.61	138.61 138.61	(66)									
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		_									
(67)m= 23.39 20.77 16.89 12.79 9.56 8.07 8.72 11.34 15.21 19.32	22.55 24.04	(67)									
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
(68)m= 262.34 265.07 258.21 243.6 225.17 207.84 196.26 193.54 200.4 215.01	233.44 250.77	(68)									
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
(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 5a)	•	'									
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0	(70)									
Losses e.g. evaporation (negative values) (Table 5)		ı									
(71)m= -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88 -110.88	-110.88 -110.88	(71)									
Water heating gains (Table 5)		I									
(72)m= 132.37 130.06 125.26 118.73 114.5 108.53 103.47 109.96 112.27 119.02	126.65 130.07	(72)									
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m + (70)m$	1)m + (72)m	l									
(73)m= 482.68 480.48 464.94 439.71 413.81 389.03 373.03 379.42 392.47 417.93	447.22 469.45	(73)									
6. Solar gains:											
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicab	ole orientation.										
Orientation: Access Factor Area Flux g_	FF	Gains									
	able 6c	(VV)									
Southeast 0.9x 0.77 x 5.5 x 36.79 x 0.63 x	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= 22 Total gain	26.28	390.73 ternal ar	548.6	3 lar	for each mor 703.29 809.1 (84)m = (73)1 1143 1223.	2   8 M +	812.79 (83)m	779.69	699		97 43	35.62 53.54	-	193.03	_		(83)
(83)m= 22	26.28	390.73	548.6	3	703.29 809.3	2 8		779.69	<del></del>				272	193.03	3		(83)
				$\neg$		_			<del></del>				_		_		
Solar gair										- Cum(74)	(O	22)m					
140111111111111111111111111111111111111	U.9X	0.77		X	4.61	X		9.21	X	0.63		x	0.7	=		12.98	(81)
Northwest Northwest	_	0.77	$\dashv$	X	4.61	」× T √		14.2	] × ] _v	0.63	$\blacksquare$	X L	0.7	┥ :	$\vdash$	20	(81)
Northwest	<u> </u>	0.77	_	X	4.61	X		8.07	X	0.63		X L	0.7	_ =	$\vdash$	39.54	(81)
Northwest	<u> </u>	0.77	_	X	4.61	X		0.42	X	0.63		x L	0.7	_  =	Ļ	71.04	(81)
Northwest	<u> </u>	0.77		X	4.61	X	7	2.63	X	0.63		x L	0.7	=	Ļ	102.32	(81)
Northwest	<u> </u>	0.77		X	4.61	x	9	91.1	x	0.63		×	0.7	=		128.35	(81)
Northwest	느	0.77		X	4.61	x	9	7.38	x	0.63		x	0.7	=		137.2	(81)
Northwest	t 0.9x	0.77		X	4.61	x	9	1.35	x	0.63		x	0.7			128.7	(81)
Northwest	t 0.9x	0.77		X	4.61	x	6	7.96	x	0.63		x [	0.7			95.74	(81)
Northwest	t 0.9x	0.77		X	4.61	j x	4	1.38	x	0.63		x [	0.7			58.3	(81)
Northwest	t 0.9x	0.77		X	4.61	x	2	2.97	x	0.63		× [	0.7			32.36	(81)
Northwest	t 0.9x	0.77		X	4.61	×	1	1.28	x	0.63		x	0.7	= =	F	15.9	(81)
Southwest	t _{0.9x}	0.77	$\exists$	X	13.21	i x	3	1.49	ĺ	0.63	$\overline{}$	x [	0.7		F	127.12	(79)
Southwest	<u> </u>	0.77		X	13.21	X		4.07	ĺ	0.63		x [	0.7		片	177.92	(79)
Southwest	<u> </u>	0.77	$\dashv$	X	13.21	X		9.27	i	0.63	$\dashv$	×	0.7	╡ -	$\vdash$	279.64	(79)
Southwest		0.77	=	X	13.21	] ^ ] x		2.85	]	0.63		× [	0.7	╡ -	H	374.86	(79)
Southwest	<u> </u>	0.77	$\dashv$	X	13.21	] ^ ] x		04.39	] ]	0.63	$\dashv$	^ L × Г	0.7	=	H	421.44	(79)
Southwest	<u> </u>	0.77	_	X	13.21	」^ ]		13.91	] ]	0.63	_	^ L х [	0.7	╡ :	$\vdash$	459.87	(79)
Southwest	<u> </u>	0.77	$\dashv$	x x	13.21	」× ] x		19.01 18.15	] ]	0.63	$\blacksquare$	x L	0.7	$\dashv$	H	480.46 476.99	(79)
Southwest	<u> </u>	0.77		X	13.21	」× ┐、		06.25	] 1	0.63		× L	0.7	╡ :	H	428.95	(79)
Southwest Southwest	<u> </u>	0.77	$\blacksquare$	X	13.21	」× ┐,		5.75	] 1	0.63		× L	0.7	_ = =	$\vdash$	346.2	$= \frac{(79)}{(70)}$
Southwest		0.77	$\blacksquare$	X	13.21	_ ×		2.67	] 1	0.63	$\blacksquare$	X L	0.7	_ = -	H	253.02	(79)
Southwest	<u> </u>	0.77	_	X	13.21	X	3	6.79	]	0.63		x L	0.7	=	Ļ	148.54	(79)
Southeast	<u> </u>	0.77		X	5.5	X	3	1.49	X	0.63		x [	0.7	=	Ļ	52.93	(77)
Southeast	<u> </u>	0.77		X	5.5	X	4	4.07	X	0.63		x	0.7	=		74.08	(77)
Southeast	느	0.77		X	5.5	X	6	9.27	X	0.63		x	0.7	=	L	116.43	(77)
Southeast	<u> </u>	0.77		X	5.5	X	9	2.85	X	0.63		x	0.7	=		156.07	(77)
Southeast	<u> </u>	0.77		X	5.5	X	10	04.39	x	0.63		x	0.7	=		175.47	(77)
Southeast	느	0.77		X	5.5	×	1	13.91	x	0.63		x	0.7	=		191.47	(77)
Southeast	t 0.9x	0.77		X	5.5	X	1	18.15	x	0.63		x [	0.7	=		198.6	(77)
Southeast	t 0.9x	0.77		x	5.5	x	1	19.01	x	0.63		x	0.7	=		200.04	(77)
Southeast	t 0.9x	0.77		X	5.5	X	10	06.25	x	0.63		x [	0.7		⋷┌	178.6	(77)

(86)m= 0.97 0.94 0.89 0.8 0.66 0.49 0.36 0.4 0.61 0.85 0.95 0.95	98 (86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 19.46 19.77 20.15 20.56 20.82 20.95 20.99 20.98 20.9 20.53 19.92 19.	.41 (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= 0.97 0.93 0.88 0.77 0.61 0.43 0.29 0.33 0.55 0.82 0.94 0.93	97 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m= 18.04 18.48 19.03 19.6 19.94 20.1 20.13 20.13 20.04 19.57 18.72 17.	.98 (90)
fLA = Living area ÷ (4) =	0.38 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 18.59 18.97 19.46 19.96 20.28 20.43 20.46 20.46 20.37 19.94 19.18 18	.53 (92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	(00)
	.53 (93)
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
the utilisation factor for gains using Table 9a	-calculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov D	Dec
Utilisation factor for gains, hm:	
	96 (94)
Useful gains, hmGm , W = (94)m x (84)m	(05)
	7.87 (95)
Monthly average external temperature from Table 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 4.6	.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m ]	
	2.83 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 573.58 416.52 319.43 161.18 64.88 0 0 0 172.08 384.3 591	1.45
Total per year (kWh/year) = Sum(98) _{15.9}	2683.43 (98)
Space heating requirement in kWh/m²/year	25.85 (99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community scheme	
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0 (301)
Fraction of space heat from community system 1 – (301) =	1 (302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources.	ces; the latter
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump	1 (303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1 (304a)
Factor for control and charging method (Table 4c(3)) for community heating system	
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year
Annual space heating requirement	2683.43

		-		-
Space heat from Community heat pump	(98) x (304a) x	( (305) x (306) =	2817.6	(307a)
Efficiency of secondary/supplementary heating system i	n % (from Table 4a or Appe	ndix E)	0	(308
Space heating requirement from secondary/supplement	ary system (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		[	2224.82	]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	x (305) x (306) =	2336.06	(310a)
Electricity used for heat distribution	0.01 × [(307a)(30	7e) + (310a)(310e)] =	51.54	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not e	nter 0) = (107) ÷ (314	) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive inp			253.73	(330a)
warm air heating system fans		Ī	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	253.73	(331)
Energy for lighting (calculated in Appendix L)		Ī	412.99	(332)
Electricity generated by PVs (Appendix M) (negative qua	antity)	Ī	-108.82	(333)
		, and the second second second second second second second second second second second second second second se		<b>-</b>
Total delivered energy for all uses (307) + (309) + (310)	+ (312) + (315) + (331) + (3	32)(237b) =	5711.56	(338)
Total delivered energy for all uses (307) + (309) + (310)  12b. CO2 Emissions – Community heating scheme	+ (312) + (315) + (331) + (3	32)(237b) =	5711.56	(338)
	+ (312) + (315) + (331) + (3 Energy kWh/year	Emission factor		(338)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (no	Energy kWh/year	Emission factor I	Emissions kg CO2/year	(338)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (no	Energy kWh/year t CHP)	Emission factor I	Emissions kg CO2/year	
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  If there is 6	Energy kWh/year t CHP) CHP using two fuels repeat (363) to	Emission factor I kg CO2/kWh	Emissions kg CO2/year	(367a)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x	Emission factor I kg CO2/kWh I o (366) for the second fuel  0.52 = 0.52 =	Emissions kg CO2/year	(367a) (367)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor I kg CO2/kWh I o (366) for the second fuel  0.52 = 0.52 =	280 955.27 26.75	(367a) (367) (372)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x	Emission factor I kg CO2/kWh  0 (366) for the second fuel  0.52 =  0.52 =	280 955.27 26.75	(367a) (367) (372) (373)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x	Emission factor I kg CO2/kWh I o (366) for the second fuel  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52	280  955.27  26.75  982.01	(367a) (367) (372) (373) (374)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or insertions.	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x stantaneous heater (312) x (373) + (374) + (375) =	Emission factor I kg CO2/kWh I o (366) for the second fuel  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52	280  955.27  26.75  982.01  0	(367a) (367) (372) (373) (374) (375)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instance CO2 associated with space and water heating	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x stantaneous heater (312) x (373) + (374) + (375) =	Emission factor I kg CO2/kWh I 0 (366) for the second fuel  0.52 = 0.52 = 0.52 = 0.52 = 0.22 = 0.22 = 0.22	280  955.27  26.75  982.01  0  982.01	(367a) (367) (372) (373) (374) (375) (376)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instance CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within	Energy kWh/year t CHP) CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x stantaneous heater (312) x (373) + (374) + (375) = In dwelling (331)) x (332))) x	Emission factor I kg CO2/kWh I 0 (366) for the second fuel  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52	280  955.27  26.75  982.01  0  982.01  131.68	(367a) (367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instance CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within CO2 associated with electricity for lighting  Energy saving/generation technologies (333) to (334) as	Energy kWh/year  t CHP) CHP using two fuels repeat (363) to  [(307b)+(310b)] × 100 ÷ (367b) ×  [(313) ×  (363)(366) + (368)(376) ×  (309) ×  stantaneous heater (312) ×  (373) + (374) + (375) =  In dwelling (331)) ×  (332))) ×  stapplicable	Emission factor	280  955.27  26.75  982.01  0  982.01  131.68  214.34	(367a) (367) (372) (373) (374) (375) (376) (378) (379)
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instance CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within CO2 associated with electricity for lighting  Energy saving/generation technologies (333) to (334) as litem 1	Energy kWh/year  t CHP) CHP using two fuels repeat (363) to  [(307b)+(310b)] × 100 ÷ (367b) ×  [(313) ×  (363)(366) + (368)(376) ×  (309) ×  stantaneous heater (312) ×  (373) + (374) + (375) =  In dwelling (331)) ×  (332))) ×  stapplicable	Emission factor	280 280 955.27 26.75 982.01 0 982.01 131.68 214.34	(367a) (367) (372) (373) (374) (375) (376) (378) (379)

#### **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 10:42:55* 

Proiect 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 25.55 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.62 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 - Heat pump

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	, 616 /6	
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
Based on:	Ğ	
Overshading:	Average or unknown	
Windows facing: North East	28.56m²	
Windows facing: South East	5.5m²	
Windows facing: North West	5.47m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m ³ /m ² h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

		Hear I	Details:						
Access an Name	Noil leabare	USEI I		- M	<b>L</b>		CTDO	040040	
Assessor Name: Software Name:	Neil Ingham Stroma FSAP 2012		Stroma Softwa					010943 on: 1.0.5.50	
Contware Hame.	Stroma i Gra 2012	Property	Address:		31011.		7 01010	71. 110.0.00	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			a(m²)	(10) ×		ight(m)	(2a) =	Volume(m³	) (3a)
	-) · (4 L ) · (4 -) · (4 -l) · (4 -) ·			(1a) x	2	65	(2a) =	352.5	(3a)
·	a)+(1b)+(1c)+(1d)+(1e)+.	(1n)1	33.02	(4)	\	I) (O )	(0.)		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	352.5	(5)
2. Ventilation rate:	main seco	ondary	other		total			m³ per hou	r
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				L	0		10 =	0	(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	ys, flues and fans = (6a)+(	6b)+(7a)+(7b)+	(7c) =	Г	0		÷ (5) =	0	(8)
•	een carried out or is intended, p			ontinue fr			. (0) =	0	
Number of storeys in the	ne dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frances.  The steel or timber frances.			•	ruction			0	(11)
deducting areas of openii		ung to the grea	iter wall area	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	oed						0	(14)
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	aEO evareaced in pubic.	matraa nar h	(8) + (10) ·	, , ,	, , ,	, ,	oroo	0	(16)
If based on air permeabil	q50, expressed in cubic its value, then $(18) = [(17) \pm (17)]$	•	•	•	etre or e	envelope	area	3	(17)
•	es if a pressurisation test has be				is being u	sed	ļ	0.15	(18)
Number of sides sheltere			,	,	Ü			0	(19)
Shelter factor			(20) = 1 - [	0.075 x (1	19)] =			1	(20)
Infiltration rate incorporat	ting shelter factor		(21) = (18)	x (20) =				0.15	(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								
	<del></del>	0.95	0.92	1	1.08	1.12	1.18		
<u> </u>	<del> </del>							ı	

Adjusted infiltr	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effe		•	rate for t	пе арріі	cable ca	se						0.5	(23
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	n heat reco	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	ı) =				74.8	(23
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2	2b)m + (	23b) × [1	1 – (23c)		`
(24a)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(24
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (I	ЛV) (24b	o)m = (22	2b)m + (2	23b)	•	•	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r	ouse ext n < 0.5 <b>x</b>			•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation				•				0.5]			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.32	0.31	0.31	0.29	0.29	0.27	0.27	0.26	0.28	0.29	0.29	0.3		(25
3. Heat losse	s and he	at loss p	paramet	er:									
ELEMENT	Gros area	_	Openin m	=	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-l		X k /K
Vindows Type	e 1				28.56	x1	/[1/( 1.4 )+	0.04] =	37.86				(2
Windows Type	2				5.5	x1	/[1/( 1.4 )+	0.04] =	7.29				(2
Windows Type	e 3				5.47	x1	/[1/( 1.4 )+	0.04] =	7.25				(2
Walls Type1	95.1	6	39.5	3	55.63	3 x	0.18	=	10.01		60	3337.8	3 (2
Walls Type2	41.0	2	0		41.02	<u>x</u>	0.17	=	6.89		60	2461.2	2 (2
Roof	133.0	)2	0		133.0	2 x	0.13	=	17.29		9	1197.1	8 (3
Total area of e	elements,	, m²			269.2	2							(3
Party wall					12.16	S X	0	=	0		45	547.2	(3
Party floor					133.0	2					40	5320.8	3 (3:
nternal wall **					196.4	7				Ī	9	1768.2	3 (3
* for windows and ** include the area						ated using	formula 1	l/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	3.2	
abric heat los	ss, W/K =	= S (A x	U)				(26)(30	) + (32) =				86.6	(3
Heat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	14632.41	(3
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			110	(3
or design assess an be used inste	ad of a det	ailed calc	ulation.			·	ecisely the	e indicative	e values of	TMP in Ta	able 1f		_
Thermal bridge	,	•		• .	•	<						11.16	(3
f details of therma Fotal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			07.77	7,0
otal labric ne /entilation hea		doulatos	l monthly	,				. ,	= (36) = = 0.33 × (	25)m v (F)		97.77	(3
	г г		·		lun	1,,1	۸۰۰۰	<del>- `                                   </del>	<u> </u>	<u> </u>		]	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(20) 20.0	1 20 47	20.02	22.05	22.44	24.02	24.02	20.0	22.44	22.44	1 24 20	25.40		(38)
(38)m= 36.9	36.47	36.03	33.85	33.41	31.23	31.23	30.8	32.11	33.41	34.29	35.16		(36)
Heat transfer (39)m= 134.67	134.23	133.8	131.62	131.18	129	129	128.56	(39)m 129.87	= (37) + (31.18)	38)m 132.05	132.93		
(39)111= 134.67	134.23	133.6	131.02	131.16	129	129	126.56			Sum(39) ₁		131.51	(39)
Heat loss para	ameter (l	HLP), W	m²K						= (39)m ÷		12712—	101.01	
(40)m= 1.01	1.01	1.01	0.99	0.99	0.97	0.97	0.97	0.98	0.99	0.99	1		_
Number of day	vs in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.99	(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	rgy requi	irement:								kWh/ye	ar:	
Assumed occu	unancy	N											(42)
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13		.9		(42)
Annual averag	ge hot wa										3.13		(43)
Reduce the annuance not more that 125	_		• •		-	-	to achieve	a water us	se target o	of			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i			<u> </u>			<u> </u>		Сор		1101			
(44)m= 113.45	109.32	105.2	101.07	96.94	92.82	92.82	96.94	101.07	105.2	109.32	113.45		
							- /			m(44) ₁₁₂ =		1237.59	(44)
Energy content of			i	,	·	i			`		· ,		
(45)m= 168.24	147.14	151.84	132.37	127.02	109.61	101.57	116.55	117.94	137.45	150.03	162.93	1600.67	(45)
If instantaneous v	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		10tai = Su	m(45) ₁₁₂ =	· [	1622.67	<b></b> (45)
(46)m= 25.24	22.07	22.78	19.86	19.05	16.44	15.23	17.48	17.69	20.62	22.51	24.44		(46)
Water storage			Į.										
Storage volum	, ,		•			•		ame ves	sel		0		(47)
If community hotherwise if no	•			_			. ,	ers) ente	er '0' in <i>(</i>	(47)			
Water storage			(					,		, ,			
a) If manufact	turer's de	eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature f											0		(49)
Energy lost from b) If manufact		_	-		or ic not		(48) x (49)	) =		1	10		(50)
Hot water stor			-							0.	02		(51)
If community h	•		on 4.3										
Volume factor			Ol-							-	03		(52)
Temperature f								>	>	0	.6		(53)
Energy lost fro Enter (50) or		_	, KVVN/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54) (55)
Water storage	. , .	,	for each	month			((56)m = (	55) × (41)ı	m	1.	03		(00)
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain												хH	. ,
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(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 the	rmostat)
(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 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
	0 0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ n	m + (46)m + (57)m + (59)m + (61)m
(62)m= 223.51 197.07 207.11 185.87 182.29 163.1 156.84 171.82 171.43 192	
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)	3,
	0 0 (63)
Output from water heater	
(64)m= 223.51 197.07 207.11 185.87 182.29 163.1 156.84 171.82 171.43 192	2.72 203.53 218.2
Output from water h	<u> </u>
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 × (45)m + (61)m] + 0.8 x [(46)m]	
(65)m= 100.16 88.87 94.71 86.81 86.45 79.24 77.99 82.97 82.01 89.	<del></del>
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water	is from community neating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
	Oct Nov Dec
(66)m= 145.12 145.12 145.12 145.12 145.12 145.12 145.12 145.12 145.12 145.12 145.12 145.12	5.12   145.12   145.12   (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 26.86 23.86 19.4 14.69 10.98 9.27 10.02 13.02 17.48 22.	19 25.9 27.61 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	5
(68)m= 301.32 304.45 296.57 279.8 258.62 238.72 225.43 222.3 230.18 246	6.95     268.13     288.03       (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 37.51 37.51 37.51 37.51 37.51 37.51 37.51 37.51 37.51 37.51 37.51	51 37.51 37.51 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -16.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -116.1 -11	6.1 -116.1 -116.1 (71)
Water heating gains (Table 5)	
(72)m= 134.62 132.24 127.29 120.57 116.2 110.05 104.83 111.52 113.9 120	0.86   128.72   132.25   (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m$	
(73)m= 529.35 527.09 509.81 481.59 452.34 424.58 406.81 413.38 428.09 456	
6. Solar gains:	(1.07)
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the app	plicable orientation.
Orientation: Access Factor Area Flux g_	FF Gains
Table 6d m ² Table 6a Table 6b	Table 6c (W)
Northeast 0.9x 0.77 x 28.56 x 11.28 x 0.63	x 0.7 = 98.48 (75)
North cost a c	$\times$ 0.7 = 200.46 (75)
0.00	200.40

Temperature Utilisation fact	during he	eating p	periods in	the livir	ng area		ole 9,	Th1 (°C)				21	(85)
7. Mean interr		1084.29 erature		1602.38 season	1635.98	1545.73	1344	1.17 1108.54	864.87	711.01	663.18		(84)
Total gains – in			<del>``</del>	<del>`                                    </del>			10			,   -,, -,	L 005 15	1	(0.4)
(83)m= 179.19	344.2	574.48		1150.04		1138.92	930.	.79 680.45	408.33	3 221.72	148.75	]	(83)
Solar gains in y	vatts, ca	lculated	for each	month			(83)m	= Sum(74)m	(82)m			_	
1401(11MCS(0.9X	0.77	X	5.47		х	9.21	X	0.63	X	0.7	=	15.4	(81)
Northwest 0.9x	0.77	×			x	14.2	] x   ] _v	0.63	x	0.7	=	23.73	(81)
Northwest 0.9x	0.77	×		_		28.07	] X   ]	0.63	x	0.7	=	46.92	(81)
Northwest 0.9x	0.77	X				50.42	X	0.63	X	0.7	╡ =	84.29	(81)
Northwest 0.9x	0.77	x		==	<b>—</b>	72.63	X	0.63	X	0.7	=	121.41	(81)
Northwest 0.9x	0.77	X	5.47		x	91.1	X	0.63	X	0.7	=	152.29	(81)
Northwest 0.9x	0.77	×	5.47		х	97.38	X	0.63	X	0.7	=	162.8	(81)
Northwest 0.9x	0.77	X	5.47		х	91.35	X	0.63	X	0.7	=	152.7	(81)
Northwest 0.9x	0.77	х	5.47		х	67.96	x	0.63	X	0.7	=	113.6	(81)
Northwest 0.9x	0.77	x	5.47		х	41.38	x	0.63	x	0.7	=	69.17	(81)
Northwest 0.9x	0.77	X	5.47		х	22.97	X	0.63	X	0.7	=	38.39	(81)
Northwest 0.9x	0.77	X	5.47		х	11.28	X	0.63	X	0.7	=	18.86	(81)
Southeast 0.9x	0.77	X	5.5		x	31.49	x	0.63	X	0.7	=	52.93	(77)
Southeast 0.9x	0.77	X	5.5		X	44.07	x	0.63	X	0.7	=	74.08	(77)
Southeast 0.9x	0.77	X	5.5		х	69.27	x	0.63	X	0.7	=	116.43	(77)
Southeast 0.9x	0.77	X	5.5		х	92.85	x	0.63	x	0.7	=	156.07	(77)
Southeast 0.9x	0.77	x	5.5		x 1	04.39	x	0.63	х	0.7	=	175.47	(77)
Southeast 0.9x	0.77	X	5.5		x 1	13.91	x	0.63	x	0.7	=	191.47	(77)
Southeast 0.9x	0.77	x	5.5		x 1	18.15	X	0.63	x	0.7	=	198.6	(77)
Southeast 0.9x	0.77	x	5.5		x 1	19.01	x	0.63	x	0.7	=	200.04	(77)
Southeast 0.9x	0.77	x	5.5		x 1	06.25	X	0.63	x	0.7	<del>=</del> =	178.6	(77)
Southeast 0.9x	0.77	x				85.75	X	0.63	x	0.7	_ =	144.14	(77)
Southeast 0.9x	0.77	X				62.67	X	0.63	x	0.7	= =	105.35	(77)
Southeast 0.9x	0.77	^	5.5			36.79	]	0.63		0.7		61.85	(77)
Northeast 0.9x	0.77	$=$ $\hat{x}$	28.56	_	^	9.21	] ^   ] _x	0.63	$=$ $\begin{bmatrix} 1 \\ x \end{bmatrix}$	0.7	= =	80.42	(75)
Northeast 0.9x	0.77	^ ^			x -	14.2	] ^   ] _x	0.63	^	0.7	= -	123.91	(75)
Northeast 0.9x	0.77	^ ^			_	28.07	] ^   ] _x	0.63	$=$ $\begin{bmatrix} \cdot \\ \mathbf{x} \end{bmatrix}$	0.7	= -	244.98	(75)
Northeast 0.9x	0.77	^	28.56			72.63 50.42	]	0.63	x	0.7		633.91	(75)
Northeast 0.9x	0.77	x	28.56		×	91.1	] x   ] x	0.63	×	0.7	_	795.16	(75)
Northeast 0.9x	0.77	×	28.56	<del></del>		97.38	]	0.63	×	0.7	<b>-</b>   -	850	(75)
Northeast 0.9x	0.77	×		_		91.35	]	0.63	×	0.7	<b>-</b>   -	797.3	(75)
Northeast 0.9x	0.77	X				67.96	X ]	0.63	X	0.7	=	593.14	(75)
Northeast _{0.9x}	0.77	×	28.56	<del></del>	<b>—</b>	41.38	] X   ]	0.63	x	0.7	=	361.17	(75)

(86)m= 0.98 0.96	0.92	0.81	0.64	0.47	0.36	0.42	0.67	0.89	0.97	0.98		(86)
Mean internal tempe	rature in li	ving are	ea T1 (fc	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m= 18.94 19.24	19.74	20.35	20.75	20.93	20.98	20.96	20.79	20.21	19.47	18.89		(87)
Temperature during	heating pe	eriods in	rest of	dwelling	from Ta	ble 9, Tl	n2 (°C)					
(88)m= 20.07 20.08	20.08	20.09	20.09	20.11	20.11	20.11	20.1	20.09	20.09	20.08		(88)
Utilisation factor for	gains for re	est of dv	welling, l	h2,m (se	e Table	9a)						
(89)m= 0.98 0.95	0.9	0.78	0.6	0.42	0.29	0.35	0.61	0.87	0.96	0.98		(89)
Mean internal tempe	rature in th	he rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m= 17.29 17.73	18.45	19.3	19.82	20.05	20.09	20.09	19.9	19.13	18.07	17.23		(90)
•		•					f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean internal tempe	rature (for	the who	ole dwel	lling) = fl	LA × T1	+ (1 – fL	.A) × T2			!		
(92)m= 18.12 18.49	19.1	19.83	20.29	20.49	20.54	20.53	20.35	19.67	18.77	18.07		(92)
Apply adjustment to	the mean	internal	temper	ature fro	m Table	4e, whe	re appro	priate				
(93)m= 18.12 18.49	19.1	19.83	20.29	20.49	20.54	20.53	20.35	19.67	18.77	18.07		(93)
8. Space heating red	quirement											
Set Ti to the mean in		•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the utilisation factor	<del></del>			مبدا	11	A	Con	0-4	Nov	Daa		
Jan Feb Utilisation factor for	Mar Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m= 0.97 0.94	0.89	0.77	0.61	0.44	0.32	0.38	0.63	0.86	0.95	0.97		(94)
Useful gains, hmGm	, W = (94)	I )m x (84	1)m									
(95)m= 684.11 819.77	<del>, ``'</del>	1055.9	977.49	720.69	497.42	512.66	696.57	742.71	673.27	643.87		(95)
Monthly average ex	ernal temp	erature	from Ta	able 8						•	l	
(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	ean interna	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]			1	
(97)m= 1861.34 1824.83			1126.8	760.2	508.39	530.98	812.05	1190.36		1843.77		(97)
Space heating requi										1	l	
(98)m= 875.86 675.39	538.87	275.36	111.09	0	0	0	0	333.05	625.21	892.72		<b>–</b> 1
						Tota	l per year	(kWh/year	) = Sum(9	8) _{15,912} =	4327.55	(98)
Space heating requi	rement in k	kWh/m²	/year								32.53	(99)
9b. Energy requireme	nts – Com	nmunity	heating	scheme	:							
This part is used for s	•	• .		•		<b>.</b>	•		unity sch	neme.		<b>¬</b>
Fraction of space hea	it from sec	ondary/	supplen	nentary l	neating (	Table 1	1) '0' if n	one			0	(301)
Fraction of space hea	t from com	nmunity	system	1 – (301	1) =						1	(302)
The community scheme mincludes boilers, heat pum	-							up to four o	other heat	sources; t	he latter	
Fraction of heat from	-			rom power	Stations.	зее Аррег	iuix C.				1	(303a)
Fraction of total spac	e heat from	n Comm	nunity he	eat pump	)			(3	02) x (303	a) =	1	(304a)
Factor for control and	charging r	method	(Table 4	4c(3)) fo	r commu	ınity hea	ting sys	tem			1	(305)
Distribution loss facto	r (Table 12	2c) for c	ommun	ity heatir	ng systei	m					1.05	(306)
Space heating											kWh/yea	' r
Annual space heating	requireme	ent									4327.55	7
•	•										l	_

On any heart from On any official and	(00) (00.4-)	(005) (000)		7(007-)			
Space heat from Community heat pump		(305) x (306) =	4543.92	(307a)			
Efficiency of secondary/supplementary heating system in %	•	,	0	(308			
Space heating requirement from secondary/supplementary	system (98) x (301) x 7	100 ÷ (308) =	0	(309)			
Water heating Annual water heating requirement			2273.51	]			
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2387.19	(310a)			
Electricity used for heat distribution	0.01 × [(307a)(307	7e) + (310a)(310e)] =	69.31	(313)			
Cooling System Energy Efficiency Ratio			0	(314)			
Space cooling (if there is a fixed cooling system, if not enter	= (107) ÷ (314)	) =	0	(315)			
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input f	rom outside		325.12	(330a)			
warm air heating system fans			0	(330b)			
pump for solar water heating			0	(330g)			
Total electricity for the above, kWh/year	=(330a) + (330	=(330a) + (330b) + (330g) =					
Energy for lighting (calculated in Appendix L)			474.41	(332)			
Electricity generated by PVs (Appendix M) (negative quantit	ty)		-108.82	(333)			
				ξ			
Total delivered energy for all uses (307) + (309) + (310) + (3	312) + (315) + (331) + (33	32)(237b) =	7621.83	(338)			
Total delivered energy for all uses (307) + (309) + (310) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110) + (3110)	312) + (315) + (331) + (3	32)(237b) =	7621.83	(338)			
	812) + (315) + (331) + (33 Energy kWh/year	Emission factor		(338)			
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (not Ch	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	(338)			
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (not Chefficiency of heat source 1 (%)  If there is CHP	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year				
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (not Chefficiency of heat source 1 (%)  If there is CHP	Energy kWh/year HP) using two fuels repeat (363) to	Emission factor kg CO2/kWh	Emissions kg CO2/year	(367a)			
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  CO2 associated with heat source 1  [(30)	Energy kWh/year HP) using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x	Emission factor kg CO2/kWh  (366) for the second fue  0.52 = 0.52 =	Emissions kg CO2/year  280  1284.73  35.97	(367a) (367)			
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  CO2 associated with heat source 1  [(30) Electrical energy for heat distribution	Energy kWh/year HP) using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x	Emission factor kg CO2/kWh  (366) for the second fue  0.52 = 0.52 =	280 1284.73 35.97	(367a) (367) (372)			
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	Energy kWh/year HP) using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x	Emission factor kg CO2/kWh  (366) for the second fue  0.52 =  0.52 =	280 1284.73 35.97 1320.7	(367a) (367) (372) (373)			
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)	Energy kWh/year HP) using two fuels repeat (363) to 07b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x	Emission factor kg CO2/kWh  (366) for the second fue  0.52 = 0.52 = 0.52 =	280 1284.73 35.97 1320.7	(367a) (367) (372) (373) (374)			
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instance of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the cont	Energy kWh/year HP) using two fuels repeat (363) to 17b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x taneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh  (366) for the second fue  0.52 = 0.52 = 0.52 =	280 280 1284.73 35.97 1320.7 0 1320.7	(367a) (367) (372) (373) (374) (375)			
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating	Energy kWh/year HP) using two fuels repeat (363) to 17b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x taneous heater (312) x (373) + (374) + (375) =	Emission factor kg CO2/kWh  (366) for the second fue  0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52	280 280 1284.73 35.97 1320.7 0 1320.7	(367a) (367) (372) (373) (374) (375) (376)			
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated within decorated	Energy kWh/year HP) using two fuels repeat (363) to 17b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x taneous heater (312) x (373) + (374) + (375) = welling (331)) x (332))) x	Emission factor kg CO2/kWh  (366) for the second fue  0.52 = 0.52 =  0.52 =  0.52 =  0.52 =	280 280 1284.73 35.97 1320.7 0 1320.7	(367a) (367) (372) (373) (374) (375) (376) (378)			
CO2 from other sources of space and water heating (not Chefficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instant  Total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within decode associated with electricity for lighting  Energy saving/generation technologies (333) to (334) as approximate to the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the cont	Energy kWh/year HP) using two fuels repeat (363) to 17b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x taneous heater (312) x (373) + (374) + (375) = welling (331)) x (332))) x	Emission factor kg CO2/kWh  (366) for the second fue  0.52 = 0.52 =  0.52 =  0.52 =  0.52 =	280 280 1284.73 35.97 1320.7 0 1320.7 168.74 246.22	(367a) (367) (372) (373) (374) (375) (376) (378) (379)			
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instant Total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within decorated with electricity for lighting  Energy saving/generation technologies (333) to (334) as applied 1	Energy kWh/year HP) using two fuels repeat (363) to 17b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(37 (309) x taneous heater (312) x (373) + (374) + (375) = welling (331)) x (332))) x	Emission factor kg CO2/kWh  (366) for the second fue  0.52 = 0.52 =  0.52 =  0.52 =  0.52 =	280 280 1284.73 35.97 1320.7 0 1320.7 168.74 246.22	(367a) (367) (372) (373) (374) (375) (376) (378) (379)			