BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name **Shell and Core**

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 CO_2 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 CO_2 emission rate (TER), $kgCO_2/m^2$.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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	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"

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

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

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* 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.

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
$m^3/(h.m^2)$ at 50 Pa	10	3

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/(l/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
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	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
E	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
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
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

	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Ground Floor - Store	110	-	-	10
Ground Floor - Plant	110	-	-	133
Ground Floor - Social Enterprise	110	-	-	552

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

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

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	156.3	156.3
External area [m^2]	330.4	330.4
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	120.17	144.54
Average U-value [W/m^{2}K]	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
100	**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/m^2]

	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/m^2]

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

Energy & CO_2 Emissions Summary

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

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

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 Heating or Cooling										
	Actual	27.6	0	0	0	0	0	0	0	0
	Notional	33.6	0.1	0	0	0	0	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [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
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	**$U_{i\text{-}Typ}$**	**$U_{i\text{-}Min}$**	**Surface where the minimum value occurs***
Wall	0.23	0.18	"Ground Floor - Social Enterprise_P_6"
Floor	0.2	0.13	"Ground Floor - Social Enterprise_S_3"
Roof	0.15	0.13	"Ground Floor - Social Enterprise_R_5"
Windows, roof windows, and rooflights	1.5	1.4	"Ground Floor - Social Enterprise_G_11"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	**Typical value**	**This building**
$m^3/(h.m^2)$ at 50 Pa	5	3

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 10:50:17

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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	5.49m²	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 00 - A

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)			Volume(m³)	
Ground floor	63.84	(1a) x	2.65	(2a)	=	169.18	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.84	(4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			169.18	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.55	x	1.4	=	3.57			(26)
Windows Type 1			5.49	x1/[1/(1.4)+ 0.04]		=	7.28			(27)
Windows Type 2			5.49	x1/[1/(1.4)+ 0.04]		=	7.28			(27)
Floor			63.84	x	0.13	=	8.2992	110	7022.4	(28)
Walls Type1	27.27	13.53	13.74	x	0.18	=	2.47	60	824.4	(29)
Walls Type2	56.63	0	56.63	x	0.17	=	9.46	60	3397.8	(29)
Roof	3.74	0	3.74	x	0.13	=	0.49	9	33.66	(30)
Total area of elements, m²			151.48							(31)
Party wall			21.76	x	0	=	0	45	979.2	(32)
Party ceiling			60.09					30	1802.7	(32b)
Internal wall **			89.09					9	801.8099	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 38.85 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 14861.97 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 232.8 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 11.14 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 49.99 (37)

DER WorkSheet: New dwelling design stage

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=	17.47	17.26	17.06	16.01	15.8	14.75	14.75	14.54	15.17	15.8	16.22	16.64	(38)

Heat transfer coefficient, W/K (39)m = (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	

Average = Sum(39)$_{1…12}$ /12= 65.94 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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	

Average = Sum(40)$_{1…12}$ /12= 1.03 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.09 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 83.79 (43)

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=	92.17	88.81	85.46	82.11	78.76	75.41	75.41	78.76	82.11	85.46	88.81	92.17	
										Total = Sum(44)$_{1…12}$ =		1005.44	(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=	136.68	119.54	123.35	107.54	103.19	89.05	82.51	94.69	95.82	111.67	121.89	132.37	
										Total = Sum(45)$_{1…12}$ =		1318.29	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(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	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (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 Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	191.96	169.47	178.63	161.04	158.47	142.54	137.79	149.96	149.31	166.94	175.39	187.64

Output from water heater (annual)$_{1...12}$ — 1969.13 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(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 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=	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 (calculated in Appendix L, equation L9 or L9a), also 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 gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(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 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=	-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 (Table 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 + (68)m + (69)m + (70)m + (71)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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

Northeast	0.9x	0.77	x	5.49	x	11.28	x	0.63	x	0.7	=	18.93	(75)
Northeast	0.9x	0.77	x	5.49	x	22.97	x	0.63	x	0.7	=	38.53	(75)
Northeast	0.9x	0.77	x	5.49	x	41.38	x	0.63	x	0.7	=	69.43	(75)
Northeast	0.9x	0.77	x	5.49	x	67.96	x	0.63	x	0.7	=	114.02	(75)
Northeast	0.9x	0.77	x	5.49	x	91.35	x	0.63	x	0.7	=	153.26	(75)
Northeast	0.9x	0.77	x	5.49	x	97.38	x	0.63	x	0.7	=	163.39	(75)
Northeast	0.9x	0.77	x	5.49	x	91.1	x	0.63	x	0.7	=	152.85	(75)
Northeast	0.9x	0.77	x	5.49	x	72.63	x	0.63	x	0.7	=	121.85	(75)
Northeast	0.9x	0.77	x	5.49	x	50.42	x	0.63	x	0.7	=	84.6	(75)
Northeast	0.9x	0.77	x	5.49	x	28.07	x	0.63	x	0.7	=	47.09	(75)
Northeast	0.9x	0.77	x	5.49	x	14.2	x	0.63	x	0.7	=	23.82	(75)
Northeast	0.9x	0.77	x	5.49	x	9.21	x	0.63	x	0.7	=	15.46	(75)
Southwest	0.9x	0.77	x	5.49	x	36.79		0.63	x	0.7	=	61.73	(79)
Southwest	0.9x	0.77	x	5.49	x	62.67		0.63	x	0.7	=	105.15	(79)
Southwest	0.9x	0.77	x	5.49	x	85.75		0.63	x	0.7	=	143.88	(79)
Southwest	0.9x	0.77	x	5.49	x	106.25		0.63	x	0.7	=	178.27	(79)
Southwest	0.9x	0.77	x	5.49	x	119.01		0.63	x	0.7	=	199.68	(79)
Southwest	0.9x	0.77	x	5.49	x	118.15		0.63	x	0.7	=	198.23	(79)
Southwest	0.9x	0.77	x	5.49	x	113.91		0.63	x	0.7	=	191.12	(79)
Southwest	0.9x	0.77	x	5.49	x	104.39		0.63	x	0.7	=	175.15	(79)
Southwest	0.9x	0.77	x	5.49	x	92.85		0.63	x	0.7	=	155.79	(79)
Southwest	0.9x	0.77	x	5.49	x	69.27		0.63	x	0.7	=	116.22	(79)
Southwest	0.9x	0.77	x	5.49	x	44.07		0.63	x	0.7	=	73.94	(79)
Southwest	0.9x	0.77	x	5.49	x	31.49		0.63	x	0.7	=	52.83	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	80.66	143.69	213.3	292.29	352.94	361.63	343.97	297	240.38	163.31	97.76	68.29	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	454.77	515.88	573.92	634.34	676.31	666.88	637.39	595.84	548.71	490.39	446.36	432.88	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.97	0.92	0.79	0.6	0.44	0.49	0.75	0.94	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.93	20.09	20.34	20.66	20.88	20.98	21	20.99	20.94	20.65	20.24	19.91	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.04	20.04	20.04	20.06	20.06	20.07	20.07	20.07	20.07	20.06	20.05	20.05	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.96	0.89	0.74	0.52	0.35	0.4	0.67	0.92	0.98	0.99	(89)

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

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(90)m=	18.62	18.85	19.22	19.66	19.94	20.06	20.07	20.07	20.02	19.66	19.08	18.59	(90)

fLA = Living area ÷ (4) = 0.58 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.38	19.57	19.87	20.24	20.49	20.59	20.61	20.61	20.55	20.23	19.75	19.35	(92)

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

(93)m=	19.38	19.57	19.87	20.24	20.49	20.59	20.61	20.61	20.55	20.23	19.75	19.35	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.98	0.96	0.9	0.77	0.57	0.4	0.45	0.71	0.92	0.98	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	438.07	429.65	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1017.25	986.6	896.2	748.15	578.01	387.82	259.37	271.38	420.18	633.55	837.42	1009.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	421.65	322.54	256.66	128.28	44.56	0	0	0	0	134.01	287.53	431.44	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 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 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		2026.67	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2128.01	(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		1969.13	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2067.59	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	41.96	(313)

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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		121.26	(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) =	121.26	(331)
Energy for lighting (calculated in Appendix L)		295.76	(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) =		4503.79	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	777.68	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	21.78	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	799.46	(373)
CO2 associated with space heating (secondary)	(309) x		0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x		0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =				799.46	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	62.93	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	153.5	(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) =				959.41	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				15.03	(384)
EI rating (section 14)					88.19	(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 10:49:51

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 60.42m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 00 - B

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 00 - B

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.42	(1a) x	2.65	(2a) =	160.11	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.42	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	160.11	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			3.49	x	1.4	=	4.886			(26)
Windows			6.56	x1/[1/(1.4)+ 0.04]		=	8.7			(27)
Floor			60.42	x	0.13	=	7.854599	110	6646.2	(28)
Walls Type1	19.85	10.05	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	5.68	0	5.68	x	0.13	=	0.74	9	51.12	(30)
Total area of elements, m²			137.15							(31)
Party wall			21.92	x	0	=	0	45	986.4	(32)
Party ceiling			54.74					30	1642.2	(32b)
Internal wall **			85.22					9	766.98	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.49 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13752.9 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 227.62 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.25 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 42.75 (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

DER WorkSheet: New dwelling design stage

(38)m=	16.54	16.34	16.14	15.15	14.95	13.96	13.96	13.76	14.36	14.95	15.35	15.75	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(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

Average = Sum(39)1…12 /12= 57.85 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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

Average = Sum(40)1…12 /12= 0.96 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.99 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.55 (43)
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=	89.7	86.44	83.18	79.91	76.65	73.39	73.39	76.65	79.91	83.18	86.44	89.7

Total = Sum(44)1…12 = 978.54 (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=	133.02	116.34	120.05	104.67	100.43	86.66	80.31	92.15	93.25	108.68	118.63	128.82

Total = Sum(45)1…12 = 1283.02 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.95	17.45	18.01	15.7	15.06	13	12.05	13.82	13.99	16.3	17.79	19.32	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

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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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (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	147.43	146.75	163.95	172.12	184.1	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.3	166.27	175.33	158.16	155.71	140.16	135.58	147.43	146.75	163.95	172.12	184.1	

Output from water heater (annual)$_{1...12}$ | 1933.86 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [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 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=	99.67	99.67	99.67	99.67	99.67	99.67	99.67	99.67	99.67	99.67	99.67	99.67	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	17.6	15.63	12.71	9.62	7.19	6.07	6.56	8.53	11.45	14.54	16.97	18.09	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	174	175.81	171.26	161.57	149.35	137.85	130.18	128.37	132.92	142.61	154.84	166.33	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(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 (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=	-79.74	-79.74	-79.74	-79.74	-79.74	-79.74	-79.74	-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 + (70)m + (71)m + (72)m

(73)m=	363.39	361.35	349.97	331.87	313.76	296.29	284.97	290.43	299.78	318.06	338.93	354.33	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
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)

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Northeast	0.9x	0.77	x	6.56	x	41.38	x	0.63	x	0.7	=	82.96	(75)
Northeast	0.9x	0.77	x	6.56	x	67.96	x	0.63	x	0.7	=	136.24	(75)
Northeast	0.9x	0.77	x	6.56	x	91.35	x	0.63	x	0.7	=	183.13	(75)
Northeast	0.9x	0.77	x	6.56	x	97.38	x	0.63	x	0.7	=	195.24	(75)
Northeast	0.9x	0.77	x	6.56	x	91.1	x	0.63	x	0.7	=	182.64	(75)
Northeast	0.9x	0.77	x	6.56	x	72.63	x	0.63	x	0.7	=	145.6	(75)
Northeast	0.9x	0.77	x	6.56	x	50.42	x	0.63	x	0.7	=	101.08	(75)
Northeast	0.9x	0.77	x	6.56	x	28.07	x	0.63	x	0.7	=	56.27	(75)
Northeast	0.9x	0.77	x	6.56	x	14.2	x	0.63	x	0.7	=	28.46	(75)
Northeast	0.9x	0.77	x	6.56	x	9.21	x	0.63	x	0.7	=	18.47	(75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	22.62	46.04	82.96	136.24	183.13	195.24	182.64	145.6	101.08	56.27	28.46	18.47	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	386.01	407.39	432.92	468.11	496.9	491.53	467.61	436.03	400.86	374.32	367.39	372.8	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.99	0.96	0.87	0.7	0.53	0.58	0.84	0.97	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.95	20.05	20.26	20.56	20.82	20.96	20.99	20.99	20.9	20.59	20.23	19.94	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.1	20.1	20.1	20.12	20.12	20.13	20.13	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=	0.99	0.99	0.98	0.95	0.83	0.62	0.43	0.48	0.77	0.96	0.99	1	(89)

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

(90)m=	18.7	18.85	19.15	19.59	19.94	20.11	20.13	20.13	20.04	19.63	19.12	18.69	(90)

fLA = Living area ÷ (4) = 0.6 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.45	19.57	19.82	20.18	20.47	20.62	20.65	20.65	20.56	20.21	19.79	19.44	(92)

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

(93)m=	19.45	19.57	19.82	20.18	20.47	20.62	20.65	20.65	20.56	20.21	19.79	19.44	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.98	0.95	0.85	0.66	0.49	0.54	0.81	0.96	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	383.49	403.45	424.54	443.16	423.22	325.98	227.32	235.95	323.86	358.55	363	370.76	(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	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	898.35	867.05	784.33	652.87	506.09	341.58	229.71	240.06	368.79	554.36	737.07	891.52	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	383.06	311.54	267.69	150.99	61.66	0	0	0	0	145.68	269.33	387.45

Total per year (kWh/year) = Sum(98)1...5,9...12 = 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 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		1977.39	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2076.26	(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		1933.86	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2030.56	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(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) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		128.53	(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) =	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 kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year

DER WorkSheet: New dwelling design stage

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	=	761.23	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	21.31	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	782.54	(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) =			782.54	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	66.71	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	161.32	(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) =			954.1	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			15.79	(384)
EI rating (section 14)				87.87	(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 10:49:25

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 59.22m²

Site Reference : Highgate Road - GREEN **Plot 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	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	**OK**
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - 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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	**OK**
MVHR efficiency:	89%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	9.01m²	
Ventilation rate:	2.00	

10 Key features

Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 00 - C

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	59.22	(1a)	x	2.65	(2a)	=	156.93	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	59.22	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	156.93	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.94	x	1.4	=	4.116			(26)
Windows			9.01	x1/[1/(1.4)+ 0.04]		=	11.95			(27)
Floor			59.22	x	0.13	=	7.6986	110	6514.2	(28)
Walls Type1	23.47	11.95	11.52	x	0.18	=	2.07	60	691.2	(29)
Walls Type2	35.26	0	35.26	x	0.17	=	5.89	60	2115.6	(29)
Roof	6.91	0	6.91	x	0.13	=	0.9	9	62.19	(30)
Total area of elements, m²			124.86							(31)
Party wall			26	x	0	=	0	45	1170	(32)
Party ceiling			52.3					30	1569	(32b)
Internal wall **			101.81					9	916.29	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.62 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13038.48 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 220.17 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.34 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 42.96 (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

DER WorkSheet: New dwelling design stage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(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		(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	59.17	58.98	58.78	57.81	57.62	56.65	56.65	56.45	57.04	57.62	58.01	58.4		

Average = Sum(39)1...12 /12= 57.77 (39)

Heat loss parameter (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

Average = Sum(40)1...12 /12= 0.98 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.96 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 80.74 (43)

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=	88.81	85.58	82.35	79.12	75.89	72.66	72.66	75.89	79.12	82.35	85.58	88.81

Total = Sum(44)1...12 = 968.86 (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=	131.71	115.19	118.87	103.63	99.44	85.81	79.51	91.24	92.33	107.6	117.46	127.55

Total = Sum(45)1...12 = 1270.32 (45)

If instantaneous water heating 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 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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (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	170.95	182.83	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	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 heater (annual)$_{1...12}$ | 1921.16 | (64)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m=	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	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 + (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 applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (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)

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Northeast 0.9x	0.77	x	9.01	x	41.38	x	0.63	x	0.7	=	113.94 (75)
Northeast 0.9x	0.77	x	9.01	x	67.96	x	0.63	x	0.7	=	187.12 (75)
Northeast 0.9x	0.77	x	9.01	x	91.35	x	0.63	x	0.7	=	251.53 (75)
Northeast 0.9x	0.77	x	9.01	x	97.38	x	0.63	x	0.7	=	268.16 (75)
Northeast 0.9x	0.77	x	9.01	x	91.1	x	0.63	x	0.7	=	250.85 (75)
Northeast 0.9x	0.77	x	9.01	x	72.63	x	0.63	x	0.7	=	199.98 (75)
Northeast 0.9x	0.77	x	9.01	x	50.42	x	0.63	x	0.7	=	138.84 (75)
Northeast 0.9x	0.77	x	9.01	x	28.07	x	0.63	x	0.7	=	77.29 (75)
Northeast 0.9x	0.77	x	9.01	x	14.2	x	0.63	x	0.7	=	39.09 (75)
Northeast 0.9x	0.77	x	9.01	x	9.21	x	0.63	x	0.7	=	25.37 (75)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	31.07	63.24	113.94	187.12	251.53	268.16	250.85	199.98	138.84	77.29	39.09	25.37	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	388.8	419.08	458.77	514.35	561.11	560.61	532.12	486.51	434.36	390.6	372.79	374.15	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.98	0.94	0.82	0.62	0.46	0.52	0.8	0.96	0.99	1	(86)

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	20.99	20.91	20.59	20.21	19.9	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.08	20.09	20.09	20.1	20.11	20.12	20.12	20.12	20.11	20.11	20.1	20.09	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.97	0.92	0.77	0.55	0.37	0.43	0.73	0.94	0.99	0.99	(89)

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

(90)m=	18.64	18.81	19.16	19.64	19.97	20.1	20.12	20.12	20.04	19.63	19.07	18.62	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.21	19.36	19.66	20.07	20.37	20.49	20.51	20.51	20.43	20.06	19.58	19.2	(92)

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

(93)m=	19.21	19.36	19.66	20.07	20.37	20.49	20.51	20.51	20.43	20.06	19.58	19.2	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.99	0.99	0.97	0.92	0.79	0.58	0.41	0.47	0.75	0.94	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	385.39	413.3	445.27	471.67	441.11	324.74	220.37	229.66	327.32	368.13	366.82	371.41	(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	4.2	(96)

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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)1...5,9...12 = 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	
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) ÷ (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)

12b. CO2 Emissions – Community heating scheme

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

DER WorkSheet: New dwelling design stage

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	=	732.53	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	20.51	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	753.04	(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) =			753.04	(376)
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 (333) to (334) as applicable Item 1		0.52	x 0.01 =	-56.48	(380)
Total CO2, kg/year	sum of (376)…(382) =			909.2	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			15.35	(384)
EI rating (section 14)				88.31	(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 10:49:01

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 00 - D

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	64.41	(1a) x	2.65	(2a) =	170.69	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	64.41	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	170.69	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
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/[1/(1.4)+ 0.04]		=	8.91			(27)
Floor			64.41	x	0.13	=	8.373301	110	7085.101	(28)
Walls Type1	45.34	14.42	30.92	x	0.18	=	5.57	60	1855.2	(29)
Walls Type2	4.69	0	4.69	x	0.18	=	0.84	60	281.4	(29)
Roof	6.8	0	6.8	x	0.13	=	0.88	9	61.2	(30)
Total area of elements, m²			121.24							(31)
Party wall			47.16	x	0	=	0	45	2122.2	(32)
Party ceiling			57.61					30	1728.3	(32b)
Internal wall **			91.05					9	819.45	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.98 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13952.85 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 216.63 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 11.69 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 46.66 (37)

DER WorkSheet: New dwelling design stage

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=	17.63	17.42	17.21	16.15	15.94	14.88	14.88	14.67	15.31	15.94	16.36	16.79	(38)

Heat transfer coefficient, W/K (39)m = (37) + (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	

Average = Sum(39)$_{1...12}$ /12= 62.76 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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	

Average = Sum(40)$_{1...12}$ /12= 0.97 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.1 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 84.15 (43)

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=	92.57	89.2	85.83	82.47	79.1	75.74	75.74	79.1	82.47	85.83	89.2	92.57	

Total = Sum(44)$_{1...12}$ = 1009.81 (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=	137.27	120.06	123.89	108.01	103.64	89.43	82.87	95.1	96.23	112.15	122.42	132.94	

Total = Sum(45)$_{1...12}$ = 1324.02 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)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	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)$_{1...12}$ | 1974.86 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(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	(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	(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 Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c	Gains (W)

Northeast	0.9x	0.77	x	5.09	x	11.28	x	0.63	x	0.7	=	17.55	(75)
Northeast	0.9x	0.77	x	5.09	x	22.97	x	0.63	x	0.7	=	35.73	(75)
Northeast	0.9x	0.77	x	5.09	x	41.38	x	0.63	x	0.7	=	64.37	(75)
Northeast	0.9x	0.77	x	5.09	x	67.96	x	0.63	x	0.7	=	105.71	(75)
Northeast	0.9x	0.77	x	5.09	x	91.35	x	0.63	x	0.7	=	142.1	(75)
Northeast	0.9x	0.77	x	5.09	x	97.38	x	0.63	x	0.7	=	151.49	(75)
Northeast	0.9x	0.77	x	5.09	x	91.1	x	0.63	x	0.7	=	141.71	(75)
Northeast	0.9x	0.77	x	5.09	x	72.63	x	0.63	x	0.7	=	112.98	(75)
Northeast	0.9x	0.77	x	5.09	x	50.42	x	0.63	x	0.7	=	78.43	(75)
Northeast	0.9x	0.77	x	5.09	x	28.07	x	0.63	x	0.7	=	43.66	(75)
Northeast	0.9x	0.77	x	5.09	x	14.2	x	0.63	x	0.7	=	22.08	(75)
Northeast	0.9x	0.77	x	5.09	x	9.21	x	0.63	x	0.7	=	14.33	(75)
Southeast	0.9x	0.77	x	6.72	x	36.79	x	0.63	x	0.7	=	75.56	(77)
Southeast	0.9x	0.77	x	6.72	x	62.67	x	0.63	x	0.7	=	128.71	(77)
Southeast	0.9x	0.77	x	6.72	x	85.75	x	0.63	x	0.7	=	176.11	(77)
Southeast	0.9x	0.77	x	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 watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	93.12	164.44	240.48	323.92	386.51	394.14	375.65	327.36	269.12	185.92	112.59	79	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	469.06	538.49	602.91	667.7	711.49	700.89	670.49	627.63	578.91	514.55	462.87	445.36	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.89	0.74	0.55	0.4	0.45	0.69	0.92	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.98	20.15	20.41	20.71	20.91	20.98	21	21	20.95	20.7	20.29	19.95	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.08	20.09	20.09	20.1	20.11	20.12	20.12	20.12	20.12	20.11	20.1	20.1	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.86	0.69	0.48	0.32	0.36	0.62	0.89	0.98	0.99	(89)

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

DER WorkSheet: New dwelling design stage

(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)

fLA = Living area ÷ (4) = 0.63 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.52	19.72	20.02	20.37	20.58	20.66	20.67	20.67	20.63	20.35	19.88	19.49	(92)

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

(93)m=	19.52	19.72	20.02	20.37	20.58	20.66	20.67	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 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	
Utilisation factor for gains, hm:													
(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													
(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													
(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]													
(97)m=	978.27	949.85	863.68	720.48	556.05	373.13	250.74	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)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)1...5,9...12 = 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 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		1782.41	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1871.53	(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		1974.86	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2073.6	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	39.45	(313)

DER WorkSheet: New dwelling design stage

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		137.02	(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) =	137.02	(331)
Energy for lighting (calculated in Appendix 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) + (332)...(237b) =		4268.24	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	731.26	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	20.48	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	751.73	(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	(373) + (374) + (375) =				751.73	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	71.11	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	153.05	(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) =				919.42	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.27	(384)
EI rating (section 14)					88.74	(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 10:48:35

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.88m²

Site Reference : Highgate Road - GREEN **Plot 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	Average	Highest	
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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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: South East	$9.14m^2$	
Ventilation rate:	3.00	

10 Key features

Air permeablility	$3.0\ m^3/m^2h$
Party Walls U-value	$0\ W/m^2K$
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 00 - E

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	61.88	(1a)	x	2.65	(2a)	=	163.98	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.88	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			163.98	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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

(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.61	x	1.4	=	3.654			(26)
Windows			9.14	x1/[1/(1.4)+ 0.04]		=	12.12			(27)
Floor			61.88	x	0.13	=	8.0444	110	6806.8	(28)
Walls Type1	21.92	11.75	10.17	x	0.18	=	1.83	60	610.2	(29)
Walls Type2	27.99	0	27.99	x	0.15	=	4.34	60	1679.4	(29)
Roof	24.98	0	24.98	x	0.13	=	3.25	9	224.82	(30)
Total area of elements, m²			136.77							(31)
Party wall			42.78	x	0	=	0	45	1925.1	(32)
Party ceiling			36.89					30	1106.7	(32b)
Internal wall **			120.68					9	1086.12	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 33.23 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13439.14 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 217.18 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 11.41 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 44.64 (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

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(38)m=	16.94	16.73	16.53	15.52	15.31	14.3	14.3	14.1	14.71	15.31	15.72	16.13	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(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	

Average = Sum(39)1...12 /12= 60.11 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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	

Average = Sum(40)1...12 /12= 0.97 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.03 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 82.51 (43)

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=	90.77	87.46	84.16	80.86	77.56	74.26	74.26	77.56	80.86	84.16	87.46	90.77	

Total = Sum(44)1...12 = 990.16 (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=	134.6	117.72	121.48	105.91	101.62	87.69	81.26	93.25	94.36	109.97	120.04	130.35	

Total = Sum(45)1...12 = 1298.26 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.19	17.66	18.22	15.89	15.24	13.15	12.19	13.99	14.15	16.5	18.01	19.55	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

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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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	189.88	167.65	176.76	159.4	156.9	141.19	136.54	148.52	147.85	165.25	173.53	185.63	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	189.88	167.65	176.76	159.4	156.9	141.19	136.54	148.52	147.85	165.25	173.53	185.63	

Output from water heater (annual)$_{1...12}$	1949.1	(64)

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

(65)m=	88.98	79.09	84.61	78.01	78.01	71.95	71.24	75.23	74.17	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 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=	101.71	101.71	101.71	101.71	101.71	101.71	101.71	101.71	101.71	101.71	101.71	101.71	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	16.8	14.92	12.13	9.19	6.87	5.8	6.26	8.14	10.93	13.88	16.19	17.26	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(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	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	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-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	108.58	114.87	117.69	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	367.57	365.63	354.24	336.02	317.72	300	288.44	293.83	303.17	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 applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (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)

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Southeast	0.9x	0.77	x	9.14	x	85.75	x	0.63	x	0.7	=	239.53	(77)
Southeast	0.9x	0.77	x	9.14	x	106.25	x	0.63	x	0.7	=	296.79	(77)
Southeast	0.9x	0.77	x	9.14	x	119.01	x	0.63	x	0.7	=	332.43	(77)
Southeast	0.9x	0.77	x	9.14	x	118.15	x	0.63	x	0.7	=	330.03	(77)
Southeast	0.9x	0.77	x	9.14	x	113.91	x	0.63	x	0.7	=	318.18	(77)
Southeast	0.9x	0.77	x	9.14	x	104.39	x	0.63	x	0.7	=	291.59	(77)
Southeast	0.9x	0.77	x	9.14	x	92.85	x	0.63	x	0.7	=	259.36	(77)
Southeast	0.9x	0.77	x	9.14	x	69.27	x	0.63	x	0.7	=	193.49	(77)
Southeast	0.9x	0.77	x	9.14	x	44.07	x	0.63	x	0.7	=	123.1	(77)
Southeast	0.9x	0.77	x	9.14	x	31.49	x	0.63	x	0.7	=	87.96	(77)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	102.78	175.07	239.53	296.79	332.43	330.03	318.18	291.59	259.36	193.49	123.1	87.96	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	470.34	540.69	593.77	632.81	650.15	630.03	606.63	585.43	562.53	515.06	465.77	446.25	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.95	0.89	0.77	0.58	0.42	0.46	0.68	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.02	20.2	20.44	20.71	20.9	20.98	21	21	20.96	20.72	20.33	19.99	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.09	20.09	20.09	20.11	20.11	20.12	20.12	20.13	20.12	20.11	20.1	20.1	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.97	0.94	0.86	0.72	0.51	0.34	0.37	0.61	0.88	0.97	0.99	(89)

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

fLA = Living area ÷ (4) = 0.56 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.47	19.69	19.98	20.3	20.51	20.6	20.61	20.61	20.57	20.32	19.85	19.44	(92)

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

(93)m=	19.47	19.69	19.98	20.3	20.51	20.6	20.61	20.61	20.57	20.32	19.85	19.44	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.97	0.94	0.87	0.74	0.55	0.39	0.42	0.65	0.88	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	462.89	524.04	557.31	549.73	480.93	345.68	235.37	245.79	365.54	455.52	451.06	440.59	(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	4.2	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	934.38	907.76	824.41	685.71	527.95	353.47	236.43	247.37	384.07	582.69	769.67	926.2	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(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(98)1...5,9...12 = 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 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		1625.56	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1706.84	(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		1949.1	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2046.56	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	37.53	(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		131.64	(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) =	131.64	(331)
Energy for lighting (calculated in Appendix L)		296.65	(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) =		4072.87	(338)

12b. CO2 Emissions – Community heating scheme

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

DER WorkSheet: New dwelling design stage

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	=	695.72	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	19.48	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	715.2	(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) =			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 (333) to (334) as applicable Item 1		0.52	x 0.01 =	-56.48	(380)
Total CO2, kg/year	sum of (376)…(382) =			881	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.24	(384)
EI rating (section 14)				88.95	(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 10:48:14

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:** 01 - 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)	31.68 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	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	(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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - A

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	48.96	(1a)	x	2.65	(2a)	=	129.74	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	48.96	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			129.74	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			5.45	x1/[1/(1.4)+ 0.04] =	7.23			(27)
Windows Type 2			6.09	x1/[1/(1.4)+ 0.04] =	8.07			(27)
Floor			48.96	x 0.13 =	6.364799	75	3672	(28)
Walls Type1	35.3	11.54	23.76	x 0.18 =	4.28	60	1425.6	(29)
Walls Type2	35.99	0	35.99	x 0.17 =	6.04	60	2159.4	(29)
Total area of elements, m²			120.25					(31)
Party wall			14.89	x 0 =	0	45	670.05	(32)
Party ceiling			48.96			30	1468.8	(32b)
Internal wall **			96.46			9	868.14	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 31.98 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10263.99 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 209.64 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.02 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41 (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=	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 coefficient, W/K (39)m = (37) + (38)m

(39)m=	54.4	54.24	54.08	53.28	53.12	52.32	52.32	52.16	52.64	53.12	53.44	53.76	

Average = $Sum(39)_{1...12}$ /12= 53.24 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	1.11	1.11	1.1	1.09	1.08	1.07	1.07	1.07	1.08	1.08	1.09	1.1

Average = Sum(40)$_{1...12}$ /12= 1.09 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 1.66 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 73.61 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)$_{1...12}$ = 883.37 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	120.08	105.03	108.38	94.49	90.66	78.23	72.5	83.19	84.18	98.11	107.09	116.29

Total = Sum(45)$_{1...12}$ = 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)

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)

Enter (50) or (54) in (55) — 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26

(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	175.36	154.95	163.65	147.98	145.94	131.73	127.77	138.47	137.68	153.38	160.59	171.57	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	175.36	154.95	163.65	147.98	145.94	131.73	127.77	138.47	137.68	153.38	160.59	171.57	

Output from water heater (annual)$_{1...12}$ 1809.07 (64)

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

(65)m=	84.15	74.86	80.26	74.21	74.37	68.81	68.33	71.88	70.79	76.84	78.4	82.89	(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=	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	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	6.25	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	114.51	108.13	106.63	110.41	118.45	128.61	138.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	(69)

Pumps and fans gains (Table 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=	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	(71)

Water heating gains (Table 5)

(72)m=	113.1	111.4	107.87	103.07	99.95	95.57	91.84	96.62	98.31	103.28	108.89	111.41	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	318.42	316.77	307.33	292.22	277.17	262.41	252.66	257.38	265	280.27	297.82	310.7	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	6.09	x	36.79	x	0.63	x	0.7	=	68.48	(77)
Southeast 0.9x	0.77	x	6.09	x	62.67	x	0.63	x	0.7	=	116.65	(77)
Southeast 0.9x	0.77	x	6.09	x	85.75	x	0.63	x	0.7	=	159.6	(77)
Southeast 0.9x	0.77	x	6.09	x	106.25	x	0.63	x	0.7	=	197.75	(77)
Southeast 0.9x	0.77	x	6.09	x	119.01	x	0.63	x	0.7	=	221.5	(77)

Southeast	0.9x	0.77	x	6.09	x	118.15	x	0.63	x	0.7	=	219.9	(77)
Southeast	0.9x	0.77	x	6.09	x	113.91	x	0.63	x	0.7	=	212.01	(77)
Southeast	0.9x	0.77	x	6.09	x	104.39	x	0.63	x	0.7	=	194.29	(77)
Southeast	0.9x	0.77	x	6.09	x	92.85	x	0.63	x	0.7	=	172.81	(77)
Southeast	0.9x	0.77	x	6.09	x	69.27	x	0.63	x	0.7	=	128.92	(77)
Southeast	0.9x	0.77	x	6.09	x	44.07	x	0.63	x	0.7	=	82.02	(77)
Southeast	0.9x	0.77	x	6.09	x	31.49	x	0.63	x	0.7	=	58.6	(77)
Southwest	0.9x	0.77	x	5.45	x	36.79		0.63	x	0.7	=	61.28	(79)
Southwest	0.9x	0.77	x	5.45	x	62.67		0.63	x	0.7	=	104.39	(79)
Southwest	0.9x	0.77	x	5.45	x	85.75		0.63	x	0.7	=	142.83	(79)
Southwest	0.9x	0.77	x	5.45	x	106.25		0.63	x	0.7	=	176.97	(79)
Southwest	0.9x	0.77	x	5.45	x	119.01		0.63	x	0.7	=	198.22	(79)
Southwest	0.9x	0.77	x	5.45	x	118.15		0.63	x	0.7	=	196.79	(79)
Southwest	0.9x	0.77	x	5.45	x	113.91		0.63	x	0.7	=	189.73	(79)
Southwest	0.9x	0.77	x	5.45	x	104.39		0.63	x	0.7	=	173.87	(79)
Southwest	0.9x	0.77	x	5.45	x	92.85		0.63	x	0.7	=	154.65	(79)
Southwest	0.9x	0.77	x	5.45	x	69.27		0.63	x	0.7	=	115.37	(79)
Southwest	0.9x	0.77	x	5.45	x	44.07		0.63	x	0.7	=	73.4	(79)
Southwest	0.9x	0.77	x	5.45	x	31.49		0.63	x	0.7	=	52.45	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	129.76	221.04	302.43	374.73	419.72	416.69	401.73	368.16	327.47	244.29	155.43	111.05	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	448.18	537.81	609.76	666.94	696.89	679.1	654.39	625.54	592.46	524.56	453.25	421.75	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.95	0.9	0.81	0.66	0.48	0.35	0.38	0.59	0.84	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.96	20.2	20.48	20.76	20.92	20.99	21	21	20.96	20.75	20.31	19.91	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.99	19.99	20	20.01	20.01	20.03	20.03	20.03	20.02	20.01	20.01	20	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.88	0.77	0.6	0.41	0.27	0.3	0.51	0.8	0.94	0.98	(89)

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

(90)m=	18.64	18.98	19.38	19.75	19.94	20.02	20.03	20.03	20	19.75	19.15	18.58	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	283.97	196.55	140.02	61.84	19.93	0	0	0	0	64.77	179.18	295.94	

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1242.21	(98)
Space heating requirement in kWh/m²/year		25.37	(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		1242.21	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1304.32	(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		1809.07	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1899.52	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.04	(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		104.15	(330a)

DER WorkSheet: New dwelling design stage

warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (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) + (312) + (315) + (331) + (332)...(237b) =		3426.74	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	610.48	(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) =				610.48	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		0.52		x 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)
EI rating (section 14)					89.64	(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 10:47:53

Project 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)	**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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - B

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.46	(1a) x	2.65	(2a) =	141.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.46	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	141.67	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			9.56	x1/[1/(1.4)+ 0.04]		=	12.67			(27)
Windows Type 2			3.98	x1/[1/(1.4)+ 0.04]		=	5.28			(27)
Floor			53.46	x	0.13	=	6.9498	75	4009.5	(28)
Walls Type1	40.04	13.54	26.5	x	0.18	=	4.77	60	1590	(29)
Walls Type2	12.16	0	12.16	x	0.17	=	2.04	60	729.6	(29)
Total area of elements, m²			105.66							(31)
Party wall			27.88	x	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-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) = 31.71 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10105.77 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 189.03 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.81 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 40.52 (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=	14.63	14.46	14.28	13.41	13.23	12.35	12.35	12.18	12.7	13.23	13.58	13.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	55.16	54.98	54.8	53.93	53.75	52.88	52.88	52.7	53.23	53.75	54.1	54.45	

Average = $Sum(39)_{1…12}$ /12= 53.88 (39)

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Heat loss parameter (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

Average = Sum(40)1…12 /12= 1.01 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.79 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 76.76 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)1…12 = 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

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:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.02	141.28	157.58	165.17	176.55	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.02	141.28	157.58	165.17	176.55	

Output from water heater (annual)$_{1...12}$ 1858.62 (64)

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

(65)m=	85.86	76.36	81.8	75.56	75.66	69.92	69.36	73.07	71.98	78.24	79.93	84.54	(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=	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	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 gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	156.21	157.83	153.74	145.05	134.07	123.75	116.86	115.24	119.33	128.02	139	149.32	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	(69)

Pumps and fans gains (Table 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=	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	(71)

Water heating gains (Table 5)

(72)m=	115.4	113.63	109.94	104.94	101.69	97.11	93.22	98.21	99.98	105.16	111.01	113.63	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	335.42	333.71	323.63	307.48	291.33	275.55	265.16	270.08	278.24	294.57	313.32	327.14	(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 Table 6d		Area m²		Flux Table 6a	g_ Table 6b		FF Table 6c		Gains (W)	
Southwest	0.9x	0.77	x	9.56	x	36.79	0.63	x	0.7	=	107.5	(79)
Southwest	0.9x	0.77	x	9.56	x	62.67	0.63	x	0.7	=	183.11	(79)
Southwest	0.9x	0.77	x	9.56	x	85.75	0.63	x	0.7	=	250.54	(79)
Southwest	0.9x	0.77	x	9.56	x	106.25	0.63	x	0.7	=	310.43	(79)
Southwest	0.9x	0.77	x	9.56	x	119.01	0.63	x	0.7	=	347.71	(79)

Southwest 0.9x	0.77	x	9.56	x	118.15		0.63	x	0.7	=	345.19	(79)
Southwest 0.9x	0.77	x	9.56	x	113.91		0.63	x	0.7	=	332.8	(79)
Southwest 0.9x	0.77	x	9.56	x	104.39		0.63	x	0.7	=	304.99	(79)
Southwest 0.9x	0.77	x	9.56	x	92.85		0.63	x	0.7	=	271.28	(79)
Southwest 0.9x	0.77	x	9.56	x	69.27		0.63	x	0.7	=	202.38	(79)
Southwest 0.9x	0.77	x	9.56	x	44.07		0.63	x	0.7	=	128.76	(79)
Southwest 0.9x	0.77	x	9.56	x	31.49		0.63	x	0.7	=	92	(79)
Northwest 0.9x	0.77	x	3.98	x	11.28	x	0.63	x	0.7	=	13.72	(81)
Northwest 0.9x	0.77	x	3.98	x	22.97	x	0.63	x	0.7	=	27.94	(81)
Northwest 0.9x	0.77	x	3.98	x	41.38	x	0.63	x	0.7	=	50.33	(81)
Northwest 0.9x	0.77	x	3.98	x	67.96	x	0.63	x	0.7	=	82.66	(81)
Northwest 0.9x	0.77	x	3.98	x	91.35	x	0.63	x	0.7	=	111.11	(81)
Northwest 0.9x	0.77	x	3.98	x	97.38	x	0.63	x	0.7	=	118.45	(81)
Northwest 0.9x	0.77	x	3.98	x	91.1	x	0.63	x	0.7	=	110.81	(81)
Northwest 0.9x	0.77	x	3.98	x	72.63	x	0.63	x	0.7	=	88.34	(81)
Northwest 0.9x	0.77	x	3.98	x	50.42	x	0.63	x	0.7	=	61.33	(81)
Northwest 0.9x	0.77	x	3.98	x	28.07	x	0.63	x	0.7	=	34.14	(81)
Northwest 0.9x	0.77	x	3.98	x	14.2	x	0.63	x	0.7	=	17.27	(81)
Northwest 0.9x	0.77	x	3.98	x	9.21	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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.95	0.9	0.79	0.63	0.45	0.33	0.36	0.58	0.84	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.94	20.18	20.48	20.77	20.93	20.99	21	21	20.96	20.74	20.29	19.9	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°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 factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.88	0.75	0.57	0.39	0.26	0.29	0.51	0.8	0.94	0.98	(89)

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

(90)m=	18.66	19.01	19.42	19.82	20.01	20.08	20.09	20.09	20.06	19.8	19.19	18.61	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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, hmGm , W = (94)m x (84)m													
(95)m=	440.75	508.82	546.29	531.19	445.95	307.94	205.7	215.23	327.97	428.45	430.11	418.09	(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	4.2	(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	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1242.49	(98)
Space heating requirement in kWh/m²/year	23.24	(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		1242.49	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1304.62	(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		1858.62	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1951.55	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.56	(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		113.73	(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) =			113.73	(331)
Energy for lighting (calculated in Appendix L)				245.94	(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) =				3507.02	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)			=	620.45	(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) =				620.45	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable Item 1			0.52	x 0.01 =	-56.48	(380)
Total CO2, kg/year	sum of (376)…(382) =				750.64	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.04	(384)
EI rating (section 14)					89.78	(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 10:47:33

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 60.89m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 01 - 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)	30.33 kg/m²	
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)	OK
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - C

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.89	(1a) x	2.65	(2a) =	161.36	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.89	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	161.36	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows 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)
Floor			60.89	x	0.13	=	7.915699	75	4566.75	(28)
Walls Type1	29.71	16.17	13.54	x	0.18	=	2.44	60	812.4	(29)
Walls Type2	13.52	0	13.52	x	0.17	=	2.27	60	811.2	(29)
Total area of elements, m²			104.12							(31)
Party wall			29.71	x	0	=	0	45	1336.95	(32)
Party ceiling			60.89					30	1826.7	(32b)
Internal wall **			146.17					9	1315.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.06 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10669.53 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 175.23 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.47 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 44.53 (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=	16.89	16.69	16.49	15.5	15.3	14.3	14.3	14.1	14.7	15.3	15.69	16.09	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.42	61.22	61.02	60.02	59.82	58.82	58.82	58.62	59.22	59.82	60.22	60.62	

Average = Sum(39)$_{1…12}$ /12= 59.97 (39)

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Heat loss parameter (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

Average = Sum(40)$_{1…12}$ /12= 0.98 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.01 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.86 (43)
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=	90.04	86.77	83.5	80.22	76.95	73.67	73.67	76.95	80.22	83.5	86.77	90.04

Total = Sum(44)$_{1…12}$ = 982.3 (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=	133.53	116.79	120.52	105.07	100.82	87	80.62	92.51	93.61	109.1	119.09	129.32

Total = Sum(45)$_{1…12}$ = 1287.96 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.03	17.52	18.08	15.76	15.12	13.05	12.09	13.88	14.04	16.36	17.86	19.4

(46)

Water storage loss:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26

(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.81	166.72	175.79	158.56	156.09	140.49	135.89	147.78	147.11	164.37	172.58	184.6	

Output from water heater (annual)$_{1...12}$ 1938.8 (64)

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

(65)m=	88.62	78.77	84.29	77.73	77.74	71.72	71.03	74.98	73.92	80.5	82.39	87.22	(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=	100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33	100.33	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	15.62	13.87	11.28	8.54	6.38	5.39	5.82	7.57	10.16	12.9	15.06	16.05	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	(69)
Pumps and 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=	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	-80.27	(71)
Water heating gains (Table 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 gains = (66)m + (67)m + (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 calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	12.71	x	11.28	x	0.63	x	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	x	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 0.9x	0.77	x	12.71	x	97.38	x	0.63	x	0.7	=	378.27	(75)
Northeast 0.9x	0.77	x	12.71	x	91.1	x	0.63	x	0.7	=	353.87	(75)
Northeast 0.9x	0.77	x	12.71	x	72.63	x	0.63	x	0.7	=	282.11	(75)
Northeast 0.9x	0.77	x	12.71	x	50.42	x	0.63	x	0.7	=	195.85	(75)
Northeast 0.9x	0.77	x	12.71	x	28.07	x	0.63	x	0.7	=	109.02	(75)
Northeast 0.9x	0.77	x	12.71	x	14.2	x	0.63	x	0.7	=	55.15	(75)
Northeast 0.9x	0.77	x	12.71	x	9.21	x	0.63	x	0.7	=	35.79	(75)
Northwest 0.9x	0.77	x	3.46	x	11.28	x	0.63	x	0.7	=	11.93	(81)
Northwest 0.9x	0.77	x	3.46	x	22.97	x	0.63	x	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.46	x	41.38	x	0.63	x	0.7	=	43.75	(81)
Northwest 0.9x	0.77	x	3.46	x	67.96	x	0.63	x	0.7	=	71.86	(81)
Northwest 0.9x	0.77	x	3.46	x	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest 0.9x	0.77	x	3.46	x	97.38	x	0.63	x	0.7	=	102.98	(81)
Northwest 0.9x	0.77	x	3.46	x	91.1	x	0.63	x	0.7	=	96.33	(81)
Northwest 0.9x	0.77	x	3.46	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	x	3.46	x	50.42	x	0.63	x	0.7	=	53.32	(81)
Northwest 0.9x	0.77	x	3.46	x	28.07	x	0.63	x	0.7	=	29.68	(81)
Northwest 0.9x	0.77	x	3.46	x	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest 0.9x	0.77	x	3.46	x	9.21	x	0.63	x	0.7	=	9.74	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	55.76	113.5	204.48	335.82	451.41	481.25	450.2	358.9	249.17	138.7	70.16	45.53	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	418.78	474.7	554.59	668.09	765.75	778.14	735.65	649.6	548.92	456.47	408.63	399.37	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.94	0.84	0.66	0.47	0.35	0.41	0.68	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.72	19.91	20.24	20.66	20.9	20.98	21	20.99	20.92	20.57	20.08	19.69	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.08	20.08	20.08	20.1	20.1	20.11	20.11	20.11	20.11	20.1	20.09	20.09	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.81	0.61	0.41	0.28	0.33	0.61	0.89	0.97	0.99	(89)

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

(90)m=	18.37	18.64	19.12	19.7	20	20.1	20.11	20.11	20.04	19.6	18.9	18.34	(90)

fLA = Living area ÷ (4) = 0.46 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	366.34	281.63	215.02	93.69	27.2	0	0	0	0	119.13	251.65	373.92	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1728.59 (98)

Space heating requirement in kWh/m²/year 28.39 (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		1728.59	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1815.02	(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		1938.8	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2035.74	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	38.51	(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		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) + (330b) + (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) + (312) + (315) + (331) + (332)...(237b) =		4166.58	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	733.75	(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) =				733.75	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		0.52		x 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)
EI rating (section 14)					88.64	(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 10:47:15

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.98m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 01 - D

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Electricity (c)		
Fuel factor: 1.55 (electricity (c))		
Target Carbon Dioxide Emission Rate (TER)	29.99 kg/m²	
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	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	(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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	$12.07m^2$	
Ventilation rate:	4.00	

10 Key features	
Air permeablility	$3.0\ m^3/m^2h$
Party Walls U-value	$0\ W/m^2K$
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - D

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.98	(1a) x	2.65	(2a) =	164.25	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.98	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	164.25	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
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	30.87	12.07	18.8	x	0.18	=	3.38	60	1128	(29)
Walls Type2	27.45	0	27.45	x	0.17	=	4.61	60	1647	(29)
Total area of elements, m²			120.3							(31)
Party wall			31.67	x	0	=	0	45	1425.15	(32)
Party ceiling			61.89					30	1856.7	(32b)
Internal wall **			95.03					9	855.27	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.05 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 11560.62 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 186.52 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.43 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.48 (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=	16.97	16.76	16.56	15.54	15.34	14.32	14.32	14.12	14.73	15.34	15.75	16.15	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	58.45	58.25	58.04	57.03	56.82	55.81	55.81	55.6	56.21	56.82	57.23	57.64	

Average = Sum(39)$_{1\ldots12}$ /12= 56.98 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.04 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 82.58 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	90.84	87.53	84.23	80.93	77.62	74.32	74.32	77.62	80.93	84.23	87.53	90.84

Total = Sum(44)$_{1…12}$ = 990.95 (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=	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 = Sum(45)$_{1…12}$ = 1299.3 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.21	17.67	18.24	15.9	15.26	13.16	12.2	14	14.17	16.51	18.02	19.57	(46)

Water storage 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	189.99	167.74	176.85	159.49	156.98	141.26	136.6	148.6	147.93	165.33	173.63	185.74	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	189.99	167.74	176.85	159.49	156.98	141.26	136.6	148.6	147.93	165.33	173.63	185.74	

Output from water heater (annual)$_{1…12}$ 1950.14 (64)

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

(65)m=	89.01	79.12	84.65	78.04	78.04	71.98	71.26	75.25	74.19	80.82	82.74	87.6	(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=	101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85	101.85	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	16.02	14.23	11.57	8.76	6.55	5.53	5.97	7.77	10.42	13.23	15.45	16.47	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	177.91	179.76	175.11	165.2	152.7	140.95	133.1	131.25	135.9	145.81	158.31	170.06	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19	33.19	(69)

Pumps and 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=	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	-81.48	(71)

Water heating gains (Table 5)

(72)m=	119.64	117.73	113.77	108.39	104.89	99.97	95.78	101.14	103.05	108.62	114.92	117.74	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	367.13	365.28	354	335.9	317.69	300	288.41	293.72	302.93	321.22	342.23	357.82	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (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	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, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	41.62	84.72	152.64	250.67	336.95	359.23	336.05	267.9	185.99	103.53	52.37	33.99	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	408.75	449.99	506.64	586.58	654.65	659.23	624.46	561.62	488.92	424.75	394.6	391.81	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.89	0.73	0.53	0.39	0.45	0.72	0.93	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.86	20.01	20.29	20.66	20.9	20.98	21	20.99	20.93	20.61	20.18	19.84	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.13	20.13	20.14	20.15	20.15	20.17	20.17	20.17	20.16	20.15	20.15	20.14	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.86	0.68	0.46	0.32	0.37	0.65	0.91	0.98	0.99	(89)

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

(90)m=	18.61	18.83	19.23	19.75	20.05	20.15	20.17	20.17	20.1	19.7	19.09	18.59	(90)

fLA = Living area ÷ (4) = 0.41 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.13	19.32	19.67	20.12	20.4	20.49	20.51	20.51	20.44	20.07	19.54	19.1	(92)

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

(93)m=	19.13	19.32	19.67	20.12	20.4	20.49	20.51	20.51	20.44	20.07	19.54	19.1	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.97	0.95	0.86	0.69	0.49	0.35	0.4	0.68	0.91	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	402.16	438.36	479.15	504.57	454.72	323.15	217.17	226.61	331.3	385.86	383.5	386.49	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	866.53	839.72	764.37	640.06	494.25	328.96	218.04	228.34	356.44	538.18	711.9	859.04	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	345.5	269.72	212.21	97.55	29.41	0	0	0	0	113.33	236.45	351.58	(98)

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	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	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 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		1655.74	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1738.52	(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		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)…(307e) + (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 outside		131.85	(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) =	131.85	(331)
Energy for lighting (calculated in Appendix L)		282.93	(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) =		4092.13	(338)

12b. CO_2 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 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)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	721.44	(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) =			721.44	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	=	68.43	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	146.84	(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) =			880.24	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.2	(384)
EI rating (section 14)				88.97	(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 10:46:56

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.44m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - E

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.44	(1a) x	2.65	(2a) =	184.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.44	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	184.02	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Windows Type 2			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	41.51	11.89	29.62	x	0.18	=	5.33	60	1777.2	(29)
Walls Type2	16.73	0	16.73	x	0.17	=	2.81	60	1003.8	(29)
Total area of elements, m²			58.24							(31)
Party wall			40.43	x	0	=	0	45	1819.35	(32)
Party floor			69.44					40	2777.6	(32a)
Party ceiling			69.44					30	2083.2	(32b)
Internal wall **			136.21					9	1225.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 23.9 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10687.04 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 153.9 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.99 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 30.9 (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=	19.27	19.04	18.81	17.67	17.44	16.3	16.3	16.08	16.76	17.44	17.9	18.35	(38)

Heat transfer coefficient, W/K (39)m = (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	

Average = Sum(39)$_{1…12}$ /12= 48.51 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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

Average = Sum(40)$_{1…12}$ /12= 0.7 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.23 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.22 (43)

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=	95.94	92.45	88.97	85.48	81.99	78.5	78.5	81.99	85.48	88.97	92.45	95.94	
										Total = Sum(44)$_{1…12}$ =		1046.65	(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=	142.28	124.44	128.41	111.95	107.42	92.7	85.9	98.57	99.74	116.24	126.89	137.79	
										Total = Sum(45)$_{1…12}$ =		1372.32	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	21.34	18.67	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67	(46)

Water storage 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.56	174.37	183.69	165.44	162.7	146.19	141.17	153.84	153.24	171.52	180.38	193.07	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	197.56	174.37	183.69	165.44	162.7	146.19	141.17	153.84	153.24	171.52	180.38	193.07	

Output from water heater (annual)$_{1...12}$ 2023.16 (64)

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

(65)m=	91.53	81.32	86.92	80.02	79.94	73.62	72.78	76.99	75.96	82.87	84.98	90.04	(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=	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18	15.98	13	9.84	7.36	6.21	6.71	8.72	11.71	14.87	17.35	18.5	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	195.99	198.02	192.9	181.98	168.21	155.27	146.62	144.59	149.71	160.62	174.4	187.34	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	(69)

Pumps and fans 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=	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	(71)

Water heating gains (Table 5)

(72)m=	123.02	121.01	116.83	111.14	107.44	102.24	97.82	103.49	105.5	111.39	118.03	121.02	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	393.49	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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast	0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast	0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast	0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast	0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

Northeast	0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast	0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast	0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast	0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast	0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast	0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast	0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)
Southwest	0.9x	0.77	x	2.92	x	36.79		0.63	x	0.7	=	32.83	(79)
Southwest	0.9x	0.77	x	2.92	x	62.67		0.63	x	0.7	=	55.93	(79)
Southwest	0.9x	0.77	x	2.92	x	85.75		0.63	x	0.7	=	76.52	(79)
Southwest	0.9x	0.77	x	2.92	x	106.25		0.63	x	0.7	=	94.82	(79)
Southwest	0.9x	0.77	x	2.92	x	119.01		0.63	x	0.7	=	106.2	(79)
Southwest	0.9x	0.77	x	2.92	x	118.15		0.63	x	0.7	=	105.44	(79)
Southwest	0.9x	0.77	x	2.92	x	113.91		0.63	x	0.7	=	101.65	(79)
Southwest	0.9x	0.77	x	2.92	x	104.39		0.63	x	0.7	=	93.16	(79)
Southwest	0.9x	0.77	x	2.92	x	92.85		0.63	x	0.7	=	82.86	(79)
Southwest	0.9x	0.77	x	2.92	x	69.27		0.63	x	0.7	=	61.81	(79)
Southwest	0.9x	0.77	x	2.92	x	44.07		0.63	x	0.7	=	39.33	(79)
Southwest	0.9x	0.77	x	2.92	x	31.49		0.63	x	0.7	=	28.1	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.76	118.89	189.96	281.11	356.62	372.4	351.39	292.25	221.08	138.76	78.25	53.36	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	457.26	510.39	569.17	640.56	696.12	692.61	659.04	605.54	544.49	482.12	444.51	436.7	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.91	0.8	0.62	0.43	0.31	0.36	0.59	0.85	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.31	20.56	20.83	20.96	20.99	21	21	20.98	20.8	20.44	20.12	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.32	20.32	20.33	20.34	20.34	20.36	20.36	20.36	20.35	20.34	20.34	20.33	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.77	0.58	0.39	0.27	0.31	0.54	0.83	0.95	0.98	(89)

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

(90)m=	19.17	19.41	19.77	20.14	20.3	20.35	20.36	20.36	20.33	20.11	19.61	19.15	(90)

fLA = Living area ÷ (4) = 0.34 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

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(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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 = (94)m x (84)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													
(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]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	238.64	173.23	122.02	45.12	10.7	0	0	0	0	54.18	148.53	244.34	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1036.76 (98)

Space heating requirement in kWh/m²/year 14.93 (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		1036.76	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1088.59	(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		2023.16	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2124.32	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.13	(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		169.72	(330a)

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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) =	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) + (312) + (315) + (331) + (332)...(237b) =		3591.65	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	612.21	(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) =				612.21	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		0.52		x 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)
EI rating (section 14)					90.53	(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 10:46:41

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.61m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - F

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.61	(1a) x	2.65	(2a) =	184.47	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.61	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	184.47	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Windows Type 2			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	41.59	11.89	29.7	x	0.18	=	5.35	60	1782	(29)
Walls Type2	18.41	0	18.41	x	0.17	=	3.09	60	1104.6	(29)
Total area of elements, m²			60							(31)
Party wall			38.68	x	0	=	0	45	1740.6	(32)
Party floor			69.61					40	2784.4	(32a)
Party ceiling			69.61					30	2088.3	(32b)
Internal wall **			136.21					9	1225.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 24.2 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10725.79 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 154.08 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.99 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.19 (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=	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 coefficient, 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	

Average = Sum(39)$_{1…12}$ /12= 48.85 (39)

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Heat loss parameter (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

Average = Sum(40)1…12 /12= 0.7 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.24 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.32 (43)

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=	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 = Sum(44)1…12 =	1047.84	(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=	142.44	124.58	128.56	112.08	107.54	92.8	85.99	98.68	99.86	116.37	127.03	137.95	
											Total = Sum(45)1…12 =	1373.88	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	21.37	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69	(46)

Water storage 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.72	174.51	183.83	165.57	162.82	146.29	141.27	153.96	153.35	171.65	180.52	193.22	(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	0	(63)

Output from water heater

(64)m=	197.72	174.51	183.83	165.57	162.82	146.29	141.27	153.96	153.35	171.65	180.52	193.22	

Output from water heater (annual)$_{1...12}$ 2024.72 (64)

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

(65)m=	91.58	81.36	86.97	80.06	79.98	73.65	72.81	77.03	76	82.92	85.03	90.09	(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=	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.04	16.02	13.03	9.87	7.37	6.23	6.73	8.74	11.74	14.9	17.39	18.54	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	196.39	198.42	193.29	182.36	168.55	155.58	146.92	144.88	150.02	160.95	174.75	187.72	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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 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=	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	(71)

Water heating gains (Table 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 internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	394.07	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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast 0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

Northeast	0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast	0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast	0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast	0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast	0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast	0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast	0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)
Southwest	0.9x	0.77	x	2.92	x	36.79		0.63	x	0.7	=	32.83	(79)
Southwest	0.9x	0.77	x	2.92	x	62.67		0.63	x	0.7	=	55.93	(79)
Southwest	0.9x	0.77	x	2.92	x	85.75		0.63	x	0.7	=	76.52	(79)
Southwest	0.9x	0.77	x	2.92	x	106.25		0.63	x	0.7	=	94.82	(79)
Southwest	0.9x	0.77	x	2.92	x	119.01		0.63	x	0.7	=	106.2	(79)
Southwest	0.9x	0.77	x	2.92	x	118.15		0.63	x	0.7	=	105.44	(79)
Southwest	0.9x	0.77	x	2.92	x	113.91		0.63	x	0.7	=	101.65	(79)
Southwest	0.9x	0.77	x	2.92	x	104.39		0.63	x	0.7	=	93.16	(79)
Southwest	0.9x	0.77	x	2.92	x	92.85		0.63	x	0.7	=	82.86	(79)
Southwest	0.9x	0.77	x	2.92	x	69.27		0.63	x	0.7	=	61.81	(79)
Southwest	0.9x	0.77	x	2.92	x	44.07		0.63	x	0.7	=	39.33	(79)
Southwest	0.9x	0.77	x	2.92	x	31.49		0.63	x	0.7	=	28.1	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.76	118.89	189.96	281.11	356.62	372.4	351.39	292.25	221.08	138.76	78.25	53.36	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	457.84	510.96	569.72	641.07	696.59	693.05	659.46	605.97	544.94	482.6	445.04	437.26	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.92	0.8	0.62	0.44	0.32	0.36	0.59	0.85	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.3	20.55	20.83	20.96	20.99	21	21	20.98	20.79	20.44	20.12	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.32	20.32	20.32	20.34	20.34	20.36	20.36	20.36	20.35	20.34	20.34	20.33	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.77	0.58	0.39	0.27	0.31	0.54	0.83	0.95	0.98	(89)

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

(90)m=	19.16	19.4	19.76	20.13	20.3	20.35	20.36	20.36	20.33	20.1	19.6	19.14	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.53	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51	(92)

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

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(93)m=	19.53	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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=	442.81	483.37	510.56	497.42	415.67	283.37	189.97	198.39	303.11	400.16	419.22	425.1	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	242.87	176.71	125.05	46.74	11.25	0	0	0	0	55.96	151.71	248.6	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1058.9 (98)

Space heating requirement in kWh/m²/year 15.21 (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		1058.9	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1111.84	(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		2024.72	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2125.95	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.38	(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		170.14	(330a)

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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) =		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) + (312) + (315) + (331) + (332)...(237b) =			3617.74	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	616.95	(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) =				616.95	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		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)
EI rating (section 14)					90.48	(385)

Regulations Compliance Report

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Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.62m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 01 - G

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	**OK**
MVHR efficiency:	89%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Ventilation rate:	4.00	

10 Key features		
Air permeablility	3.0 m³/m²h	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - G

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(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 heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Walls Type1	31.4	8.97	22.43	x	0.18	=	4.04	60	1345.8	(29)
Walls Type2	22.92	0	22.92	x	0.17	=	3.85	60	1375.2	(29)
Total area of elements, m²			54.32							(31)
Party wall			30.08	x	0	=	0	45	1353.6	(32)
Party floor			50.62					40	2024.8	(32a)
Party ceiling			50.62					30	1518.6	(32b)
Internal wall **			83.2					9	748.8	(32c)

* *for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

** *include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 19.78 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8366.8 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 165.29 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.92 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.7 (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=	13.86	13.69	13.52	12.69	12.53	11.7	11.7	11.53	12.03	12.53	12.86	13.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	39.55	39.39	39.22	38.39	38.22	37.39	37.39	37.23	37.73	38.22	38.56	38.89	

Average = $Sum(39)_{1\ldots12}$ /12= 38.35 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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	

Average = Sum(40)$_{1...12}$ /12= 0.76 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.71 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 74.77 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 = Sum(44)$_{1...12}$ = 897.28 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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	

Total = Sum(45)$_{1...12}$ = 1176.48 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	18.3	16	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72	(46)

Water storage loss:

Storage volume (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)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 where (H11) is from Appendix H

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 thermostat)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.78	139	154.93	162.27	173.4	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.78	139	154.93	162.27	173.4	

Output from water heater (annual)$_{1...12}$ 1827.32 (64)

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

(65)m=	84.78	75.41	80.82	74.71	74.84	69.22	68.71	72.32	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 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=	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	13.59	12.07	9.81	7.43	5.55	4.69	5.07	6.59	8.84	11.22	13.1	13.97	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	(69)

Pumps and fans gains (Table 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=	-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 (Table 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 internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast 0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

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Northeast	0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast	0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast	0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast	0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast	0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast	0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast	0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)

Solar gains in watts, calculated for each 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 and 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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	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 internal temperature in living area T1 (follow steps 3 to 7 in Table 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 heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.27	20.27	20.28	20.29	20.29	20.31	20.31	20.31	20.3	20.29	20.29	20.28	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(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	(89)

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

(90)m=	19.1	19.31	19.66	20.06	20.24	20.3	20.31	20.31	20.28	20.03	19.54	19.09	(90)

fLA = Living area ÷ (4) = 0.49 (91)

Mean internal temperature (for the whole dwelling) = fLA × 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 adjustment to the mean internal temperature from Table 4e, where appropriate

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)m													
(95)m=	344.68	367.88	388.24	384.81	326.31	224.34	151.08	157.68	238.18	307.45	324.2	332.97	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	605.37	586.05	532.59	442.53	339.89	225.9	151.29	158.09	245.86	374.26	496.17	598.46	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	193.95	146.61	107.39	41.56	10.1	0	0	0	0	49.71	123.82	197.53	(98)

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	Total per year (kWh/year) = Sum(98)1...5,9...12 =	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 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		870.67	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	914.2	(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		1827.32	
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)…(307e) + (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 outside		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) =		3071.72	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	525.1	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	14.7	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	539.8	(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) =			539.8	(376)
CO2 associated with electricity for pumps and fans 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 (334) as applicable Item 1		0.52	x 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)
EI rating (section 14)				90.7	(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 10:46:11

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.92m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 01 - 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
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - H

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	63.92	(1a) x	2.65	(2a) =	169.39	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.92	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	169.39	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 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	61.09	18.32	42.77	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)
Total area of elements, m²			64.95							(31)
Party wall			37.5	x	0	=	0	45	1687.5	(32)
Party floor			63.92					40	2556.8	(32a)
Party ceiling			63.92					30	1917.6	(32b)
Internal wall **			113.47					9	1021.23	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.63 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9980.93 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 156.15 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.91 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 40.54 (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	15.82	14.77	14.77	14.56	15.19	15.82	16.24	16.66	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	58.04	57.83	57.62	56.57	56.36	55.32	55.32	55.11	55.73	56.36	56.78	57.2	

Average = Sum(39)$_{1…12}$ /12= 56.52 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.09 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 83.84 (43)

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=	92.22	88.87	85.51	82.16	78.81	75.45	75.45	78.81	82.16	85.51	88.87	92.22

Total = Sum(44)$_{1...12}$ = 1006.06 (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=	136.76	119.61	123.43	107.61	103.25	89.1	82.56	94.74	95.88	111.73	121.97	132.45

Total = Sum(45)$_{1...12}$ = 1319.1 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.51	17.94	18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87	(46)

Water storage loss:

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)

Enter (50) or (54) in (55) — 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.02	149.37	167.01	175.46	187.72	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.02	149.37	167.01	175.46	187.72	

Output from water heater (annual)$_{1…12}$ 1969.94 (64)

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

(65)m=	89.69	79.71	85.26	78.58	78.55	72.42	71.67	75.72	74.67	81.37	83.35	88.26	(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=	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 gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	(69)

Pumps and fans gains (Table 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=	-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 (Table 5)

(72)m=	120.56	118.62	114.6	109.13	105.58	100.58	96.34	101.78	103.71	109.37	115.76	118.63	(72)

Total internal gains = (66)m + (67)m + (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	298.82	308.23	326.92	348.4	364.37	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	9.56	x	11.28	x	0.63	x	0.7	=	32.96	(75)
Northeast 0.9x	0.77	x	9.56	x	22.97	x	0.63	x	0.7	=	67.1	(75)
Northeast 0.9x	0.77	x	9.56	x	41.38	x	0.63	x	0.7	=	120.89	(75)
Northeast 0.9x	0.77	x	9.56	x	67.96	x	0.63	x	0.7	=	198.54	(75)
Northeast 0.9x	0.77	x	9.56	x	91.35	x	0.63	x	0.7	=	266.88	(75)

Northeast	0.9x	0.77	x	9.56	x	97.38	x	0.63	x	0.7	=	284.52	(75)
Northeast	0.9x	0.77	x	9.56	x	91.1	x	0.63	x	0.7	=	266.17	(75)
Northeast	0.9x	0.77	x	9.56	x	72.63	x	0.63	x	0.7	=	212.19	(75)
Northeast	0.9x	0.77	x	9.56	x	50.42	x	0.63	x	0.7	=	147.31	(75)
Northeast	0.9x	0.77	x	9.56	x	28.07	x	0.63	x	0.7	=	82	(75)
Northeast	0.9x	0.77	x	9.56	x	14.2	x	0.63	x	0.7	=	41.48	(75)
Northeast	0.9x	0.77	x	9.56	x	9.21	x	0.63	x	0.7	=	26.92	(75)
Southeast	0.9x	0.77	x	8.76	x	36.79	x	0.63	x	0.7	=	98.5	(77)
Southeast	0.9x	0.77	x	8.76	x	62.67	x	0.63	x	0.7	=	167.79	(77)
Southeast	0.9x	0.77	x	8.76	x	85.75	x	0.63	x	0.7	=	229.57	(77)
Southeast	0.9x	0.77	x	8.76	x	106.25	x	0.63	x	0.7	=	284.45	(77)
Southeast	0.9x	0.77	x	8.76	x	119.01	x	0.63	x	0.7	=	318.61	(77)
Southeast	0.9x	0.77	x	8.76	x	118.15	x	0.63	x	0.7	=	316.31	(77)
Southeast	0.9x	0.77	x	8.76	x	113.91	x	0.63	x	0.7	=	304.95	(77)
Southeast	0.9x	0.77	x	8.76	x	104.39	x	0.63	x	0.7	=	279.47	(77)
Southeast	0.9x	0.77	x	8.76	x	92.85	x	0.63	x	0.7	=	248.58	(77)
Southeast	0.9x	0.77	x	8.76	x	69.27	x	0.63	x	0.7	=	185.44	(77)
Southeast	0.9x	0.77	x	8.76	x	44.07	x	0.63	x	0.7	=	117.98	(77)
Southeast	0.9x	0.77	x	8.76	x	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	234.89	350.47	483	585.49	600.83	571.12	491.66	395.89	267.44	159.46	111.22	(83)

Total gains – internal and 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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.94	0.87	0.73	0.55	0.39	0.28	0.32	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=	19.93	20.19	20.51	20.81	20.95	20.99	21	21	20.97	20.76	20.3	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(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	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.85	0.69	0.51	0.34	0.23	0.26	0.47	0.77	0.93	0.97	(89)

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

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	864.4	845.57	773.35	644.22	492.83	326.09	215.79	226.04	355.11	542.96	713.83	854.77	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	284.73	195.21	130.84	48.57	12.73	0	0	0	0	62.48	178.05	295.89	

Total per year (kWh/year) = Sum(98)1...5,9...12 =	1208.5	(98)
Space heating requirement in kWh/m²/year	18.91	(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		1208.5	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1268.93	(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		1969.94	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2068.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	33.37	(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		135.98	(330a)

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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) =	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) + (312) + (315) + (331) + (332)...(237b) =		3652.2	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	635.93	(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) =				635.93	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		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)
EI rating (section 14)					90.17	(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 10:45:56

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:** 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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	

10 Key features

Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 01 - I

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.34	(1a) x	2.65	(2a) =	159.9	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.34	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	159.9	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			4.7	x1/[1/(1.4)+ 0.04]		=	6.23			(27)
Windows Type 2			6.09	x1/[1/(1.4)+ 0.04]		=	8.07			(27)
Windows Type 3			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	52.8	13.71	39.09	x	0.18	=	7.04	60	2345.4	(29)
Walls Type2	27.31	0	27.31	x	0.17	=	4.59	60	1638.6	(29)
Total area of elements, m²			80.11							(31)
Party wall			16.88	x	0	=	0	45	759.6	(32)
Party floor			60.34					40	2413.6	(32a)
Party ceiling			60.34					30	1810.2	(32b)
Internal wall **			107.91					9	971.1901	(32c)

* *for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

** *include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.8 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9938.59 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 164.71 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.62 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 37.42 (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

DER WorkSheet: New dwelling design stage

(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)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	53.93	53.74	53.54	52.55	52.35	51.36	51.36	51.16	51.76	52.35	52.75	53.14	

Average = $Sum(39)_{1...12}$ /12= 52.5 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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	

Average = $Sum(40)_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.99 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.49 (43)

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=	89.64	86.38	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64

Total = $Sum(44)_{1...12}$ = 977.9 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	132.93	116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74

Total = $Sum(45)_{1...12}$ = 1282.18 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.94	17.44	18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

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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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)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	172.05	184.02	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.21	166.19	175.25	158.09	155.64	140.1	135.53	147.37	146.69	163.88	172.05	184.02	

Output from water heater (annual)$_{1…12}$ | 1933.02 | (64)

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

(65)m=	88.42	78.6	84.11	77.57	77.59	71.59	70.91	74.84	73.78	80.33	82.21	87.03	(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=	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 Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.49	13.76	11.19	8.47	6.33	5.35	5.78	7.51	10.08	12.8	14.94	15.93	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see 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	166.13	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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 (negative values) (Table 5)

(71)m=	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	(71)

Water heating gains (Table 5)

(72)m=	118.85	116.96	113.06	107.74	104.29	99.43	95.3	100.59	102.47	107.97	114.19	116.97	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	361.01	359.2	348.18	330.47	312.67	295.34	283.98	289.2	298.19	316.08	336.65	351.9	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast	0.9x	0.77	x	6.09	x	36.79	x	0.63	x	0.7	=	68.48	(77)
Southeast	0.9x	0.77	x	6.09	x	62.67	x	0.63	x	0.7	=	116.65	(77)

Southeast 0.9x	0.77	x	6.09	x	85.75	x	0.63	x	0.7	=	159.6	(77)
Southeast 0.9x	0.77	x	6.09	x	106.25	x	0.63	x	0.7	=	197.75	(77)
Southeast 0.9x	0.77	x	6.09	x	119.01	x	0.63	x	0.7	=	221.5	(77)
Southeast 0.9x	0.77	x	6.09	x	118.15	x	0.63	x	0.7	=	219.9	(77)
Southeast 0.9x	0.77	x	6.09	x	113.91	x	0.63	x	0.7	=	212.01	(77)
Southeast 0.9x	0.77	x	6.09	x	104.39	x	0.63	x	0.7	=	194.29	(77)
Southeast 0.9x	0.77	x	6.09	x	92.85	x	0.63	x	0.7	=	172.81	(77)
Southeast 0.9x	0.77	x	6.09	x	69.27	x	0.63	x	0.7	=	128.92	(77)
Southeast 0.9x	0.77	x	6.09	x	44.07	x	0.63	x	0.7	=	82.02	(77)
Southeast 0.9x	0.77	x	6.09	x	31.49	x	0.63	x	0.7	=	58.6	(77)
Southwest 0.9x	0.77	x	4.7	x	36.79		0.63	x	0.7	=	52.85	(79)
Southwest 0.9x	0.77	x	4.7	x	62.67		0.63	x	0.7	=	90.02	(79)
Southwest 0.9x	0.77	x	4.7	x	85.75		0.63	x	0.7	=	123.17	(79)
Southwest 0.9x	0.77	x	4.7	x	106.25		0.63	x	0.7	=	152.62	(79)
Southwest 0.9x	0.77	x	4.7	x	119.01		0.63	x	0.7	=	170.94	(79)
Southwest 0.9x	0.77	x	4.7	x	118.15		0.63	x	0.7	=	169.71	(79)
Southwest 0.9x	0.77	x	4.7	x	113.91		0.63	x	0.7	=	163.62	(79)
Southwest 0.9x	0.77	x	4.7	x	104.39		0.63	x	0.7	=	149.94	(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	69.27		0.63	x	0.7	=	99.49	(79)
Southwest 0.9x	0.77	x	4.7	x	44.07		0.63	x	0.7	=	63.3	(79)
Southwest 0.9x	0.77	x	4.7	x	31.49		0.63	x	0.7	=	45.23	(79)
Northwest 0.9x	0.77	x	2.92	x	11.28	x	0.63	x	0.7	=	10.07	(81)
Northwest 0.9x	0.77	x	2.92	x	22.97	x	0.63	x	0.7	=	20.5	(81)
Northwest 0.9x	0.77	x	2.92	x	41.38	x	0.63	x	0.7	=	36.93	(81)
Northwest 0.9x	0.77	x	2.92	x	67.96	x	0.63	x	0.7	=	60.64	(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	x	97.38	x	0.63	x	0.7	=	86.9	(81)
Northwest 0.9x	0.77	x	2.92	x	91.1	x	0.63	x	0.7	=	81.3	(81)
Northwest 0.9x	0.77	x	2.92	x	72.63	x	0.63	x	0.7	=	64.81	(81)
Northwest 0.9x	0.77	x	2.92	x	50.42	x	0.63	x	0.7	=	44.99	(81)
Northwest 0.9x	0.77	x	2.92	x	28.07	x	0.63	x	0.7	=	25.05	(81)
Northwest 0.9x	0.77	x	2.92	x	14.2	x	0.63	x	0.7	=	12.67	(81)
Northwest 0.9x	0.77	x	2.92	x	9.21	x	0.63	x	0.7	=	8.22	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	131.4	227.17	319.7	411.01	473.96	476.51	456.92	409.05	351.18	253.46	157.99	112.06	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(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)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

DER WorkSheet: New dwelling design stage

(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 ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × 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	(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

	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													
(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													
(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]													
(97)m=	814.42	795.35	725.02	601.93	460.68	305.71	203.32	212.81	333	509.67	672	805.28	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	256.41	173.67	118.07	46.74	13.38	0	0	0	0	52.7	156.87	267.08	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1084.92 (98)

Space heating requirement in kWh/m²/year 17.98 (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	1084.92

DER WorkSheet: New dwelling design stage

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1139.16	(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		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)…(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 4f): mechanical ventilation - balanced, extract or positive input from outside		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) + (330b) + (330g) =	128.36	(331)
Energy for lighting (calculated in Appendix L)		273.64	(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) =		3462.02	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	587.37	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	16.45	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	603.81	(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) =				603.81	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	66.62	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	142.02	(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) =				755.98	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.53	(384)
EI rating (section 14)					90.38	(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 10:45:43

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:** 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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - A

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	48.96	(1a)	x	2.65	(2a)	=	129.74	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	48.96	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			129.74	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 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	23.76	x	0.18	=	4.28	60	1425.6	(29)
Walls Type2	35.99	0	35.99	x	0.17	=	6.04	60	2159.4	(29)
Total area of elements, m²			71.29							(31)
Party wall			14.89	x	0	=	0	45	670.05	(32)
Party floor			48.96					40	1958.4	(32a)
Party ceiling			48.96					30	1468.8	(32b)
Internal wall **			96.46					9	868.14	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 25.62 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8550.39 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 174.64 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.71 (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=	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 coefficient, 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

Average = Sum(39)$_{1…12}$ /12= 43.95 (39)

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Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.66 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 73.61 (43)

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)$_{1...12}$ = 883.37 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	120.08	105.03	108.38	94.49	90.66	78.23	72.5	83.19	84.18	98.11	107.09	116.29

Total = Sum(45)$_{1...12}$ = 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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	175.36	154.95	163.65	147.98	145.94	131.73	127.77	138.47	137.68	153.38	160.59	171.57	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	175.36	154.95	163.65	147.98	145.94	131.73	127.77	138.47	137.68	153.38	160.59	171.57	

Output from water heater (annual)$_{1...12}$ 1809.07 (64)

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

(65)m=	84.15	74.86	80.26	74.21	74.37	68.81	68.33	71.88	70.79	76.84	78.4	82.89	(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=	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	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	6.25	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	114.51	108.13	106.63	110.41	118.45	128.61	138.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	(69)

Pumps and fans gains (Table 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=	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	(71)

Water heating gains (Table 5)

(72)m=	113.1	111.4	107.87	103.07	99.95	95.57	91.84	96.62	98.31	103.28	108.89	111.41	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	318.42	316.77	307.33	292.22	277.17	262.41	252.66	257.38	265	280.27	297.82	310.7	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	6.09	x	36.79	x	0.63	x	0.7	=	68.48	(77)
Southeast 0.9x	0.77	x	6.09	x	62.67	x	0.63	x	0.7	=	116.65	(77)
Southeast 0.9x	0.77	x	6.09	x	85.75	x	0.63	x	0.7	=	159.6	(77)
Southeast 0.9x	0.77	x	6.09	x	106.25	x	0.63	x	0.7	=	197.75	(77)
Southeast 0.9x	0.77	x	6.09	x	119.01	x	0.63	x	0.7	=	221.5	(77)

Southeast	0.9x	0.77	x	6.09	x	118.15	x	0.63	x	0.7	=	219.9	(77)
Southeast	0.9x	0.77	x	6.09	x	113.91	x	0.63	x	0.7	=	212.01	(77)
Southeast	0.9x	0.77	x	6.09	x	104.39	x	0.63	x	0.7	=	194.29	(77)
Southeast	0.9x	0.77	x	6.09	x	92.85	x	0.63	x	0.7	=	172.81	(77)
Southeast	0.9x	0.77	x	6.09	x	69.27	x	0.63	x	0.7	=	128.92	(77)
Southeast	0.9x	0.77	x	6.09	x	44.07	x	0.63	x	0.7	=	82.02	(77)
Southeast	0.9x	0.77	x	6.09	x	31.49	x	0.63	x	0.7	=	58.6	(77)
Southwest	0.9x	0.77	x	5.45	x	36.79		0.63	x	0.7	=	61.28	(79)
Southwest	0.9x	0.77	x	5.45	x	62.67		0.63	x	0.7	=	104.39	(79)
Southwest	0.9x	0.77	x	5.45	x	85.75		0.63	x	0.7	=	142.83	(79)
Southwest	0.9x	0.77	x	5.45	x	106.25		0.63	x	0.7	=	176.97	(79)
Southwest	0.9x	0.77	x	5.45	x	119.01		0.63	x	0.7	=	198.22	(79)
Southwest	0.9x	0.77	x	5.45	x	118.15		0.63	x	0.7	=	196.79	(79)
Southwest	0.9x	0.77	x	5.45	x	113.91		0.63	x	0.7	=	189.73	(79)
Southwest	0.9x	0.77	x	5.45	x	104.39		0.63	x	0.7	=	173.87	(79)
Southwest	0.9x	0.77	x	5.45	x	92.85		0.63	x	0.7	=	154.65	(79)
Southwest	0.9x	0.77	x	5.45	x	69.27		0.63	x	0.7	=	115.37	(79)
Southwest	0.9x	0.77	x	5.45	x	44.07		0.63	x	0.7	=	73.4	(79)
Southwest	0.9x	0.77	x	5.45	x	31.49		0.63	x	0.7	=	52.45	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	129.76	221.04	302.43	374.73	419.72	416.69	401.73	368.16	327.47	244.29	155.43	111.05	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	448.18	537.81	609.76	666.94	696.89	679.1	654.39	625.54	592.46	524.56	453.25	421.75	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.92	0.84	0.72	0.56	0.4	0.29	0.31	0.49	0.76	0.92	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.38	20.64	20.86	20.96	20.99	21	21	20.98	20.85	20.47	20.09	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.15	20.15	20.15	20.17	20.17	20.19	20.19	20.19	20.18	20.17	20.17	20.16	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.9	0.82	0.68	0.52	0.35	0.24	0.26	0.44	0.72	0.9	0.96	(89)

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

(90)m=	19.02	19.37	19.72	20.01	20.13	20.18	20.19	20.19	20.17	20.01	19.51	18.97	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

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(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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 = (94)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	689.14	673.12	612.61	507.26	387.6	257.47	171.63	179.6	280.53	430.55	569.04	681.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	197.75	127.99	83.22	31.68	8.88	0	0	0	0	34.46	115.88	207.69	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 807.54 (98)

Space heating requirement in kWh/m²/year 16.49 (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		807.54	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	847.92	(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		1809.07	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1899.52	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	27.47	(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		104.15	(330a)

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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) =			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) + (312) + (315) + (331) + (332)...(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 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	=	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)			=	523.52	(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) =				523.52	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		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)
EI rating (section 14)					90.88	(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 10:45:30

Project 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:** 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - B

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.46	(1a) x	2.65	(2a) =	141.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.46	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		141.67	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			9.56	x1/[1/(1.4)+ 0.04]		=	12.67			(27)
Windows Type 2			3.98	x1/[1/(1.4)+ 0.04]		=	5.28			(27)
Walls Type1	40.04	13.54	26.5	x	0.18	=	4.77	60	1590	(29)
Walls Type2	12.16	0	12.16	x	0.17	=	2.04	60	729.6	(29)
Total area of elements, m²			52.2							(31)
Party wall			27.88	x	0	=	0	45	1254.6	(32)
Party floor			53.46					70	3742.2	(32a)
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-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) = 24.76 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9838.47 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 184.03 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 30.85 (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=	14.63	14.46	14.28	13.41	13.23	12.35	12.35	12.18	12.7	13.23	13.58	13.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)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	

Average = Sum(39)$_{1…12}$ /12= 44.21 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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

Average = Sum(40)$_{1…12}$ /12= 0.83 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.79 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 76.76 (43)
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=	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)$_{1…12}$ = 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

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:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26

(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.02	141.28	157.58	165.17	176.55	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.02	141.28	157.58	165.17	176.55	

Output from water heater (annual)$_{1...12}$ 1858.62 (64)

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

(65)m=	85.86	76.36	81.8	75.56	75.66	69.92	69.36	73.07	71.98	78.24	79.93	84.54	(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=	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	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 gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	156.21	157.83	153.74	145.05	134.07	123.75	116.86	115.24	119.33	128.02	139	149.32	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	(69)

Pumps and fans gains (Table 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=	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	(71)

Water heating gains (Table 5)

(72)m=	115.4	113.63	109.94	104.94	101.69	97.11	93.22	98.21	99.98	105.16	111.01	113.63	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	335.42	333.71	323.63	307.48	291.33	275.55	265.16	270.08	278.24	294.57	313.32	327.14	(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 Table 6d		Area m²		Flux Table 6a	g_ Table 6b		FF Table 6c		Gains (W)	
Southwest	0.9x	0.77	x	9.56	x	36.79	0.63	x	0.7	=	107.5	(79)
Southwest	0.9x	0.77	x	9.56	x	62.67	0.63	x	0.7	=	183.11	(79)
Southwest	0.9x	0.77	x	9.56	x	85.75	0.63	x	0.7	=	250.54	(79)
Southwest	0.9x	0.77	x	9.56	x	106.25	0.63	x	0.7	=	310.43	(79)
Southwest	0.9x	0.77	x	9.56	x	119.01	0.63	x	0.7	=	347.71	(79)

Southwest	0.9x	0.77	x	9.56	x	118.15		0.63	x	0.7	=	345.19	(79)
Southwest	0.9x	0.77	x	9.56	x	113.91		0.63	x	0.7	=	332.8	(79)
Southwest	0.9x	0.77	x	9.56	x	104.39		0.63	x	0.7	=	304.99	(79)
Southwest	0.9x	0.77	x	9.56	x	92.85		0.63	x	0.7	=	271.28	(79)
Southwest	0.9x	0.77	x	9.56	x	69.27		0.63	x	0.7	=	202.38	(79)
Southwest	0.9x	0.77	x	9.56	x	44.07		0.63	x	0.7	=	128.76	(79)
Southwest	0.9x	0.77	x	9.56	x	31.49		0.63	x	0.7	=	92	(79)
Northwest	0.9x	0.77	x	3.98	x	11.28	x	0.63	x	0.7	=	13.72	(81)
Northwest	0.9x	0.77	x	3.98	x	22.97	x	0.63	x	0.7	=	27.94	(81)
Northwest	0.9x	0.77	x	3.98	x	41.38	x	0.63	x	0.7	=	50.33	(81)
Northwest	0.9x	0.77	x	3.98	x	67.96	x	0.63	x	0.7	=	82.66	(81)
Northwest	0.9x	0.77	x	3.98	x	91.35	x	0.63	x	0.7	=	111.11	(81)
Northwest	0.9x	0.77	x	3.98	x	97.38	x	0.63	x	0.7	=	118.45	(81)
Northwest	0.9x	0.77	x	3.98	x	91.1	x	0.63	x	0.7	=	110.81	(81)
Northwest	0.9x	0.77	x	3.98	x	72.63	x	0.63	x	0.7	=	88.34	(81)
Northwest	0.9x	0.77	x	3.98	x	50.42	x	0.63	x	0.7	=	61.33	(81)
Northwest	0.9x	0.77	x	3.98	x	28.07	x	0.63	x	0.7	=	34.14	(81)
Northwest	0.9x	0.77	x	3.98	x	14.2	x	0.63	x	0.7	=	17.27	(81)
Northwest	0.9x	0.77	x	3.98	x	9.21	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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	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 internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.24	20.47	20.71	20.91	20.98	21	21	21	20.99	20.88	20.55	20.2	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.21	20.21	20.22	20.23	20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.83	0.67	0.49	0.33	0.22	0.25	0.43	0.73	0.92	0.97	(89)

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

(90)m=	19.21	19.53	19.86	20.13	20.21	20.24	20.25	20.25	20.23	20.1	19.66	19.17	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

DER WorkSheet: New dwelling design stage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	195.8	124.45	75.21	23.46	4.97	0	0	0	0	29.62	112.12	205.7	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 771.33 (98)

Space heating requirement in kWh/m²/year 14.43 (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		771.33	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	809.9	(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		1858.62	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1951.55	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	27.61	(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		113.73	(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) =			113.73	(331)
Energy for lighting (calculated in Appendix L)				245.94	(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) =				3012.29	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	526.18	(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) =				526.18	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1			0.52	x 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)
EI rating (section 14)					91.07	(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 10:45:15

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.62m²

Site Reference : Highgate Road - GREEN **Plot 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - C

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.62	(1a) x	2.65	(2a) =	192.44	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.62	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	192.44	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0 ÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows 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	72.62	16.17	56.45	x	0.18	=	10.16	60	3387	(29)
Walls Type2	17.78	0	17.78	x	0.17	=	2.99	60	1066.8	(29)
Total area of elements, m²			90.4							(31)
Party wall			30.32	x	0	=	0	45	1364.4	(32)
Party floor			72.62					40	2904.8	(32a)
Party ceiling			72.62					30	2178.6	(32b)
Internal wall **			146.17					9	1315.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.58 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12217.13 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 168.23 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.11 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.69 (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=	20.15	19.91	19.67	18.48	18.24	17.05	17.05	16.81	17.53	18.24	18.72	19.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.84	61.6	61.36	60.17	59.93	58.74	58.74	58.51	59.22	59.93	60.41	60.89	

Average = Sum(39)$_{1…12}$ /12= 60.11 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.85	0.85	0.84	0.83	0.83	0.81	0.81	0.81	0.82	0.83	0.83	0.84

Average = Sum(40)1…12 /12= 0.83 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.31 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.02 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)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

Total = Sum(44)1…12 = 1068.18 (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=	145.21	127	131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63

Total = Sum(45)1…12 = 1400.56 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)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	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	200.48	176.93	186.33	167.75	164.91	148.1	142.94	155.87	155.29	173.91	182.99	195.9	

Output from water heater (annual)$_{1…12}$ 2051.4 (64)

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

(65)m=	92.5	82.17	87.8	80.78	80.67	74.25	73.37	77.67	76.64	83.67	85.85	90.98	(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=	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.13	16.1	13.09	9.91	7.41	6.26	6.76	8.79	11.79	14.97	17.48	18.63	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	(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=	-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 + (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 calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	12.71	x	11.28	x	0.63	x	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	x	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 0.9x	0.77	x	12.71	x	97.38	x	0.63	x	0.7	=	378.27	(75)
Northeast 0.9x	0.77	x	12.71	x	91.1	x	0.63	x	0.7	=	353.87	(75)
Northeast 0.9x	0.77	x	12.71	x	72.63	x	0.63	x	0.7	=	282.11	(75)
Northeast 0.9x	0.77	x	12.71	x	50.42	x	0.63	x	0.7	=	195.85	(75)
Northeast 0.9x	0.77	x	12.71	x	28.07	x	0.63	x	0.7	=	109.02	(75)
Northeast 0.9x	0.77	x	12.71	x	14.2	x	0.63	x	0.7	=	55.15	(75)
Northeast 0.9x	0.77	x	12.71	x	9.21	x	0.63	x	0.7	=	35.79	(75)
Northwest 0.9x	0.77	x	3.46	x	11.28	x	0.63	x	0.7	=	11.93	(81)
Northwest 0.9x	0.77	x	3.46	x	22.97	x	0.63	x	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.46	x	41.38	x	0.63	x	0.7	=	43.75	(81)
Northwest 0.9x	0.77	x	3.46	x	67.96	x	0.63	x	0.7	=	71.86	(81)
Northwest 0.9x	0.77	x	3.46	x	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest 0.9x	0.77	x	3.46	x	97.38	x	0.63	x	0.7	=	102.98	(81)
Northwest 0.9x	0.77	x	3.46	x	91.1	x	0.63	x	0.7	=	96.33	(81)
Northwest 0.9x	0.77	x	3.46	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	x	3.46	x	50.42	x	0.63	x	0.7	=	53.32	(81)
Northwest 0.9x	0.77	x	3.46	x	28.07	x	0.63	x	0.7	=	29.68	(81)
Northwest 0.9x	0.77	x	3.46	x	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest 0.9x	0.77	x	3.46	x	9.21	x	0.63	x	0.7	=	9.74	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	55.76	113.5	204.48	335.82	451.41	481.25	450.2	358.9	249.17	138.7	70.16	45.53	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	459.17	514.94	593.33	704.36	799.39	809.34	765.31	679.71	580.35	490.4	445.43	438.43	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.94	0.84	0.65	0.46	0.34	0.39	0.66	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.91	20.08	20.38	20.74	20.93	20.99	21	21	20.95	20.66	20.23	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.21	20.21	20.21	20.23	20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.81	0.61	0.41	0.28	0.33	0.6	0.89	0.97	0.99	(89)

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

(90)m=	18.74	18.99	19.42	19.93	20.17	20.24	20.24	20.25	20.2	19.84	19.23	18.72	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.19	19.41	19.79	20.24	20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17	(92)

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

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(93)m=	19.19	19.41	19.79	20.24	20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)
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	431.1	(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	4.2	(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	911.39	(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	0	103.45	234.84	357.33	

	Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ =	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 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		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: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2153.97	(310a)
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): mechanical ventilation - balanced, extract or positive input from outside		177.49	(330a)

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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 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 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)
EI rating (section 14)					89.36	(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 10:45:04

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.96m²

Site Reference : Highgate Road - GREEN **Plot 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - D

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.96	(1a) x	2.65	(2a) =	142.99	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.96	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	142.99	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows			12.07	x1/[1/(1.4)+ 0.04]		=	16			(27)
Walls Type1	27.66	12.07	15.59	x	0.18	=	2.81	60	935.4	(29)
Walls Type2	24.24	0	24.24	x	0.17	=	4.07	60	1454.4	(29)
Total area of elements, m²			51.9							(31)
Party wall			31.67	x	0	=	0	45	1425.15	(32)
Party floor			53.96					40	2158.4	(32a)
Party ceiling			53.96					30	1618.8	(32b)
Internal wall **			95.03					9	855.27	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8447.42 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 156.55 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.04 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 28.91 (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=	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 coefficient, W/K (39)m = (37) + (38)m

(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)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.81 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 77.11 (43)

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=	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 = Sum(44)1…12 = 925.35 (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=	125.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82

Total = Sum(45)1…12 = 1213.27 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.87	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27	(46)

Water storage loss:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	181.07	159.94	168.8	152.47	150.25	135.45	131.22	142.42	141.68	158.05	165.67	177.1	

Output from water heater (annual)$_{1...12}$ 1864.11 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(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)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	14.04	12.47	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	157.5	159.14	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	(69)
Pumps and fans gains (Table 5a)													
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	(71)
Water heating gains (Table 5)													
(72)m=	115.65	113.87	110.17	105.15	101.88	97.28	93.38	98.38	100.16	105.37	111.24	113.88	(72)
Total internal gains = (66)m + (67)m + (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	271.49	279.71	296.15	315.03	328.97	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (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	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, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	41.62	84.72	152.64	250.67	336.95	359.23	336.05	267.9	185.99	103.53	52.37	33.99	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	378.92	420.3	478.07	559.85	629.86	636.24	602.59	539.39	465.7	399.68	367.4	362.95	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.91	0.79	0.6	0.41	0.3	0.35	0.59	0.86	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.03	20.19	20.48	20.8	20.95	20.99	21	21	20.97	20.74	20.34	20	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.25	20.25	20.25	20.26	20.27	20.28	20.28	20.28	20.28	20.27	20.26	20.26	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.76	0.56	0.37	0.25	0.3	0.54	0.83	0.95	0.98	(89)

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

(90)m=	18.94	19.19	19.59	20.03	20.22	20.28	20.28	20.28	20.25	19.97	19.41	18.92	(90)

fLA = Living area ÷ (4) = | 0.47 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.45	19.66	20.01	20.4	20.57	20.62	20.62	20.62	20.59	20.33	19.85	19.43	(92)

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

(93)m=	19.45	19.66	20.01	20.4	20.57	20.62	20.62	20.62	20.59	20.33	19.85	19.43	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.95	0.89	0.76	0.57	0.39	0.28	0.32	0.56	0.84	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	365.75	397.48	427.33	427.25	360.81	247.22	166.11	173.41	261.73	334.22	345.95	352.08	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	661.94	642.24	585.42	487.92	374.76	248.93	166.37	173.92	270.77	411.33	543.52	654.55	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	220.37	164.48	117.62	43.69	10.37	0	0	0	0	57.37	142.25	225.03	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	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 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		981.18	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1030.24	(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		1864.11	
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) + (310a)…(310e)] =	29.88	(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) =		3241.49	(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 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	=	553.76	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	15.51	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	569.27	(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) =				569.27	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable Item 1		0.52		x 0.01 =	-56.48	(380)
Total CO2, kg/year	sum of (376)…(382) =				701.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.99	(384)
EI rating (section 14)					90.51	(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 10:44:53

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.44m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 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))		
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - E

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.44	(1a) x	2.65	(2a) =	184.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.44	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	184.02	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Windows Type 2			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	41.51	11.89	29.62	x	0.18	=	5.33	60	1777.2	(29)
Walls Type2	16.73	0	16.73	x	0.17	=	2.81	60	1003.8	(29)
Total area of elements, m²			58.24							(31)
Party wall			40.43	x	0	=	0	45	1819.35	(32)
Party floor			69.44					40	2777.6	(32a)
Party ceiling			69.44					30	2083.2	(32b)
Internal wall **			136.21					9	1225.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 23.9 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10687.04 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 153.9 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.99 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 30.9 (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=	19.27	19.04	18.81	17.67	17.44	16.3	16.3	16.08	16.76	17.44	17.9	18.35	(38)

Heat transfer coefficient, W/K (39)m = (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	

Average = Sum(39)$_{1…12}$ /12= 48.51 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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

Average = Sum(40)$_{1…12}$ /12= 0.7 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.23 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.22 (43)

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=	95.94	92.45	88.97	85.48	81.99	78.5	78.5	81.99	85.48	88.97	92.45	95.94

Total = Sum(44)$_{1…12}$ = 1046.65 (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=	142.28	124.44	128.41	111.95	107.42	92.7	85.9	98.57	99.74	116.24	126.89	137.79

Total = Sum(45)$_{1…12}$ = 1372.32 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.34	18.67	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67	(46)

Water storage 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.56	174.37	183.69	165.44	162.7	146.19	141.17	153.84	153.24	171.52	180.38	193.07	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	197.56	174.37	183.69	165.44	162.7	146.19	141.17	153.84	153.24	171.52	180.38	193.07

Output from water heater (annual)$_{1...12}$ 2023.16 (64)

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

(65)m=	91.53	81.32	86.92	80.02	79.94	73.62	72.78	76.99	75.96	82.87	84.98	90.04	(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=	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	18	15.98	13	9.84	7.36	6.21	6.71	8.72	11.71	14.87	17.35	18.5	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	195.99	198.02	192.9	181.98	168.21	155.27	146.62	144.59	149.71	160.62	174.4	187.34	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	(69)
Pumps and fans 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=	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	(71)
Water heating gains (Table 5)													
(72)m=	123.02	121.01	116.83	111.14	107.44	102.24	97.82	103.49	105.5	111.39	118.03	121.02	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	393.49	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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast 0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

Northeast 0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast 0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast 0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast 0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast 0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast 0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast 0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)
Southwest 0.9x	0.77	x	2.92	x	36.79		0.63	x	0.7	=	32.83	(79)
Southwest 0.9x	0.77	x	2.92	x	62.67		0.63	x	0.7	=	55.93	(79)
Southwest 0.9x	0.77	x	2.92	x	85.75		0.63	x	0.7	=	76.52	(79)
Southwest 0.9x	0.77	x	2.92	x	106.25		0.63	x	0.7	=	94.82	(79)
Southwest 0.9x	0.77	x	2.92	x	119.01		0.63	x	0.7	=	106.2	(79)
Southwest 0.9x	0.77	x	2.92	x	118.15		0.63	x	0.7	=	105.44	(79)
Southwest 0.9x	0.77	x	2.92	x	113.91		0.63	x	0.7	=	101.65	(79)
Southwest 0.9x	0.77	x	2.92	x	104.39		0.63	x	0.7	=	93.16	(79)
Southwest 0.9x	0.77	x	2.92	x	92.85		0.63	x	0.7	=	82.86	(79)
Southwest 0.9x	0.77	x	2.92	x	69.27		0.63	x	0.7	=	61.81	(79)
Southwest 0.9x	0.77	x	2.92	x	44.07		0.63	x	0.7	=	39.33	(79)
Southwest 0.9x	0.77	x	2.92	x	31.49		0.63	x	0.7	=	28.1	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.76	118.89	189.96	281.11	356.62	372.4	351.39	292.25	221.08	138.76	78.25	53.36	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	457.26	510.39	569.17	640.56	696.12	692.61	659.04	605.54	544.49	482.12	444.51	436.7	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.91	0.8	0.62	0.43	0.31	0.36	0.59	0.85	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.31	20.56	20.83	20.96	20.99	21	21	20.98	20.8	20.44	20.12	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.32	20.32	20.33	20.34	20.34	20.36	20.36	20.36	20.35	20.34	20.34	20.33	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.77	0.58	0.39	0.27	0.31	0.54	0.83	0.95	0.98	(89)

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

(90)m=	19.17	19.41	19.77	20.14	20.3	20.35	20.36	20.36	20.33	20.11	19.61	19.15	(90)

fLA = Living area ÷ (4) = 0.34 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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 = (94)m x (84)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													
(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]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	238.64	173.23	122.02	45.12	10.7	0	0	0	0	54.18	148.53	244.34	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1036.76	(98)
Space heating requirement in kWh/m²/year	14.93	(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		1036.76	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1088.59	(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		2023.16	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2124.32	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.13	(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		169.72	(330a)

DER WorkSheet: New dwelling design stage

warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (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) + (312) + (315) + (331) + (332)...(237b) =		3591.65	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	612.21	(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) =				612.21	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		0.52		x 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)
EI rating (section 14)					90.53	(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 10:44:42

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.61m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - F

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.61	(1a) x	2.65	(2a) =	184.47	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.61	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	184.47	(5)

2. Ventilation rate:

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

Air changes per hour

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Windows Type 2			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	41.59	11.89	29.7	x	0.18	=	5.35	60	1782	(29)
Walls Type2	18.41	0	18.41	x	0.17	=	3.09	60	1104.6	(29)
Total area of elements, m²			60							(31)
Party wall			38.68	x	0	=	0	45	1740.6	(32)
Party floor			69.61					40	2784.4	(32a)
Party ceiling			69.61					30	2088.3	(32b)
Internal wall **			136.21					9	1225.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 24.2 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10725.79 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 154.08 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.99 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.19 (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=	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 coefficient, 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	

Average = Sum(39)$_{1…12}$ /12= 48.85 (39)

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Heat loss parameter (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

Average = Sum(40)$_{1...12}$ /12= 0.7 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.24 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.32 (43)

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=	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 = Sum(44)$_{1...12}$ = 1047.84 (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=	142.44	124.58	128.56	112.08	107.54	92.8	85.99	98.68	99.86	116.37	127.03	137.95

Total = Sum(45)$_{1...12}$ = 1373.88 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.37	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69	(46)

Water storage 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.72	174.51	183.83	165.57	162.82	146.29	141.27	153.96	153.35	171.65	180.52	193.22	(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	0	(63)

Output from water heater

(64)m=	197.72	174.51	183.83	165.57	162.82	146.29	141.27	153.96	153.35	171.65	180.52	193.22	

Output from water heater (annual)$_{1...12}$ 2024.72 (64)

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

(65)m=	91.58	81.36	86.97	80.06	79.98	73.65	72.81	77.03	76	82.92	85.03	90.09	(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=	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.04	16.02	13.03	9.87	7.37	6.23	6.73	8.74	11.74	14.9	17.39	18.54	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	196.39	198.42	193.29	182.36	168.55	155.58	146.92	144.88	150.02	160.95	174.75	187.72	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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 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=	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	(71)

Water heating gains (Table 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 internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	394.07	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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast	0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast	0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast	0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast	0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

Northeast 0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast 0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast 0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast 0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast 0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast 0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast 0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)
Southwest 0.9x	0.77	x	2.92	x	36.79		0.63	x	0.7	=	32.83	(79)
Southwest 0.9x	0.77	x	2.92	x	62.67		0.63	x	0.7	=	55.93	(79)
Southwest 0.9x	0.77	x	2.92	x	85.75		0.63	x	0.7	=	76.52	(79)
Southwest 0.9x	0.77	x	2.92	x	106.25		0.63	x	0.7	=	94.82	(79)
Southwest 0.9x	0.77	x	2.92	x	119.01		0.63	x	0.7	=	106.2	(79)
Southwest 0.9x	0.77	x	2.92	x	118.15		0.63	x	0.7	=	105.44	(79)
Southwest 0.9x	0.77	x	2.92	x	113.91		0.63	x	0.7	=	101.65	(79)
Southwest 0.9x	0.77	x	2.92	x	104.39		0.63	x	0.7	=	93.16	(79)
Southwest 0.9x	0.77	x	2.92	x	92.85		0.63	x	0.7	=	82.86	(79)
Southwest 0.9x	0.77	x	2.92	x	69.27		0.63	x	0.7	=	61.81	(79)
Southwest 0.9x	0.77	x	2.92	x	44.07		0.63	x	0.7	=	39.33	(79)
Southwest 0.9x	0.77	x	2.92	x	31.49		0.63	x	0.7	=	28.1	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.76	118.89	189.96	281.11	356.62	372.4	351.39	292.25	221.08	138.76	78.25	53.36	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	457.84	510.96	569.72	641.07	696.59	693.05	659.46	605.97	544.94	482.6	445.04	437.26	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.92	0.8	0.62	0.44	0.32	0.36	0.59	0.85	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.3	20.55	20.83	20.96	20.99	21	21	20.98	20.79	20.44	20.12	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.32	20.32	20.32	20.34	20.34	20.36	20.36	20.36	20.35	20.34	20.34	20.33	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.77	0.58	0.39	0.27	0.31	0.54	0.83	0.95	0.98	(89)

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

(90)m=	19.16	19.4	19.76	20.13	20.3	20.35	20.36	20.36	20.33	20.1	19.6	19.14	(90)

fLA = Living area ÷ (4) = | 0.38 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.53	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51	(92)

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

(93)m=	19.53	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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=	442.81	483.37	510.56	497.42	415.67	283.37	189.97	198.39	303.11	400.16	419.22	425.1	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	242.87	176.71	125.05	46.74	11.25	0	0	0	0	55.96	151.71	248.6	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1058.9	(98)
Space heating requirement in kWh/m²/year	15.21	(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		1058.9	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1111.84	(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		2024.72	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2125.95	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.38	(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		170.14	(330a)

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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) =		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) + (312) + (315) + (331) + (332)...(237b) =			3617.74	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	616.95	(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) =				616.95	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable Item 1		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)
EI rating (section 14)					90.48	(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 10:44:32

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.62m²

Site Reference : Highgate Road - GREEN **Plot 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	**OK**
MVHR efficiency:	89%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Ventilation rate:	4.00	

10 Key features

Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - G

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(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 heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Walls Type1	31.4	8.97	22.43	x	0.18	=	4.04	60	1345.8	(29)
Walls Type2	22.92	0	22.92	x	0.17	=	3.85	60	1375.2	(29)
Total area of elements, m²			54.32							(31)
Party wall			30.08	x	0	=	0	45	1353.6	(32)
Party floor			50.62					40	2024.8	(32a)
Party ceiling			50.62					30	1518.6	(32b)
Internal wall **			83.2					9	748.8	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 19.78 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8366.8 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 165.29 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.92 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.7 (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=	13.86	13.69	13.52	12.69	12.53	11.7	11.7	11.53	12.03	12.53	12.86	13.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	39.55	39.39	39.22	38.39	38.22	37.39	37.39	37.23	37.73	38.22	38.56	38.89	

Average = Sum(39)$_{1…12}$ /12= 38.35 (39)

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Heat loss parameter (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

Average = Sum(40)$_{1…12}$ /12= 0.76 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.71 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 74.77 (43)

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=	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 = Sum(44)$_{1…12}$ = 897.28 (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=	121.98	106.68	110.09	95.97	92.09	79.47	73.64	84.5	85.51	99.65	108.78	118.13

Total = Sum(45)$_{1…12}$ = 1176.48 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.3	16	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72	(46)

Water storage loss:

Storage volume (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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.78	139	154.93	162.27	173.4	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.78	139	154.93	162.27	173.4	

Output from water heater (annual)$_{1...12}$ 1827.32 (64)

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

(65)m=	84.78	75.41	80.82	74.71	74.84	69.22	68.71	72.32	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 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=	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	13.59	12.07	9.81	7.43	5.55	4.69	5.07	6.59	8.84	11.22	13.1	13.97	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	(69)

Pumps and fans gains (Table 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=	-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 (Table 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 internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast 0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

DER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast	0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast	0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast	0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast	0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast	0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast	0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)

Solar gains in watts, calculated for each 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 and 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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	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 internal temperature in living area T1 (follow steps 3 to 7 in Table 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 heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.27	20.27	20.28	20.29	20.29	20.31	20.31	20.31	20.3	20.29	20.29	20.28	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(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	(89)

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

(90)m=	19.1	19.31	19.66	20.06	20.24	20.3	20.31	20.31	20.28	20.03	19.54	19.09	(90)

fLA = Living area ÷ (4) = 0.49 (91)

Mean internal temperature (for the whole dwelling) = fLA × 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 adjustment to the mean internal temperature from Table 4e, where appropriate

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)m													
(95)m=	344.68	367.88	388.24	384.81	326.31	224.34	151.08	157.68	238.18	307.45	324.2	332.97	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	605.37	586.05	532.59	442.53	339.89	225.9	151.29	158.09	245.86	374.26	496.17	598.46	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	193.95	146.61	107.39	41.56	10.1	0	0	0	0	49.71	123.82	197.53	(98)

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	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 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		870.67	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	914.2	(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		1827.32	
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)…(307e) + (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 outside		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) =		3071.72	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	525.1	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	14.7	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	539.8	(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) =			539.8	(376)
CO2 associated with electricity for pumps and fans 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 (334) as applicable Item 1		0.52	x 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)
EI rating (section 14)				90.7	(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 10:44:23

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.92m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 02 - H

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	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		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - H

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	63.92	(1a) x	2.65	(2a) =	169.39	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.92	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	169.39	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 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	61.09	18.32	42.77	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)
Total area of elements, m²			64.95							(31)
Party wall			37.5	x	0	=	0	45	1687.5	(32)
Party floor			63.92					40	2556.8	(32a)
Party ceiling			63.92					30	1917.6	(32b)
Internal wall **			113.47					9	1021.23	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.63 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9980.93 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 156.15 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.91 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 40.54 (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	15.82	14.77	14.77	14.56	15.19	15.82	16.24	16.66	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	58.04	57.83	57.62	56.57	56.36	55.32	55.32	55.11	55.73	56.36	56.78	57.2	

Average = Sum(39)1…12 /12= 56.52 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.09 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 83.84 (43)

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=	92.22	88.87	85.51	82.16	78.81	75.45	75.45	78.81	82.16	85.51	88.87	92.22	
Total = Sum(44)1…12 =												1006.06	(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=	136.76	119.61	123.43	107.61	103.25	89.1	82.56	94.74	95.88	111.73	121.97	132.45	
Total = Sum(45)1…12 =												1319.1	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	20.51	17.94	18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87	(46)

Water storage loss:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.02	149.37	167.01	175.46	187.72	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.02	149.37	167.01	175.46	187.72	

Output from water heater (annual)$_{1...12}$ 1969.94 (64)

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

(65)m=	89.69	79.71	85.26	78.58	78.55	72.42	71.67	75.72	74.67	81.37	83.35	88.26	(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=	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 gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	(69)

Pumps and fans gains (Table 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=	-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 (Table 5)

(72)m=	120.56	118.62	114.6	109.13	105.58	100.58	96.34	101.78	103.71	109.37	115.76	118.63	(72)

Total internal gains = (66)m + (67)m + (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	298.82	308.23	326.92	348.4	364.37	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	9.56	x	11.28	x	0.63	x	0.7	=	32.96	(75)
Northeast 0.9x	0.77	x	9.56	x	22.97	x	0.63	x	0.7	=	67.1	(75)
Northeast 0.9x	0.77	x	9.56	x	41.38	x	0.63	x	0.7	=	120.89	(75)
Northeast 0.9x	0.77	x	9.56	x	67.96	x	0.63	x	0.7	=	198.54	(75)
Northeast 0.9x	0.77	x	9.56	x	91.35	x	0.63	x	0.7	=	266.88	(75)

Northeast	0.9x	0.77	x	9.56	x	97.38	x	0.63	x	0.7	=	284.52	(75)
Northeast	0.9x	0.77	x	9.56	x	91.1	x	0.63	x	0.7	=	266.17	(75)
Northeast	0.9x	0.77	x	9.56	x	72.63	x	0.63	x	0.7	=	212.19	(75)
Northeast	0.9x	0.77	x	9.56	x	50.42	x	0.63	x	0.7	=	147.31	(75)
Northeast	0.9x	0.77	x	9.56	x	28.07	x	0.63	x	0.7	=	82	(75)
Northeast	0.9x	0.77	x	9.56	x	14.2	x	0.63	x	0.7	=	41.48	(75)
Northeast	0.9x	0.77	x	9.56	x	9.21	x	0.63	x	0.7	=	26.92	(75)
Southeast	0.9x	0.77	x	8.76	x	36.79	x	0.63	x	0.7	=	98.5	(77)
Southeast	0.9x	0.77	x	8.76	x	62.67	x	0.63	x	0.7	=	167.79	(77)
Southeast	0.9x	0.77	x	8.76	x	85.75	x	0.63	x	0.7	=	229.57	(77)
Southeast	0.9x	0.77	x	8.76	x	106.25	x	0.63	x	0.7	=	284.45	(77)
Southeast	0.9x	0.77	x	8.76	x	119.01	x	0.63	x	0.7	=	318.61	(77)
Southeast	0.9x	0.77	x	8.76	x	118.15	x	0.63	x	0.7	=	316.31	(77)
Southeast	0.9x	0.77	x	8.76	x	113.91	x	0.63	x	0.7	=	304.95	(77)
Southeast	0.9x	0.77	x	8.76	x	104.39	x	0.63	x	0.7	=	279.47	(77)
Southeast	0.9x	0.77	x	8.76	x	92.85	x	0.63	x	0.7	=	248.58	(77)
Southeast	0.9x	0.77	x	8.76	x	69.27	x	0.63	x	0.7	=	185.44	(77)
Southeast	0.9x	0.77	x	8.76	x	44.07	x	0.63	x	0.7	=	117.98	(77)
Southeast	0.9x	0.77	x	8.76	x	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	234.89	350.47	483	585.49	600.83	571.12	491.66	395.89	267.44	159.46	111.22	(83)

Total gains – internal and 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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.94	0.87	0.73	0.55	0.39	0.28	0.32	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=	19.93	20.19	20.51	20.81	20.95	20.99	21	21	20.97	20.76	20.3	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(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	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.85	0.69	0.51	0.34	0.23	0.26	0.47	0.77	0.93	0.97	(89)

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

fLA = Living area ÷ (4) = | 0.38 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

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(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	864.4	845.57	773.35	644.22	492.83	326.09	215.79	226.04	355.11	542.96	713.83	854.77	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	284.73	195.21	130.84	48.57	12.73	0	0	0	0	62.48	178.05	295.89	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1208.5 (98)

Space heating requirement in kWh/m²/year 18.91 (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		1208.5	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1268.93	(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		1969.94	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2068.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	33.37	(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		135.98	(330a)

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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) =		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) + (312) + (315) + (331) + (332)...(237b) =			3652.2	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	635.93	(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) =				635.93	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable Item 1		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)
EI rating (section 14)					90.17	(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 10:44:14

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))		
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	

10 Key features	
Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 02 - I

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)			Volume(m³)	
Ground floor	60.34	(1a) x	2.65	(2a)	=	159.9	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.34	(4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	159.9	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			4.7	x1/[1/(1.4)+ 0.04]		=	6.23			(27)
Windows Type 2			6.09	x1/[1/(1.4)+ 0.04]		=	8.07			(27)
Windows Type 3			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	52.8	13.71	39.09	x	0.18	=	7.04	60	2345.4	(29)
Walls Type2	27.31	0	27.31	x	0.17	=	4.59	60	1638.6	(29)
Total area of elements, m²			80.11							(31)
Party wall			16.88	x	0	=	0	45	759.6	(32)
Party floor			60.34					40	2413.6	(32a)
Party ceiling			60.34					30	1810.2	(32b)
Internal wall **			107.91					9	971.1901	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.8 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9938.59 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 164.71 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.62 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 37.42 (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

DER WorkSheet: New dwelling design stage

(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)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	53.93	53.74	53.54	52.55	52.35	51.36	51.36	51.16	51.76	52.35	52.75	53.14	

Average = $Sum(39)_{1...12}$ /12= 52.5 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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

Average = $Sum(40)_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.99 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.49 (43)
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=	89.64	86.38	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64

Total = $Sum(44)_{1...12}$ = 977.9 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	132.93	116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74

Total = $Sum(45)_{1...12}$ = 1282.18 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.94	17.44	18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)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	172.05	184.02	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.21	166.19	175.25	158.09	155.64	140.1	135.53	147.37	146.69	163.88	172.05	184.02	

Output from water heater (annual)1…12 | 1933.02 | (64)

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

(65)m=	88.42	78.6	84.11	77.57	77.59	71.59	70.91	74.84	73.78	80.33	82.21	87.03	(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=	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 Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.49	13.76	11.19	8.47	6.33	5.35	5.78	7.51	10.08	12.8	14.94	15.93	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see 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	166.13	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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 (negative values) (Table 5)

(71)m=	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	(71)

Water heating gains (Table 5)

(72)m=	118.85	116.96	113.06	107.74	104.29	99.43	95.3	100.59	102.47	107.97	114.19	116.97	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	361.01	359.2	348.18	330.47	312.67	295.34	283.98	289.2	298.19	316.08	336.65	351.9	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast	0.9x	0.77	x	6.09	x	36.79	x	0.63	x	0.7	=	68.48	(77)
Southeast	0.9x	0.77	x	6.09	x	62.67	x	0.63	x	0.7	=	116.65	(77)

DER WorkSheet: New dwelling design stage

Southeast	0.9x	0.77	x	6.09	x	85.75	x	0.63	x	0.7	=	159.6	(77)
Southeast	0.9x	0.77	x	6.09	x	106.25	x	0.63	x	0.7	=	197.75	(77)
Southeast	0.9x	0.77	x	6.09	x	119.01	x	0.63	x	0.7	=	221.5	(77)
Southeast	0.9x	0.77	x	6.09	x	118.15	x	0.63	x	0.7	=	219.9	(77)
Southeast	0.9x	0.77	x	6.09	x	113.91	x	0.63	x	0.7	=	212.01	(77)
Southeast	0.9x	0.77	x	6.09	x	104.39	x	0.63	x	0.7	=	194.29	(77)
Southeast	0.9x	0.77	x	6.09	x	92.85	x	0.63	x	0.7	=	172.81	(77)
Southeast	0.9x	0.77	x	6.09	x	69.27	x	0.63	x	0.7	=	128.92	(77)
Southeast	0.9x	0.77	x	6.09	x	44.07	x	0.63	x	0.7	=	82.02	(77)
Southeast	0.9x	0.77	x	6.09	x	31.49	x	0.63	x	0.7	=	58.6	(77)
Southwest	0.9x	0.77	x	4.7	x	36.79		0.63	x	0.7	=	52.85	(79)
Southwest	0.9x	0.77	x	4.7	x	62.67		0.63	x	0.7	=	90.02	(79)
Southwest	0.9x	0.77	x	4.7	x	85.75		0.63	x	0.7	=	123.17	(79)
Southwest	0.9x	0.77	x	4.7	x	106.25		0.63	x	0.7	=	152.62	(79)
Southwest	0.9x	0.77	x	4.7	x	119.01		0.63	x	0.7	=	170.94	(79)
Southwest	0.9x	0.77	x	4.7	x	118.15		0.63	x	0.7	=	169.71	(79)
Southwest	0.9x	0.77	x	4.7	x	113.91		0.63	x	0.7	=	163.62	(79)
Southwest	0.9x	0.77	x	4.7	x	104.39		0.63	x	0.7	=	149.94	(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	69.27		0.63	x	0.7	=	99.49	(79)
Southwest	0.9x	0.77	x	4.7	x	44.07		0.63	x	0.7	=	63.3	(79)
Southwest	0.9x	0.77	x	4.7	x	31.49		0.63	x	0.7	=	45.23	(79)
Northwest	0.9x	0.77	x	2.92	x	11.28	x	0.63	x	0.7	=	10.07	(81)
Northwest	0.9x	0.77	x	2.92	x	22.97	x	0.63	x	0.7	=	20.5	(81)
Northwest	0.9x	0.77	x	2.92	x	41.38	x	0.63	x	0.7	=	36.93	(81)
Northwest	0.9x	0.77	x	2.92	x	67.96	x	0.63	x	0.7	=	60.64	(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	x	97.38	x	0.63	x	0.7	=	86.9	(81)
Northwest	0.9x	0.77	x	2.92	x	91.1	x	0.63	x	0.7	=	81.3	(81)
Northwest	0.9x	0.77	x	2.92	x	72.63	x	0.63	x	0.7	=	64.81	(81)
Northwest	0.9x	0.77	x	2.92	x	50.42	x	0.63	x	0.7	=	44.99	(81)
Northwest	0.9x	0.77	x	2.92	x	28.07	x	0.63	x	0.7	=	25.05	(81)
Northwest	0.9x	0.77	x	2.92	x	14.2	x	0.63	x	0.7	=	12.67	(81)
Northwest	0.9x	0.77	x	2.92	x	9.21	x	0.63	x	0.7	=	8.22	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	131.4	227.17	319.7	411.01	473.96	476.51	456.92	409.05	351.18	253.46	157.99	112.06	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(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)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

DER WorkSheet: New dwelling design stage

(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 ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × 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	(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

	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													
(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													
(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]													
(97)m=	814.42	795.35	725.02	601.93	460.68	305.71	203.32	212.81	333	509.67	672	805.28	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	256.41	173.67	118.07	46.74	13.38	0	0	0	0	52.7	156.87	267.08	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1084.92 (98)

Space heating requirement in kWh/m²/year 17.98 (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		1084.92	

DER WorkSheet: New dwelling design stage

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1139.16	(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		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)…(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 4f): mechanical ventilation - balanced, extract or positive input from outside		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) + (330b) + (330g) =	128.36	(331)
Energy for lighting (calculated in Appendix L)		273.64	(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) =		3462.02	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	587.37	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	16.45	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	603.81	(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) =				603.81	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	66.62	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	142.02	(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) =				755.98	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.53	(384)
EI rating (section 14)					90.38	(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 10:44:06

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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - A

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)			Volume(m³)	
Ground floor	48.96	(1a) x	2.65	(2a)	=	129.74	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	48.96	(4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			129.74	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0	÷ (5) =	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) ÷ 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 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 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	23.76	x	0.18	=	4.28	60	1425.6	(29)
Walls Type2	35.99	0	35.99	x	0.17	=	6.04	60	2159.4	(29)
Total area of elements, m²			71.29							(31)
Party wall			14.89	x	0	=	0	45	670.05	(32)
Party floor			48.96					40	1958.4	(32a)
Party ceiling			48.96					30	1468.8	(32b)
Internal wall **			96.46					9	868.14	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 25.62 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8550.39 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 174.64 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.71 (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=	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 coefficient, 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	

Average = $Sum(39)_{1…12}$ /12= 43.95 (39)

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Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.66 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 73.61 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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)$_{1…12}$ = 883.37 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	120.08	105.03	108.38	94.49	90.66	78.23	72.5	83.19	84.18	98.11	107.09	116.29

Total = Sum(45)$_{1…12}$ = 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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	175.36	154.95	163.65	147.98	145.94	131.73	127.77	138.47	137.68	153.38	160.59	171.57	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	175.36	154.95	163.65	147.98	145.94	131.73	127.77	138.47	137.68	153.38	160.59	171.57	

Output from water heater (annual)1…12 1809.07 (64)

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

(65)m=	84.15	74.86	80.26	74.21	74.37	68.81	68.33	71.88	70.79	76.84	78.4	82.89	(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=	82.98	82.98	82.98	82.98	82.98	82.98	82.98	82.98	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	6.25	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	114.51	108.13	106.63	110.41	118.45	128.61	138.16	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	(69)
Pumps and fans gains (Table 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=	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	-66.38	(71)
Water heating gains (Table 5)													
(72)m=	113.1	111.4	107.87	103.07	99.95	95.57	91.84	96.62	98.31	103.28	108.89	111.41	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	318.42	316.77	307.33	292.22	277.17	262.41	252.66	257.38	265	280.27	297.82	310.7	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	6.09	x	36.79	x	0.63	x	0.7	=	68.48	(77)
Southeast 0.9x	0.77	x	6.09	x	62.67	x	0.63	x	0.7	=	116.65	(77)
Southeast 0.9x	0.77	x	6.09	x	85.75	x	0.63	x	0.7	=	159.6	(77)
Southeast 0.9x	0.77	x	6.09	x	106.25	x	0.63	x	0.7	=	197.75	(77)
Southeast 0.9x	0.77	x	6.09	x	119.01	x	0.63	x	0.7	=	221.5	(77)

Southeast	0.9x	0.77	x	6.09	x	118.15	x	0.63	x	0.7	=	219.9	(77)
Southeast	0.9x	0.77	x	6.09	x	113.91	x	0.63	x	0.7	=	212.01	(77)
Southeast	0.9x	0.77	x	6.09	x	104.39	x	0.63	x	0.7	=	194.29	(77)
Southeast	0.9x	0.77	x	6.09	x	92.85	x	0.63	x	0.7	=	172.81	(77)
Southeast	0.9x	0.77	x	6.09	x	69.27	x	0.63	x	0.7	=	128.92	(77)
Southeast	0.9x	0.77	x	6.09	x	44.07	x	0.63	x	0.7	=	82.02	(77)
Southeast	0.9x	0.77	x	6.09	x	31.49	x	0.63	x	0.7	=	58.6	(77)
Southwest	0.9x	0.77	x	5.45	x	36.79		0.63	x	0.7	=	61.28	(79)
Southwest	0.9x	0.77	x	5.45	x	62.67		0.63	x	0.7	=	104.39	(79)
Southwest	0.9x	0.77	x	5.45	x	85.75		0.63	x	0.7	=	142.83	(79)
Southwest	0.9x	0.77	x	5.45	x	106.25		0.63	x	0.7	=	176.97	(79)
Southwest	0.9x	0.77	x	5.45	x	119.01		0.63	x	0.7	=	198.22	(79)
Southwest	0.9x	0.77	x	5.45	x	118.15		0.63	x	0.7	=	196.79	(79)
Southwest	0.9x	0.77	x	5.45	x	113.91		0.63	x	0.7	=	189.73	(79)
Southwest	0.9x	0.77	x	5.45	x	104.39		0.63	x	0.7	=	173.87	(79)
Southwest	0.9x	0.77	x	5.45	x	92.85		0.63	x	0.7	=	154.65	(79)
Southwest	0.9x	0.77	x	5.45	x	69.27		0.63	x	0.7	=	115.37	(79)
Southwest	0.9x	0.77	x	5.45	x	44.07		0.63	x	0.7	=	73.4	(79)
Southwest	0.9x	0.77	x	5.45	x	31.49		0.63	x	0.7	=	52.45	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	129.76	221.04	302.43	374.73	419.72	416.69	401.73	368.16	327.47	244.29	155.43	111.05	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	448.18	537.81	609.76	666.94	696.89	679.1	654.39	625.54	592.46	524.56	453.25	421.75	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.92	0.84	0.72	0.56	0.4	0.29	0.31	0.49	0.76	0.92	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.38	20.64	20.86	20.96	20.99	21	21	20.98	20.85	20.47	20.09	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.15	20.15	20.15	20.17	20.17	20.19	20.19	20.19	20.18	20.17	20.17	20.16	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.9	0.82	0.68	0.52	0.35	0.24	0.26	0.44	0.72	0.9	0.96	(89)

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

(90)m=	19.02	19.37	19.72	20.01	20.13	20.18	20.19	20.19	20.17	20.01	19.51	18.97	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

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(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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 = (94)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	689.14	673.12	612.61	507.26	387.6	257.47	171.63	179.6	280.53	430.55	569.04	681.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	197.75	127.99	83.22	31.68	8.88	0	0	0	0	34.46	115.88	207.69	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ =	807.54	(98)
Space heating requirement in kWh/m²/year	16.49	(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		807.54	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	847.92	(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		1809.07	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1899.52	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	27.47	(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		104.15	(330a)

DER WorkSheet: New dwelling design stage

warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (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) + (312) + (315) + (331) + (332)...(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 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	=	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)			=	523.52	(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) =				523.52	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		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)
EI rating (section 14)					90.88	(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 10:43:59

Project 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:** 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	
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - B

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.46	(1a) x	2.65	(2a) =	141.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.46	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		141.67	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation:	0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0.5	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.65	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			9.56	x1/[1/(1.4)+ 0.04]		=	12.67			(27)
Windows Type 2			3.98	x1/[1/(1.4)+ 0.04]		=	5.28			(27)
Walls Type1	40.04	13.54	26.5	x	0.18	=	4.77	60	1590	(29)
Walls Type2	12.16	0	12.16	x	0.17	=	2.04	60	729.6	(29)
Total area of elements, m²			52.2							(31)
Party wall			27.88	x	0	=	0	45	1254.6	(32)
Party floor			53.46					70	3742.2	(32a)
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-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) =	24.76	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	9838.47	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	= (34) ÷ (4) =	184.03	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K		6.09	(36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	30.85	(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=	14.63	14.46	14.28	13.41	13.23	12.35	12.35	12.18	12.7	13.23	13.58	13.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)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	

Average = Sum(39)$_{1…12}$ /12= 44.21 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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

Average = Sum(40)$_{1...12}$ /12= 0.83 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.79 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 76.76 (43)

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=	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)$_{1...12}$ =			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	
									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:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.02	141.28	157.58	165.17	176.55	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	180.5	159.45	168.29	152.02	149.82	135.07	130.87	142.02	141.28	157.58	165.17	176.55	

Output from water heater (annual)$_{1...12}$ 1858.62 (64)

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

(65)m=	85.86	76.36	81.8	75.56	75.66	69.92	69.36	73.07	71.98	78.24	79.93	84.54	(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=	89.61	89.61	89.61	89.61	89.61	89.61	89.61	89.61	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 gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	156.21	157.83	153.74	145.05	134.07	123.75	116.86	115.24	119.33	128.02	139	149.32	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	31.96	(69)
Pumps and fans gains (Table 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=	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	-71.68	(71)
Water heating gains (Table 5)													
(72)m=	115.4	113.63	109.94	104.94	101.69	97.11	93.22	98.21	99.98	105.16	111.01	113.63	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	335.42	333.71	323.63	307.48	291.33	275.55	265.16	270.08	278.24	294.57	313.32	327.14	(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 Table 6d		Area m²		Flux Table 6a	g_ Table 6b		FF Table 6c		Gains (W)	
Southwest	0.9x	0.77	x	9.56	x	36.79	0.63	x	0.7	=	107.5	(79)
Southwest	0.9x	0.77	x	9.56	x	62.67	0.63	x	0.7	=	183.11	(79)
Southwest	0.9x	0.77	x	9.56	x	85.75	0.63	x	0.7	=	250.54	(79)
Southwest	0.9x	0.77	x	9.56	x	106.25	0.63	x	0.7	=	310.43	(79)
Southwest	0.9x	0.77	x	9.56	x	119.01	0.63	x	0.7	=	347.71	(79)

DER WorkSheet: New dwelling design stage

Southwest	0.9x	0.77	x	9.56	x	118.15		0.63	x	0.7	=	345.19	(79)
Southwest	0.9x	0.77	x	9.56	x	113.91		0.63	x	0.7	=	332.8	(79)
Southwest	0.9x	0.77	x	9.56	x	104.39		0.63	x	0.7	=	304.99	(79)
Southwest	0.9x	0.77	x	9.56	x	92.85		0.63	x	0.7	=	271.28	(79)
Southwest	0.9x	0.77	x	9.56	x	69.27		0.63	x	0.7	=	202.38	(79)
Southwest	0.9x	0.77	x	9.56	x	44.07		0.63	x	0.7	=	128.76	(79)
Southwest	0.9x	0.77	x	9.56	x	31.49		0.63	x	0.7	=	92	(79)
Northwest	0.9x	0.77	x	3.98	x	11.28	x	0.63	x	0.7	=	13.72	(81)
Northwest	0.9x	0.77	x	3.98	x	22.97	x	0.63	x	0.7	=	27.94	(81)
Northwest	0.9x	0.77	x	3.98	x	41.38	x	0.63	x	0.7	=	50.33	(81)
Northwest	0.9x	0.77	x	3.98	x	67.96	x	0.63	x	0.7	=	82.66	(81)
Northwest	0.9x	0.77	x	3.98	x	91.35	x	0.63	x	0.7	=	111.11	(81)
Northwest	0.9x	0.77	x	3.98	x	97.38	x	0.63	x	0.7	=	118.45	(81)
Northwest	0.9x	0.77	x	3.98	x	91.1	x	0.63	x	0.7	=	110.81	(81)
Northwest	0.9x	0.77	x	3.98	x	72.63	x	0.63	x	0.7	=	88.34	(81)
Northwest	0.9x	0.77	x	3.98	x	50.42	x	0.63	x	0.7	=	61.33	(81)
Northwest	0.9x	0.77	x	3.98	x	28.07	x	0.63	x	0.7	=	34.14	(81)
Northwest	0.9x	0.77	x	3.98	x	14.2	x	0.63	x	0.7	=	17.27	(81)
Northwest	0.9x	0.77	x	3.98	x	9.21	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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	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 internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.24	20.47	20.71	20.91	20.98	21	21	21	20.99	20.88	20.55	20.2	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.21	20.21	20.22	20.23	20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.83	0.67	0.49	0.33	0.22	0.25	0.43	0.73	0.92	0.97	(89)

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

(90)m=	19.21	19.53	19.86	20.13	20.21	20.24	20.25	20.25	20.23	20.1	19.66	19.17	(90)

fLA = Living area ÷ (4) = 0.45 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

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(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	195.8	124.45	75.21	23.46	4.97	0	0	0	0	29.62	112.12	205.7	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	771.33	(98)
Space heating requirement in kWh/m²/year	14.43	(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		771.33	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	809.9	(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		1858.62	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1951.55	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	27.61	(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		113.73	(330a)

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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) =			113.73	(331)
Energy for lighting (calculated in Appendix L)				245.94	(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) =				3012.29	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	526.18	(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) =				526.18	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		0.52		x 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)
EI rating (section 14)					91.07	(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 10:43:52

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.62m²

Site Reference : Highgate Road - GREEN **Plot 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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - C

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.62	(1a) x	2.65	(2a) =	192.44	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.62	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		192.44	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows 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	72.62	16.17	56.45	x 0.18	=	10.16	60	3387	(29)
Walls Type2	17.78	0	17.78	x 0.17	=	2.99	60	1066.8	(29)
Total area of elements, m²			90.4						(31)
Party wall			30.32	x 0	=	0	45	1364.4	(32)
Party floor			72.62				40	2904.8	(32a)
Party ceiling			72.62				30	2178.6	(32b)
Internal wall **			146.17				9	1315.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.58 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12217.13 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 168.23 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.11 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.69 (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=	20.15	19.91	19.67	18.48	18.24	17.05	17.05	16.81	17.53	18.24	18.72	19.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.84	61.6	61.36	60.17	59.93	58.74	58.74	58.51	59.22	59.93	60.41	60.89	

Average = Sum(39)$_{1…12}$ /12= 60.11 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.85	0.85	0.84	0.83	0.83	0.81	0.81	0.81	0.82	0.83	0.83	0.84	

Average = Sum(40)$_{1…12}$ /12= 0.83 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.31 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.02 (43)

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=	97.92	94.36	90.8	87.24	83.67	80.11	80.11	83.67	87.24	90.8	94.36	97.92	

Total = Sum(44)$_{1…12}$ = 1068.18 (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=	145.21	127	131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63	

Total = Sum(45)$_{1…12}$ = 1400.56 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)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	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	200.48	176.93	186.33	167.75	164.91	148.1	142.94	155.87	155.29	173.91	182.99	195.9	

Output from water heater (annual)$_{1...12}$ 2051.4 (64)

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

(65)m=	92.5	82.17	87.8	80.78	80.67	74.25	73.37	77.67	76.64	83.67	85.85	90.98	(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=	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.13	16.1	13.09	9.91	7.41	6.26	6.76	8.79	11.79	14.97	17.48	18.63	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	(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=	-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 + (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 calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	12.71	x	11.28	x	0.63	x	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	x	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	0.9x	0.77	x	12.71	x	97.38	x	0.63	x	0.7	=	378.27	(75)
Northeast	0.9x	0.77	x	12.71	x	91.1	x	0.63	x	0.7	=	353.87	(75)
Northeast	0.9x	0.77	x	12.71	x	72.63	x	0.63	x	0.7	=	282.11	(75)
Northeast	0.9x	0.77	x	12.71	x	50.42	x	0.63	x	0.7	=	195.85	(75)
Northeast	0.9x	0.77	x	12.71	x	28.07	x	0.63	x	0.7	=	109.02	(75)
Northeast	0.9x	0.77	x	12.71	x	14.2	x	0.63	x	0.7	=	55.15	(75)
Northeast	0.9x	0.77	x	12.71	x	9.21	x	0.63	x	0.7	=	35.79	(75)
Northwest	0.9x	0.77	x	3.46	x	11.28	x	0.63	x	0.7	=	11.93	(81)
Northwest	0.9x	0.77	x	3.46	x	22.97	x	0.63	x	0.7	=	24.29	(81)
Northwest	0.9x	0.77	x	3.46	x	41.38	x	0.63	x	0.7	=	43.75	(81)
Northwest	0.9x	0.77	x	3.46	x	67.96	x	0.63	x	0.7	=	71.86	(81)
Northwest	0.9x	0.77	x	3.46	x	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest	0.9x	0.77	x	3.46	x	97.38	x	0.63	x	0.7	=	102.98	(81)
Northwest	0.9x	0.77	x	3.46	x	91.1	x	0.63	x	0.7	=	96.33	(81)
Northwest	0.9x	0.77	x	3.46	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest	0.9x	0.77	x	3.46	x	50.42	x	0.63	x	0.7	=	53.32	(81)
Northwest	0.9x	0.77	x	3.46	x	28.07	x	0.63	x	0.7	=	29.68	(81)
Northwest	0.9x	0.77	x	3.46	x	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest	0.9x	0.77	x	3.46	x	9.21	x	0.63	x	0.7	=	9.74	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	55.76	113.5	204.48	335.82	451.41	481.25	450.2	358.9	249.17	138.7	70.16	45.53	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	459.17	514.94	593.33	704.36	799.39	809.34	765.31	679.71	580.35	490.4	445.43	438.43	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.94	0.84	0.65	0.46	0.34	0.39	0.66	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.91	20.08	20.38	20.74	20.93	20.99	21	21	20.95	20.66	20.23	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.21	20.21	20.21	20.23	20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.81	0.61	0.41	0.28	0.33	0.6	0.89	0.97	0.99	(89)

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

(90)m=	18.74	18.99	19.42	19.93	20.17	20.24	20.24	20.25	20.2	19.84	19.23	18.72	(90)

fLA = Living area ÷ (4) = | 0.38 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.19	19.41	19.79	20.24	20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17	(92)

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

(93)m=	19.19	19.41	19.79	20.24	20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)
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	431.1	(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	4.2	(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	911.39	(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	0	103.45	234.84	357.33	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	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 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		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: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2153.97	(310a)
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): mechanical ventilation - balanced, extract or positive input from outside		177.49	(330a)

DER WorkSheet: New dwelling design stage

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 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 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)
EI rating (section 14)					89.36	(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 10:43:46

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.96m²

Site Reference : Highgate Road - GREEN **Plot 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - D

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.96	(1a) x	2.65	(2a) =	142.99	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.96	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	142.99	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows			12.07	x1/[1/(1.4)+ 0.04]		=	16			(27)
Walls Type1	27.66	12.07	15.59	x	0.18	=	2.81	60	935.4	(29)
Walls Type2	24.24	0	24.24	x	0.17	=	4.07	60	1454.4	(29)
Total area of elements, m²			51.9							(31)
Party wall			31.67	x	0	=	0	45	1425.15	(32)
Party floor			53.96					40	2158.4	(32a)
Party ceiling			53.96					30	1618.8	(32b)
Internal wall **			95.03					9	855.27	(32c)

* *for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

** *include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8447.42 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 156.55 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.04 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 28.91 (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=	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 coefficient, W/K (39)m = (37) + (38)m

(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)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.81 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 77.11 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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 = $Sum(44)_{1...12}$ = 925.35 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(45)m=	125.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82

Total = $Sum(45)_{1...12}$ = 1213.27 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	18.87	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27	(46)

Water storage loss:

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)

Enter (50) or (54) in (55) 1.03 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 where (H11) is from Appendix H

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 thermostat)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	181.07	159.94	168.8	152.47	150.25	135.45	131.22	142.42	141.68	158.05	165.67	177.1	

Output from water heater (annual)1…12 1864.11 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(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)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	14.04	12.47	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	157.5	159.14	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	(69)
Pumps and fans gains (Table 5a)													
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	(71)
Water heating gains (Table 5)													
(72)m=	115.65	113.87	110.17	105.15	101.88	97.28	93.38	98.38	100.16	105.37	111.24	113.88	(72)
Total internal gains = (66)m + (67)m + (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	271.49	279.71	296.15	315.03	328.97	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (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	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, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	41.62	84.72	152.64	250.67	336.95	359.23	336.05	267.9	185.99	103.53	52.37	33.99	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	378.92	420.3	478.07	559.85	629.86	636.24	602.59	539.39	465.7	399.68	367.4	362.95	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.91	0.79	0.6	0.41	0.3	0.35	0.59	0.86	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.03	20.19	20.48	20.8	20.95	20.99	21	21	20.97	20.74	20.34	20	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.25	20.25	20.25	20.26	20.27	20.28	20.28	20.28	20.28	20.27	20.26	20.26	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.76	0.56	0.37	0.25	0.3	0.54	0.83	0.95	0.98	(89)

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

(90)m=	18.94	19.19	19.59	20.03	20.22	20.28	20.28	20.28	20.25	19.97	19.41	18.92	(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.45	19.66	20.01	20.4	20.57	20.62	20.62	20.62	20.59	20.33	19.85	19.43	(92)

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

(93)m=	19.45	19.66	20.01	20.4	20.57	20.62	20.62	20.62	20.59	20.33	19.85	19.43	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.95	0.89	0.76	0.57	0.39	0.28	0.32	0.56	0.84	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	365.75	397.48	427.33	427.25	360.81	247.22	166.11	173.41	261.73	334.22	345.95	352.08	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	661.94	642.24	585.42	487.92	374.76	248.93	166.37	173.92	270.77	411.33	543.52	654.55	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	220.37	164.48	117.62	43.69	10.37	0	0	0	0	57.37	142.25	225.03	

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)1...5,9...12 =	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 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		981.18	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1030.24	(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		1864.11	
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) + (310a)…(310e)] =	29.88	(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) =		3241.49	(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 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	=	553.76	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	15.51	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	569.27	(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) =				569.27	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable Item 1		0.52		x 0.01 =	-56.48	(380)
Total CO2, kg/year	sum of (376)…(382) =				701.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.99	(384)
EI rating (section 14)					90.51	(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 10:43:41

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.44m²

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

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - E

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.44	(1a) x	2.65	(2a) =	184.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.44	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	184.02	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			8.97	x1/[1/(1.4)+ 0.04]	=	11.89			(27)
Windows Type 2			2.92	x1/[1/(1.4)+ 0.04]	=	3.87			(27)
Walls Type1	41.51	11.89	29.62	x 0.18	=	5.33	60	1777.2	(29)
Walls Type2	16.73	0	16.73	x 0.17	=	2.81	60	1003.8	(29)
Total area of elements, m²			58.24						(31)
Party wall			40.43	x 0	=	0	45	1819.35	(32)
Party floor			69.44				40	2777.6	(32a)
Party ceiling			69.44				30	2083.2	(32b)
Internal wall **			136.21				9	1225.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 23.9 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10687.04 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 153.9 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.99 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 30.9 (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=	19.27	19.04	18.81	17.67	17.44	16.3	16.3	16.08	16.76	17.44	17.9	18.35	(38)

Heat transfer coefficient, W/K (39)m = (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	

Average = Sum(39)$_{1…12}$ /12= 48.51 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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

Average = Sum(40)$_{1...12}$ /12= 0.7 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.23 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.22 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

Total = Sum(44)$_{1...12}$ = 1046.65 (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=	142.28	124.44	128.41	111.95	107.42	92.7	85.9	98.57	99.74	116.24	126.89	137.79

Total = Sum(45)$_{1...12}$ = 1372.32 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.34	18.67	19.26	16.79	16.11	13.9	12.88	14.78	14.96	17.44	19.03	20.67	(46)

Water storage 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.56	174.37	183.69	165.44	162.7	146.19	141.17	153.84	153.24	171.52	180.38	193.07	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	197.56	174.37	183.69	165.44	162.7	146.19	141.17	153.84	153.24	171.52	180.38	193.07	

Output from water heater (annual)$_{1...12}$ 2023.16 (64)

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

(65)m=	91.53	81.32	86.92	80.02	79.94	73.62	72.78	76.99	75.96	82.87	84.98	90.04	(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=	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	111.62	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18	15.98	13	9.84	7.36	6.21	6.71	8.72	11.71	14.87	17.35	18.5	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	195.99	198.02	192.9	181.98	168.21	155.27	146.62	144.59	149.71	160.62	174.4	187.34	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	34.16	(69)

Pumps and fans 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=	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	-89.3	(71)

Water heating gains (Table 5)

(72)m=	123.02	121.01	116.83	111.14	107.44	102.24	97.82	103.49	105.5	111.39	118.03	121.02	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	393.49	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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast 0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

Northeast	0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast	0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast	0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast	0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast	0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast	0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast	0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)
Southwest	0.9x	0.77	x	2.92	x	36.79		0.63	x	0.7	=	32.83	(79)
Southwest	0.9x	0.77	x	2.92	x	62.67		0.63	x	0.7	=	55.93	(79)
Southwest	0.9x	0.77	x	2.92	x	85.75		0.63	x	0.7	=	76.52	(79)
Southwest	0.9x	0.77	x	2.92	x	106.25		0.63	x	0.7	=	94.82	(79)
Southwest	0.9x	0.77	x	2.92	x	119.01		0.63	x	0.7	=	106.2	(79)
Southwest	0.9x	0.77	x	2.92	x	118.15		0.63	x	0.7	=	105.44	(79)
Southwest	0.9x	0.77	x	2.92	x	113.91		0.63	x	0.7	=	101.65	(79)
Southwest	0.9x	0.77	x	2.92	x	104.39		0.63	x	0.7	=	93.16	(79)
Southwest	0.9x	0.77	x	2.92	x	92.85		0.63	x	0.7	=	82.86	(79)
Southwest	0.9x	0.77	x	2.92	x	69.27		0.63	x	0.7	=	61.81	(79)
Southwest	0.9x	0.77	x	2.92	x	44.07		0.63	x	0.7	=	39.33	(79)
Southwest	0.9x	0.77	x	2.92	x	31.49		0.63	x	0.7	=	28.1	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.76	118.89	189.96	281.11	356.62	372.4	351.39	292.25	221.08	138.76	78.25	53.36	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	457.26	510.39	569.17	640.56	696.12	692.61	659.04	605.54	544.49	482.12	444.51	436.7	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.91	0.8	0.62	0.43	0.31	0.36	0.59	0.85	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.31	20.56	20.83	20.96	20.99	21	21	20.98	20.8	20.44	20.12	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.32	20.32	20.33	20.34	20.34	20.36	20.36	20.36	20.35	20.34	20.34	20.33	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.77	0.58	0.39	0.27	0.31	0.54	0.83	0.95	0.98	(89)

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

(90)m=	19.17	19.41	19.77	20.14	20.3	20.35	20.36	20.36	20.33	20.11	19.61	19.15	(90)

fLA = Living area ÷ (4) = 0.34 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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 = (94)m x (84)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													
(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]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	238.64	173.23	122.02	45.12	10.7	0	0	0	0	54.18	148.53	244.34	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1036.76	(98)
Space heating requirement in kWh/m²/year	14.93	(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		1036.76	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1088.59	(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		2023.16	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2124.32	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.13	(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		169.72	(330a)

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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) =	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) + (312) + (315) + (331) + (332)...(237b) =		3591.65	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	612.21	(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) =				612.21	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		0.52		x 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)
EI rating (section 14)					90.53	(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 10:43:36

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.61m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - F

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	69.61	(1a) x	2.65	(2a) =	184.47	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.61	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	184.47	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Windows Type 2			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	41.59	11.89	29.7	x	0.18	=	5.35	60	1782	(29)
Walls Type2	18.41	0	18.41	x	0.17	=	3.09	60	1104.6	(29)
Total area of elements, m²			60							(31)
Party wall			38.68	x	0	=	0	45	1740.6	(32)
Party floor			69.61					40	2784.4	(32a)
Party ceiling			69.61					30	2088.3	(32b)
Internal wall **			136.21					9	1225.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 24.2 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10725.79 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 154.08 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.99 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 31.19 (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=	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 coefficient, 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	

Average = Sum(39)$_{1…12}$ /12= 48.85 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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

Average = Sum(40)$_{1...12}$ /12= 0.7 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.24 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.32 (43)

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=	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 = Sum(44)$_{1...12}$ = 1047.84 (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=	142.44	124.58	128.56	112.08	107.54	92.8	85.99	98.68	99.86	116.37	127.03	137.95

Total = Sum(45)$_{1...12}$ = 1373.88 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.37	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69	(46)

Water storage 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.72	174.51	183.83	165.57	162.82	146.29	141.27	153.96	153.35	171.65	180.52	193.22	(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	0	(63)

Output from water heater

(64)m=	197.72	174.51	183.83	165.57	162.82	146.29	141.27	153.96	153.35	171.65	180.52	193.22	

Output from water heater (annual)$_{1...12}$ 2024.72 (64)

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

(65)m=	91.58	81.36	86.97	80.06	79.98	73.65	72.81	77.03	76	82.92	85.03	90.09	(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=	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.04	16.02	13.03	9.87	7.37	6.23	6.73	8.74	11.74	14.9	17.39	18.54	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	196.39	198.42	193.29	182.36	168.55	155.58	146.92	144.88	150.02	160.95	174.75	187.72	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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 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=	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	(71)

Water heating gains (Table 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 internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	394.07	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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast	0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast	0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast	0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast	0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

Northeast 0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast 0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast 0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast 0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast 0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast 0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast 0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)
Southwest0.9x	0.77	x	2.92	x	36.79		0.63	x	0.7	=	32.83	(79)
Southwest0.9x	0.77	x	2.92	x	62.67		0.63	x	0.7	=	55.93	(79)
Southwest0.9x	0.77	x	2.92	x	85.75		0.63	x	0.7	=	76.52	(79)
Southwest0.9x	0.77	x	2.92	x	106.25		0.63	x	0.7	=	94.82	(79)
Southwest0.9x	0.77	x	2.92	x	119.01		0.63	x	0.7	=	106.2	(79)
Southwest0.9x	0.77	x	2.92	x	118.15		0.63	x	0.7	=	105.44	(79)
Southwest0.9x	0.77	x	2.92	x	113.91		0.63	x	0.7	=	101.65	(79)
Southwest0.9x	0.77	x	2.92	x	104.39		0.63	x	0.7	=	93.16	(79)
Southwest0.9x	0.77	x	2.92	x	92.85		0.63	x	0.7	=	82.86	(79)
Southwest0.9x	0.77	x	2.92	x	69.27		0.63	x	0.7	=	61.81	(79)
Southwest0.9x	0.77	x	2.92	x	44.07		0.63	x	0.7	=	39.33	(79)
Southwest0.9x	0.77	x	2.92	x	31.49		0.63	x	0.7	=	28.1	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.76	118.89	189.96	281.11	356.62	372.4	351.39	292.25	221.08	138.76	78.25	53.36	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	457.84	510.96	569.72	641.07	696.59	693.05	659.46	605.97	544.94	482.6	445.04	437.26	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.92	0.8	0.62	0.44	0.32	0.36	0.59	0.85	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.14	20.3	20.55	20.83	20.96	20.99	21	21	20.98	20.79	20.44	20.12	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.32	20.32	20.32	20.34	20.34	20.36	20.36	20.36	20.35	20.34	20.34	20.33	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.77	0.58	0.39	0.27	0.31	0.54	0.83	0.95	0.98	(89)

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

(90)m=	19.16	19.4	19.76	20.13	20.3	20.35	20.36	20.36	20.33	20.1	19.6	19.14	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.53	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51	(92)

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

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(93)m=	19.53	19.74	20.06	20.4	20.55	20.6	20.6	20.6	20.58	20.37	19.92	19.51	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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=	442.81	483.37	510.56	497.42	415.67	283.37	189.97	198.39	303.11	400.16	419.22	425.1	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	242.87	176.71	125.05	46.74	11.25	0	0	0	0	55.96	151.71	248.6	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 1058.9 (98)

Space heating requirement in kWh/m²/year 15.21 (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		1058.9	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1111.84	(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		2024.72	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2125.95	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	32.38	(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		170.14	(330a)

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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) =			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) + (312) + (315) + (331) + (332)...(237b) =				3617.74	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	616.95	(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) =				616.95	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable Item 1		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)
EI rating (section 14)					90.48	(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 10:43:31

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.62m²

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

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	**OK**
MVHR efficiency:	89%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.97m²	
Ventilation rate:	4.00	

10 Key features	
Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - G

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(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 heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Walls Type1	31.4	8.97	22.43	x	0.18	=	4.04	60	1345.8	(29)
Walls Type2	22.92	0	22.92	x	0.17	=	3.85	60	1375.2	(29)
Total area of elements, m²			54.32							(31)
Party wall			30.08	x	0	=	0	45	1353.6	(32)
Party floor			50.62					40	2024.8	(32a)
Party ceiling			50.62					30	1518.6	(32b)
Internal wall **			83.2					9	748.8	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 19.78 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8366.8 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 165.29 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 5.92 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.7 (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=	13.86	13.69	13.52	12.69	12.53	11.7	11.7	11.53	12.03	12.53	12.86	13.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	39.55	39.39	39.22	38.39	38.22	37.39	37.39	37.23	37.73	38.22	38.56	38.89	

Average = Sum(39)$_{1\ldots12}$ /12= 38.35 (39)

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Heat loss parameter (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

Average = Sum(40)$_{1…12}$ /12= 0.76 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.71 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 74.77 (43)

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=	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 = Sum(44)$_{1…12}$ = 897.28 (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=	121.98	106.68	110.09	95.97	92.09	79.47	73.64	84.5	85.51	99.65	108.78	118.13

Total = Sum(45)$_{1…12}$ = 1176.48 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.3	16	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72	(46)

Water storage loss:

Storage volume (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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.78	139	154.93	162.27	173.4	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.78	139	154.93	162.27	173.4

Output from water heater (annual)$_{1...12}$ 1827.32 (64)

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

(65)m=	84.78	75.41	80.82	74.71	74.84	69.22	68.71	72.32	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 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=	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	13.59	12.07	9.81	7.43	5.55	4.69	5.07	6.59	8.84	11.22	13.1	13.97	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	(69)

Pumps and fans gains (Table 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=	-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 (Table 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 internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast 0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

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Northeast	0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast	0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast	0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast	0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast	0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast	0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast	0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)

Solar gains in watts, calculated for each 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 and 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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	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 internal temperature in living area T1 (follow steps 3 to 7 in Table 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 heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.27	20.27	20.28	20.29	20.29	20.31	20.31	20.31	20.3	20.29	20.29	20.28	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(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	(89)

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

(90)m=	19.1	19.31	19.66	20.06	20.24	20.3	20.31	20.31	20.28	20.03	19.54	19.09	(90)

fLA = Living area ÷ (4) = 0.49 (91)

Mean internal temperature (for the whole dwelling) = fLA × 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 adjustment to the mean internal temperature from Table 4e, where appropriate

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)m													
(95)m=	344.68	367.88	388.24	384.81	326.31	224.34	151.08	157.68	238.18	307.45	324.2	332.97	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	605.37	586.05	532.59	442.53	339.89	225.9	151.29	158.09	245.86	374.26	496.17	598.46	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	193.95	146.61	107.39	41.56	10.1	0	0	0	0	49.71	123.82	197.53	(98)

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	Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ =	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 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		870.67	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	914.2	(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		1827.32	
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)…(307e) + (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 outside		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) =		3071.72	(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 fuel			280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	525.1	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	14.7	(372)

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Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	539.8	(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) =				539.8	(376)
CO2 associated with electricity for pumps and fans 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 (334) as applicable Item 1		0.52	x 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)
EI rating (section 14)					90.7	(385)

Regulations Compliance Report

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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

Site Reference : Highgate Road - GREEN **Plot 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
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - H

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	63.92	(1a)	x	2.65	(2a)	=	169.39	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.92	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			169.39	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 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	61.09	18.32	42.77	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)
Total area of elements, m²			64.95							(31)
Party wall			37.5	x	0	=	0	45	1687.5	(32)
Party floor			63.92					40	2556.8	(32a)
Party ceiling			63.92					30	1917.6	(32b)
Internal wall **			113.47					9	1021.23	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 32.63 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9980.93 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 156.15 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.91 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 40.54 (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	15.82	14.77	14.77	14.56	15.19	15.82	16.24	16.66	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	58.04	57.83	57.62	56.57	56.36	55.32	55.32	55.11	55.73	56.36	56.78	57.2	

Average = Sum(39)1…12 /12= 56.52 (39)

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Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.09 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 83.84 (43)

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=	92.22	88.87	85.51	82.16	78.81	75.45	75.45	78.81	82.16	85.51	88.87	92.22

Total = Sum(44)$_{1...12}$ = 1006.06 (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=	136.76	119.61	123.43	107.61	103.25	89.1	82.56	94.74	95.88	111.73	121.97	132.45

Total = Sum(45)$_{1...12}$ = 1319.1 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.51	17.94	18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87	(46)

Water storage loss:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.02	149.37	167.01	175.46	187.72	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.02	149.37	167.01	175.46	187.72	

Output from water heater (annual)$_{1...12}$ 1969.94 (64)

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

(65)m=	89.69	79.71	85.26	78.58	78.55	72.42	71.67	75.72	74.67	81.37	83.35	88.26	(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=	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 gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	(69)

Pumps and fans gains (Table 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=	-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 (Table 5)

(72)m=	120.56	118.62	114.6	109.13	105.58	100.58	96.34	101.78	103.71	109.37	115.76	118.63	(72)

Total internal gains = (66)m + (67)m + (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	298.82	308.23	326.92	348.4	364.37	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	9.56	x	11.28	x	0.63	x	0.7	=	32.96	(75)
Northeast 0.9x	0.77	x	9.56	x	22.97	x	0.63	x	0.7	=	67.1	(75)
Northeast 0.9x	0.77	x	9.56	x	41.38	x	0.63	x	0.7	=	120.89	(75)
Northeast 0.9x	0.77	x	9.56	x	67.96	x	0.63	x	0.7	=	198.54	(75)
Northeast 0.9x	0.77	x	9.56	x	91.35	x	0.63	x	0.7	=	266.88	(75)

Northeast	0.9x	0.77	x	9.56	x	97.38	x	0.63	x	0.7	=	284.52	(75)
Northeast	0.9x	0.77	x	9.56	x	91.1	x	0.63	x	0.7	=	266.17	(75)
Northeast	0.9x	0.77	x	9.56	x	72.63	x	0.63	x	0.7	=	212.19	(75)
Northeast	0.9x	0.77	x	9.56	x	50.42	x	0.63	x	0.7	=	147.31	(75)
Northeast	0.9x	0.77	x	9.56	x	28.07	x	0.63	x	0.7	=	82	(75)
Northeast	0.9x	0.77	x	9.56	x	14.2	x	0.63	x	0.7	=	41.48	(75)
Northeast	0.9x	0.77	x	9.56	x	9.21	x	0.63	x	0.7	=	26.92	(75)
Southeast	0.9x	0.77	x	8.76	x	36.79	x	0.63	x	0.7	=	98.5	(77)
Southeast	0.9x	0.77	x	8.76	x	62.67	x	0.63	x	0.7	=	167.79	(77)
Southeast	0.9x	0.77	x	8.76	x	85.75	x	0.63	x	0.7	=	229.57	(77)
Southeast	0.9x	0.77	x	8.76	x	106.25	x	0.63	x	0.7	=	284.45	(77)
Southeast	0.9x	0.77	x	8.76	x	119.01	x	0.63	x	0.7	=	318.61	(77)
Southeast	0.9x	0.77	x	8.76	x	118.15	x	0.63	x	0.7	=	316.31	(77)
Southeast	0.9x	0.77	x	8.76	x	113.91	x	0.63	x	0.7	=	304.95	(77)
Southeast	0.9x	0.77	x	8.76	x	104.39	x	0.63	x	0.7	=	279.47	(77)
Southeast	0.9x	0.77	x	8.76	x	92.85	x	0.63	x	0.7	=	248.58	(77)
Southeast	0.9x	0.77	x	8.76	x	69.27	x	0.63	x	0.7	=	185.44	(77)
Southeast	0.9x	0.77	x	8.76	x	44.07	x	0.63	x	0.7	=	117.98	(77)
Southeast	0.9x	0.77	x	8.76	x	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	234.89	350.47	483	585.49	600.83	571.12	491.66	395.89	267.44	159.46	111.22	(83)

Total gains – internal and 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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.94	0.87	0.73	0.55	0.39	0.28	0.32	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=	19.93	20.19	20.51	20.81	20.95	20.99	21	21	20.97	20.76	20.3	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(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	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.85	0.69	0.51	0.34	0.23	0.26	0.47	0.77	0.93	0.97	(89)

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

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	864.4	845.57	773.35	644.22	492.83	326.09	215.79	226.04	355.11	542.96	713.83	854.77	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	284.73	195.21	130.84	48.57	12.73	0	0	0	0	62.48	178.05	295.89	

Total per year (kWh/year) = Sum(98)1...5,9...12 =	1208.5	(98)
Space heating requirement in kWh/m²/year	18.91	(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		1208.5	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1268.93	(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		1969.94	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2068.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	33.37	(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		135.98	(330a)

DER WorkSheet: New dwelling design stage

warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (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) + (312) + (315) + (331) + (332)...(237b) =		3652.2	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)...(372)			=	635.93	(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) =				635.93	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable Item 1		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)
EI rating (section 14)					90.17	(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 10:43:23

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:** 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	

10 Key features	
Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 03 - I

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	60.34	(1a) x	2.65	(2a) =	159.9	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.34	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	159.9	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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 and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			4.7	x1/[1/(1.4)+ 0.04] =	6.23			(27)
Windows Type 2			6.09	x1/[1/(1.4)+ 0.04] =	8.07			(27)
Windows Type 3			2.92	x1/[1/(1.4)+ 0.04] =	3.87			(27)
Walls Type1	52.8	13.71	39.09	x 0.18 =	7.04	60	2345.4	(29)
Walls Type2	27.31	0	27.31	x 0.17 =	4.59	60	1638.6	(29)
Total area of elements, m²			80.11					(31)
Party wall			16.88	x 0 =	0	45	759.6	(32)
Party floor			60.34			40	2413.6	(32a)
Party ceiling			60.34			30	1810.2	(32b)
Internal wall **			107.91			9	971.1901	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.8 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9938.59 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 164.71 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.62 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 37.42 (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

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(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)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	53.93	53.74	53.54	52.55	52.35	51.36	51.36	51.16	51.76	52.35	52.75	53.14	

Average = Sum(39)$_{1…12}$ /12= 52.5 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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

Average = Sum(40)$_{1…12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.99 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.49 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	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

Total = Sum(44)$_{1…12}$ = 977.9 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	132.93	116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74

Total = Sum(45)$_{1…12}$ = 1282.18 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.94	17.44	18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)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	172.05	184.02	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.21	166.19	175.25	158.09	155.64	140.1	135.53	147.37	146.69	163.88	172.05	184.02	

Output from water heater (annual)$_{1...12}$	1933.02	(64)

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

(65)m=	88.42	78.6	84.11	77.57	77.59	71.59	70.91	74.84	73.78	80.33	82.21	87.03	(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=	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 Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	15.49	13.76	11.19	8.47	6.33	5.35	5.78	7.51	10.08	12.8	14.94	15.93	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see 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	166.13	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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 (negative values) (Table 5)													
(71)m=	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	(71)
Water heating gains (Table 5)													
(72)m=	118.85	116.96	113.06	107.74	104.29	99.43	95.3	100.59	102.47	107.97	114.19	116.97	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	361.01	359.2	348.18	330.47	312.67	295.34	283.98	289.2	298.19	316.08	336.65	351.9	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast	0.9x	0.77	x	6.09	x	36.79	x	0.63	x	0.7	=	68.48	(77)
Southeast	0.9x	0.77	x	6.09	x	62.67	x	0.63	x	0.7	=	116.65	(77)

Southeast 0.9x	0.77	x	6.09	x	85.75	x	0.63	x	0.7	=	159.6	(77)
Southeast 0.9x	0.77	x	6.09	x	106.25	x	0.63	x	0.7	=	197.75	(77)
Southeast 0.9x	0.77	x	6.09	x	119.01	x	0.63	x	0.7	=	221.5	(77)
Southeast 0.9x	0.77	x	6.09	x	118.15	x	0.63	x	0.7	=	219.9	(77)
Southeast 0.9x	0.77	x	6.09	x	113.91	x	0.63	x	0.7	=	212.01	(77)
Southeast 0.9x	0.77	x	6.09	x	104.39	x	0.63	x	0.7	=	194.29	(77)
Southeast 0.9x	0.77	x	6.09	x	92.85	x	0.63	x	0.7	=	172.81	(77)
Southeast 0.9x	0.77	x	6.09	x	69.27	x	0.63	x	0.7	=	128.92	(77)
Southeast 0.9x	0.77	x	6.09	x	44.07	x	0.63	x	0.7	=	82.02	(77)
Southeast 0.9x	0.77	x	6.09	x	31.49	x	0.63	x	0.7	=	58.6	(77)
Southwest 0.9x	0.77	x	4.7	x	36.79		0.63	x	0.7	=	52.85	(79)
Southwest 0.9x	0.77	x	4.7	x	62.67		0.63	x	0.7	=	90.02	(79)
Southwest 0.9x	0.77	x	4.7	x	85.75		0.63	x	0.7	=	123.17	(79)
Southwest 0.9x	0.77	x	4.7	x	106.25		0.63	x	0.7	=	152.62	(79)
Southwest 0.9x	0.77	x	4.7	x	119.01		0.63	x	0.7	=	170.94	(79)
Southwest 0.9x	0.77	x	4.7	x	118.15		0.63	x	0.7	=	169.71	(79)
Southwest 0.9x	0.77	x	4.7	x	113.91		0.63	x	0.7	=	163.62	(79)
Southwest 0.9x	0.77	x	4.7	x	104.39		0.63	x	0.7	=	149.94	(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	69.27		0.63	x	0.7	=	99.49	(79)
Southwest 0.9x	0.77	x	4.7	x	44.07		0.63	x	0.7	=	63.3	(79)
Southwest 0.9x	0.77	x	4.7	x	31.49		0.63	x	0.7	=	45.23	(79)
Northwest 0.9x	0.77	x	2.92	x	11.28	x	0.63	x	0.7	=	10.07	(81)
Northwest 0.9x	0.77	x	2.92	x	22.97	x	0.63	x	0.7	=	20.5	(81)
Northwest 0.9x	0.77	x	2.92	x	41.38	x	0.63	x	0.7	=	36.93	(81)
Northwest 0.9x	0.77	x	2.92	x	67.96	x	0.63	x	0.7	=	60.64	(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	x	97.38	x	0.63	x	0.7	=	86.9	(81)
Northwest 0.9x	0.77	x	2.92	x	91.1	x	0.63	x	0.7	=	81.3	(81)
Northwest 0.9x	0.77	x	2.92	x	72.63	x	0.63	x	0.7	=	64.81	(81)
Northwest 0.9x	0.77	x	2.92	x	50.42	x	0.63	x	0.7	=	44.99	(81)
Northwest 0.9x	0.77	x	2.92	x	28.07	x	0.63	x	0.7	=	25.05	(81)
Northwest 0.9x	0.77	x	2.92	x	14.2	x	0.63	x	0.7	=	12.67	(81)
Northwest 0.9x	0.77	x	2.92	x	9.21	x	0.63	x	0.7	=	8.22	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	131.4	227.17	319.7	411.01	473.96	476.51	456.92	409.05	351.18	253.46	157.99	112.06	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(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)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

DER WorkSheet: New dwelling design stage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × 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	(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

	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													
(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													
(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]													
(97)m=	814.42	795.35	725.02	601.93	460.68	305.71	203.32	212.81	333	509.67	672	805.28	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	256.41	173.67	118.07	46.74	13.38	0	0	0	0	52.7	156.87	267.08	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1084.92 (98)

Space heating requirement in kWh/m²/year 17.98 (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	1084.92

DER WorkSheet: New dwelling design stage

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1139.16	(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		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)…(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 4f): mechanical ventilation - balanced, extract or positive input from outside		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) + (330b) + (330g) =	128.36	(331)
Energy for lighting (calculated in Appendix L)		273.64	(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) =		3462.02	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	587.37	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	16.45	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	603.81	(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) =				603.81	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	66.62	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	142.02	(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) =				755.98	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.53	(384)
EI rating (section 14)					90.38	(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 10:43:20

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 103.81m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 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))

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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	13.21m²	
Windows facing: South East	5.5m²	
Windows facing: North West	4.61m²	
Ventilation rate:	6.00	

10 Key features

Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 04 - A

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	103.81	(1a) x	2.65	(2a) =	275.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	103.81	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	275.1	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			13.21	x1/[1/(1.4)+ 0.04]	=	17.51			(27)
Windows Type 2			5.5	x1/[1/(1.4)+ 0.04]	=	7.29			(27)
Windows Type 3			4.61	x1/[1/(1.4)+ 0.04]	=	6.11			(27)
Walls Type1	76.16	23.32	52.84	x 0.18	=	9.51	60	3170.4	(29)
Walls Type2	49.77	0	49.77	x 0.17	=	8.36	60	2986.2	(29)
Total area of elements, m²			125.93						(31)
Party wall			12.14	x 0	=	0	45	546.3	(32)
Party floor			103.81				40	4152.4	(32a)
Party ceiling			103.81				30	3114.3	(32b)
Internal wall **			193.17				9	1738.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 48.78 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 15708.13 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 151.32 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.77 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.55 (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

DER WorkSheet: New dwelling design stage

(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 transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	87.35	87.01	86.67	84.97	84.63	82.93	82.93	82.59	83.61	84.63	85.31	85.99	

Average = Sum(39)$_{1…12}$ /12= 84.89 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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	

Average = Sum(40)$_{1…12}$ /12= 0.82 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.77 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 100.04 (43)

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=	110.04	106.04	102.04	98.04	94.04	90.03	90.03	94.04	98.04	102.04	106.04	110.04	

Total = Sum(44)$_{1…12}$ = 1200.45 (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=	163.19	142.73	147.28	128.4	123.2	106.32	98.52	113.05	114.4	133.32	145.53	158.04	

Total = Sum(45)$_{1…12}$ = 1573.98 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(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:

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(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 contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	218.46	192.65	202.56	181.9	178.48	159.81	153.79	168.33	167.89	188.6	199.03	213.32

Output from water heater (annual)$_{1…12}$ | 2224.82 | (64)

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

(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 from community heating

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m=	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)													
(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)													
(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 + (71)m + (72)m													
(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 applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
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)

Southeast 0.9x	0.77	x	5.5	x	85.75	x	0.63	x	0.7	=	144.14	(77)
Southeast 0.9x	0.77	x	5.5	x	106.25	x	0.63	x	0.7	=	178.6	(77)
Southeast 0.9x	0.77	x	5.5	x	119.01	x	0.63	x	0.7	=	200.04	(77)
Southeast 0.9x	0.77	x	5.5	x	118.15	x	0.63	x	0.7	=	198.6	(77)
Southeast 0.9x	0.77	x	5.5	x	113.91	x	0.63	x	0.7	=	191.47	(77)
Southeast 0.9x	0.77	x	5.5	x	104.39	x	0.63	x	0.7	=	175.47	(77)
Southeast 0.9x	0.77	x	5.5	x	92.85	x	0.63	x	0.7	=	156.07	(77)
Southeast 0.9x	0.77	x	5.5	x	69.27	x	0.63	x	0.7	=	116.43	(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	x	31.49	x	0.63	x	0.7	=	52.93	(77)
Southwest 0.9x	0.77	x	13.21	x	36.79		0.63	x	0.7	=	148.54	(79)
Southwest 0.9x	0.77	x	13.21	x	62.67		0.63	x	0.7	=	253.02	(79)
Southwest 0.9x	0.77	x	13.21	x	85.75		0.63	x	0.7	=	346.2	(79)
Southwest 0.9x	0.77	x	13.21	x	106.25		0.63	x	0.7	=	428.95	(79)
Southwest 0.9x	0.77	x	13.21	x	119.01		0.63	x	0.7	=	480.46	(79)
Southwest 0.9x	0.77	x	13.21	x	118.15		0.63	x	0.7	=	476.99	(79)
Southwest 0.9x	0.77	x	13.21	x	113.91		0.63	x	0.7	=	459.87	(79)
Southwest 0.9x	0.77	x	13.21	x	104.39		0.63	x	0.7	=	421.44	(79)
Southwest 0.9x	0.77	x	13.21	x	92.85		0.63	x	0.7	=	374.86	(79)
Southwest 0.9x	0.77	x	13.21	x	69.27		0.63	x	0.7	=	279.64	(79)
Southwest 0.9x	0.77	x	13.21	x	44.07		0.63	x	0.7	=	177.92	(79)
Southwest 0.9x	0.77	x	13.21	x	31.49		0.63	x	0.7	=	127.12	(79)
Northwest 0.9x	0.77	x	4.61	x	11.28	x	0.63	x	0.7	=	15.9	(81)
Northwest 0.9x	0.77	x	4.61	x	22.97	x	0.63	x	0.7	=	32.36	(81)
Northwest 0.9x	0.77	x	4.61	x	41.38	x	0.63	x	0.7	=	58.3	(81)
Northwest 0.9x	0.77	x	4.61	x	67.96	x	0.63	x	0.7	=	95.74	(81)
Northwest 0.9x	0.77	x	4.61	x	91.35	x	0.63	x	0.7	=	128.7	(81)
Northwest 0.9x	0.77	x	4.61	x	97.38	x	0.63	x	0.7	=	137.2	(81)
Northwest 0.9x	0.77	x	4.61	x	91.1	x	0.63	x	0.7	=	128.35	(81)
Northwest 0.9x	0.77	x	4.61	x	72.63	x	0.63	x	0.7	=	102.32	(81)
Northwest 0.9x	0.77	x	4.61	x	50.42	x	0.63	x	0.7	=	71.04	(81)
Northwest 0.9x	0.77	x	4.61	x	28.07	x	0.63	x	0.7	=	39.54	(81)
Northwest 0.9x	0.77	x	4.61	x	14.2	x	0.63	x	0.7	=	20	(81)
Northwest 0.9x	0.77	x	4.61	x	9.21	x	0.63	x	0.7	=	12.98	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	226.28	390.73	548.63	703.29	809.2	812.79	779.69	699.23	601.97	435.62	272	193.03	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	708.96	871.2	1013.57	1143	1223.01	1201.81	1152.72	1078.65	994.43	853.54	719.21	662.48	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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(86)m=	0.98	0.95	0.89	0.77	0.61	0.44	0.32	0.35	0.56	0.83	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 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)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.22	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 gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.87	0.74	0.57	0.39	0.26	0.29	0.5	0.8	0.94	0.98	(89)

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

(90)m=	18.75	19.14	19.58	19.99	20.18	20.25	20.25	20.26	20.22	19.95	19.3	18.69	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.19	19.54	19.93	20.3	20.47	20.53	20.54	20.54	20.51	20.26	19.68	19.14	(92)

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

(93)m=	19.19	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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.93	0.86	0.74	0.58	0.4	0.28	0.32	0.52	0.8	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	684.71	810.29	876.63	848.5	708.01	486.63	325.87	340.61	519.7	681.17	673.32	644.36	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1300.79	1273.63	1164.02	968.27	742.05	491.85	326.66	341.91	535.72	817.5	1073.07	1284.7	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	458.37	311.36	213.82	86.23	25.32	0	0	0	0	101.43	287.82	476.41	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1960.76 (98)

Space heating requirement in kWh/m²/year 18.89 (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	1960.76	

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Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2058.8	(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		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)…(307e) + (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) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		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) + (330b) + (330g) =	253.73	(331)
Energy for lighting (calculated in Appendix L)		412.99	(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) =		4952.76	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	814.62	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	22.81	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	837.43	(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) =				837.43	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	131.68	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	214.34	(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) =				1126.98	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				10.86	(384)
EI rating (section 14)					89.85	(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 10:43:17

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.56m²

Site Reference : Highgate Road - GREEN **Plot 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 04 - B

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.56	(1a) x	2.65	(2a) =	165.78	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.56	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	165.78	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows 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	46.72	16.17	30.55	x	0.18	=	5.5	60	1833	(29)
Walls Type2	13.75	0	13.75	x	0.17	=	2.31	60	825	(29)
Total area of elements, m²			60.47							(31)
Party wall			30.32	x	0	=	0	45	1364.4	(32)
Party floor			62.56					40	2502.4	(32a)
Party ceiling			62.56					30	1876.8	(32b)
Internal wall **			100.8					9	907.2	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.25 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9308.8 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 148.8 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.33 (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=	17.36	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 coefficient, 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	

Average = Sum(39)$_{1…12}$ /12= 52.19 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N — 2.05 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 — 82.96 (43)

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=	91.25	87.94	84.62	81.3	77.98	74.66	74.66	77.98	81.3	84.62	87.94	91.25	
											Total = Sum(44)$_{1...12}$ =	995.51	(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=	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 = Sum(45)$_{1...12}$ =	1305.27	(45)
If instantaneous water heating 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 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)

Enter (50) or (54) in (55) — 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	190.61	168.29	177.41	159.97	157.45	141.66	136.98	149.03	148.36	165.84	174.18	186.34	

Output from water heater (annual)$_{1...12}$ 1956.11 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 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	75.39	74.34	80.98	82.92	87.8	(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=	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	15.99	14.2	11.55	8.74	6.54	5.52	5.96	7.75	10.4	13.21	15.42	16.43	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	(69)
Pumps and fans gains (Table 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=	-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 (Table 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 + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	369.06	367.21	355.89	337.69	319.37	301.56	289.88	295.2	304.45	322.84	343.98	359.68	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	12.71	x	11.28	x	0.63	x	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	x	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	0.9x	0.77	x	12.71	x	97.38	x	0.63	x	0.7	=	378.27	(75)
Northeast	0.9x	0.77	x	12.71	x	91.1	x	0.63	x	0.7	=	353.87	(75)
Northeast	0.9x	0.77	x	12.71	x	72.63	x	0.63	x	0.7	=	282.11	(75)
Northeast	0.9x	0.77	x	12.71	x	50.42	x	0.63	x	0.7	=	195.85	(75)
Northeast	0.9x	0.77	x	12.71	x	28.07	x	0.63	x	0.7	=	109.02	(75)
Northeast	0.9x	0.77	x	12.71	x	14.2	x	0.63	x	0.7	=	55.15	(75)
Northeast	0.9x	0.77	x	12.71	x	9.21	x	0.63	x	0.7	=	35.79	(75)
Northwest	0.9x	0.77	x	3.46	x	11.28	x	0.63	x	0.7	=	11.93	(81)
Northwest	0.9x	0.77	x	3.46	x	22.97	x	0.63	x	0.7	=	24.29	(81)
Northwest	0.9x	0.77	x	3.46	x	41.38	x	0.63	x	0.7	=	43.75	(81)
Northwest	0.9x	0.77	x	3.46	x	67.96	x	0.63	x	0.7	=	71.86	(81)
Northwest	0.9x	0.77	x	3.46	x	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest	0.9x	0.77	x	3.46	x	97.38	x	0.63	x	0.7	=	102.98	(81)
Northwest	0.9x	0.77	x	3.46	x	91.1	x	0.63	x	0.7	=	96.33	(81)
Northwest	0.9x	0.77	x	3.46	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest	0.9x	0.77	x	3.46	x	50.42	x	0.63	x	0.7	=	53.32	(81)
Northwest	0.9x	0.77	x	3.46	x	28.07	x	0.63	x	0.7	=	29.68	(81)
Northwest	0.9x	0.77	x	3.46	x	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest	0.9x	0.77	x	3.46	x	9.21	x	0.63	x	0.7	=	9.74	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	55.76	113.5	204.48	335.82	451.41	481.25	450.2	358.9	249.17	138.7	70.16	45.53	(83)

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) — 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	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	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)

fLA = 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)

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

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(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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 = (94)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	288.59	216.28	156.66	60.76	15.58	0	0	0	0	82.12	191.38	294.91	

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1306.29	(98)
Space heating requirement in kWh/m²/year		20.88	(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		1306.29	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1371.61	(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		1956.11	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2053.91	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	34.26	(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		152.91	(330a)

DER WorkSheet: New dwelling design stage

warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	152.91	(331)
Energy for lighting (calculated in Appendix L)		282.38	(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) =		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 (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	=	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)			=	652.72	(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) =				652.72	(376)
CO2 associated with electricity for pumps and fans 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) as applicable						
Item 1		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)
EI rating (section 14)					89.76	(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 10:43:14

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.62m²

Site Reference : Highgate Road - GREEN **Plot 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 04 - C

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.62	(1a) x	2.65	(2a) =	192.44	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.62	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	192.44	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows 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	72.62	16.17	56.45	x 0.18	=	10.16	60	3387	(29)
Walls Type2	17.78	0	17.78	x 0.17	=	2.99	60	1066.8	(29)
Total area of elements, m²			90.4						(31)
Party wall			30.32	x 0	=	0	45	1364.4	(32)
Party floor			72.62				40	2904.8	(32a)
Party ceiling			72.62				30	2178.6	(32b)
Internal wall **			146.17				9	1315.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.58 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12217.13 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 168.23 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.11 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.69 (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=	20.15	19.91	19.67	18.48	18.24	17.05	17.05	16.81	17.53	18.24	18.72	19.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.84	61.6	61.36	60.17	59.93	58.74	58.74	58.51	59.22	59.93	60.41	60.89	

Average = Sum(39)$_{1…12}$ /12= 60.11 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.85	0.85	0.84	0.83	0.83	0.81	0.81	0.81	0.82	0.83	0.83	0.84

Average = Sum(40)$_{1...12}$ /12= 0.83 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.31 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.02 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)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

Total = Sum(44)$_{1...12}$ = 1068.18 (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=	145.21	127	131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63

Total = Sum(45)$_{1...12}$ = 1400.56 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)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	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	200.48	176.93	186.33	167.75	164.91	148.1	142.94	155.87	155.29	173.91	182.99	195.9	

Output from water heater (annual)$_{1...12}$ 2051.4 (64)

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

(65)m=	92.5	82.17	87.8	80.78	80.67	74.25	73.37	77.67	76.64	83.67	85.85	90.98	(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=	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.13	16.1	13.09	9.91	7.41	6.26	6.76	8.79	11.79	14.97	17.48	18.63	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	(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=	-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 + (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 calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	12.71	x	11.28	x	0.63	x	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	x	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 0.9x	0.77	x	12.71	x	97.38	x	0.63	x	0.7	=	378.27	(75)
Northeast 0.9x	0.77	x	12.71	x	91.1	x	0.63	x	0.7	=	353.87	(75)
Northeast 0.9x	0.77	x	12.71	x	72.63	x	0.63	x	0.7	=	282.11	(75)
Northeast 0.9x	0.77	x	12.71	x	50.42	x	0.63	x	0.7	=	195.85	(75)
Northeast 0.9x	0.77	x	12.71	x	28.07	x	0.63	x	0.7	=	109.02	(75)
Northeast 0.9x	0.77	x	12.71	x	14.2	x	0.63	x	0.7	=	55.15	(75)
Northeast 0.9x	0.77	x	12.71	x	9.21	x	0.63	x	0.7	=	35.79	(75)
Northwest 0.9x	0.77	x	3.46	x	11.28	x	0.63	x	0.7	=	11.93	(81)
Northwest 0.9x	0.77	x	3.46	x	22.97	x	0.63	x	0.7	=	24.29	(81)
Northwest 0.9x	0.77	x	3.46	x	41.38	x	0.63	x	0.7	=	43.75	(81)
Northwest 0.9x	0.77	x	3.46	x	67.96	x	0.63	x	0.7	=	71.86	(81)
Northwest 0.9x	0.77	x	3.46	x	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest 0.9x	0.77	x	3.46	x	97.38	x	0.63	x	0.7	=	102.98	(81)
Northwest 0.9x	0.77	x	3.46	x	91.1	x	0.63	x	0.7	=	96.33	(81)
Northwest 0.9x	0.77	x	3.46	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest 0.9x	0.77	x	3.46	x	50.42	x	0.63	x	0.7	=	53.32	(81)
Northwest 0.9x	0.77	x	3.46	x	28.07	x	0.63	x	0.7	=	29.68	(81)
Northwest 0.9x	0.77	x	3.46	x	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest 0.9x	0.77	x	3.46	x	9.21	x	0.63	x	0.7	=	9.74	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	55.76	113.5	204.48	335.82	451.41	481.25	450.2	358.9	249.17	138.7	70.16	45.53	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	459.17	514.94	593.33	704.36	799.39	809.34	765.31	679.71	580.35	490.4	445.43	438.43	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.94	0.84	0.65	0.46	0.34	0.39	0.66	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.91	20.08	20.38	20.74	20.93	20.99	21	21	20.95	20.66	20.23	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.21	20.21	20.21	20.23	20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.81	0.61	0.41	0.28	0.33	0.6	0.89	0.97	0.99	(89)

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

(90)m=	18.74	18.99	19.42	19.93	20.17	20.24	20.24	20.25	20.2	19.84	19.23	18.72	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.19	19.41	19.79	20.24	20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17	(92)

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

(93)m=	19.19	19.41	19.79	20.24	20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)
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	431.1	(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	4.2	(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	911.39	(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	0	103.45	234.84	357.33	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 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 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 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:
Water heat from Community heat pump (64) x (303a) x (305) x (306) = 2153.97 (310a)

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):
mechanical ventilation - balanced, extract or positive input from outside 177.49 (330a)

DER WorkSheet: New dwelling design stage

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 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 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)
EI rating (section 14)					89.36	(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 10:43:11

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.96m²

Site Reference : Highgate Road - GREEN **Plot 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 04 - D

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.96	(1a) x	2.65	(2a) =	142.99	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.96	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	142.99	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows			12.07	x1/[1/(1.4)+ 0.04]		=	16			(27)
Walls Type1	27.66	12.07	15.59	x	0.18	=	2.81	60	935.4	(29)
Walls Type2	24.24	0	24.24	x	0.17	=	4.07	60	1454.4	(29)
Total area of elements, m²			51.9							(31)
Party wall			31.67	x	0	=	0	45	1425.15	(32)
Party floor			53.96					40	2158.4	(32a)
Party ceiling			53.96					30	1618.8	(32b)
Internal wall **			95.03					9	855.27	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 22.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8447.42 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 156.55 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.04 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 28.91 (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=	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 coefficient, W/K (39)m = (37) + (38)m

(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)

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Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.81 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 77.11 (43)

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=	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 = Sum(44)$_{1…12}$ =		925.35	(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=	125.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82	
										Total = Sum(45)$_{1…12}$ =		1213.27	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	18.87	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27	(46)

Water storage loss:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	181.07	159.94	168.8	152.47	150.25	135.45	131.22	142.42	141.68	158.05	165.67	177.1	

Output from water heater (annual)$_{1...12}$ 1864.11 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(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)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.04	12.47	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	157.5	159.14	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	(71)

Water heating gains (Table 5)

(72)m=	115.65	113.87	110.17	105.15	101.88	97.28	93.38	98.38	100.16	105.37	111.24	113.88	(72)

Total internal gains = (66)m + (67)m + (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	271.49	279.71	296.15	315.03	328.97	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (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	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, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	41.62	84.72	152.64	250.67	336.95	359.23	336.05	267.9	185.99	103.53	52.37	33.99	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	378.92	420.3	478.07	559.85	629.86	636.24	602.59	539.39	465.7	399.68	367.4	362.95	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.91	0.79	0.6	0.41	0.3	0.35	0.59	0.86	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.03	20.19	20.48	20.8	20.95	20.99	21	21	20.97	20.74	20.34	20	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.25	20.25	20.25	20.26	20.27	20.28	20.28	20.28	20.28	20.27	20.26	20.26	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.76	0.56	0.37	0.25	0.3	0.54	0.83	0.95	0.98	(89)

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

(90)m=	18.94	19.19	19.59	20.03	20.22	20.28	20.28	20.28	20.25	19.97	19.41	18.92	(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.45	19.66	20.01	20.4	20.57	20.62	20.62	20.62	20.59	20.33	19.85	19.43	(92)

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

(93)m=	19.45	19.66	20.01	20.4	20.57	20.62	20.62	20.62	20.59	20.33	19.85	19.43	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.95	0.89	0.76	0.57	0.39	0.28	0.32	0.56	0.84	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	365.75	397.48	427.33	427.25	360.81	247.22	166.11	173.41	261.73	334.22	345.95	352.08	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	661.94	642.24	585.42	487.92	374.76	248.93	166.37	173.92	270.77	411.33	543.52	654.55	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	220.37	164.48	117.62	43.69	10.37	0	0	0	0	57.37	142.25	225.03	

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	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	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 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		981.18	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1030.24	(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		1864.11	
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) + (310a)…(310e)] =	29.88	(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) =		3241.49	(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 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	=	553.76	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	15.51	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	569.27	(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) =			569.27	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable Item 1		0.52	x 0.01 =	-56.48	(380)
Total CO2, kg/year	sum of (376)…(382) =			701.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			12.99	(384)
EI rating (section 14)				90.51	(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 10:43:09

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.61m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 04 - E

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum	70%	OK

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 04 - E

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	69.61	(1a)	x	2.65	(2a)	=	184.47	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.61	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			184.47	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Windows Type 2			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	41.59	11.89	29.7	x	0.18	=	5.35	60	1782	(29)
Walls Type2	18.41	0	18.41	x	0.17	=	3.09	60	1104.6	(29)
Roof	69.61	0	69.61	x	0.13	=	9.05	9	626.49	(30)
Total area of elements, m²			129.61							(31)
Party wall			38.68	x	0	=	0	45	1740.6	(32)
Party floor			69.61					40	2784.4	(32a)
Internal wall **			136.21					9	1225.89	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 33.25 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9263.98 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 133.08 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.36 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 40.61 (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=	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 coefficient, W/K (39)m = (37) + (38)m

(39)m=	59.93	59.7	59.47	58.33	58.1	56.96	56.96	56.73	57.42	58.1	58.56	59.01	

Average = Sum(39)$_{1…12}$ /12= 58.27 (39)

DER WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)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

Average = Sum(40)$_{1...12}$ /12= 0.84 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.24 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.32 (43)

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=	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 = Sum(44)$_{1...12}$ = 1047.84 (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=	142.44	124.58	128.56	112.08	107.54	92.8	85.99	98.68	99.86	116.37	127.03	137.95

Total = Sum(45)$_{1...12}$ = 1373.88 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.37	18.69	19.28	16.81	16.13	13.92	12.9	14.8	14.98	17.46	19.05	20.69	(46)

Water storage 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	197.72	174.51	183.83	165.57	162.82	146.29	141.27	153.96	153.35	171.65	180.52	193.22	(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	0	(63)

Output from water heater

(64)m=	197.72	174.51	183.83	165.57	162.82	146.29	141.27	153.96	153.35	171.65	180.52	193.22	

Output from water heater (annual)$_{1...12}$ 2024.72 (64)

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

(65)m=	91.58	81.36	86.97	80.06	79.98	73.65	72.81	77.03	76	82.92	85.03	90.09	(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=	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	111.83	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.04	16.02	13.03	9.87	7.37	6.23	6.73	8.74	11.74	14.9	17.39	18.54	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	196.39	198.42	193.29	182.36	168.55	155.58	146.92	144.88	150.02	160.95	174.75	187.72	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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 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=	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	-89.46	(71)

Water heating gains (Table 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 internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	394.07	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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast 0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

Northeast 0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast 0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast 0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast 0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast 0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast 0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast 0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)
Southwest 0.9x	0.77	x	2.92	x	36.79		0.63	x	0.7	=	32.83	(79)
Southwest 0.9x	0.77	x	2.92	x	62.67		0.63	x	0.7	=	55.93	(79)
Southwest 0.9x	0.77	x	2.92	x	85.75		0.63	x	0.7	=	76.52	(79)
Southwest 0.9x	0.77	x	2.92	x	106.25		0.63	x	0.7	=	94.82	(79)
Southwest 0.9x	0.77	x	2.92	x	119.01		0.63	x	0.7	=	106.2	(79)
Southwest 0.9x	0.77	x	2.92	x	118.15		0.63	x	0.7	=	105.44	(79)
Southwest 0.9x	0.77	x	2.92	x	113.91		0.63	x	0.7	=	101.65	(79)
Southwest 0.9x	0.77	x	2.92	x	104.39		0.63	x	0.7	=	93.16	(79)
Southwest 0.9x	0.77	x	2.92	x	92.85		0.63	x	0.7	=	82.86	(79)
Southwest 0.9x	0.77	x	2.92	x	69.27		0.63	x	0.7	=	61.81	(79)
Southwest 0.9x	0.77	x	2.92	x	44.07		0.63	x	0.7	=	39.33	(79)
Southwest 0.9x	0.77	x	2.92	x	31.49		0.63	x	0.7	=	28.1	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	63.76	118.89	189.96	281.11	356.62	372.4	351.39	292.25	221.08	138.76	78.25	53.36	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	457.84	510.96	569.72	641.07	696.59	693.05	659.46	605.97	544.94	482.6	445.04	437.26	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.96	0.92	0.83	0.69	0.51	0.38	0.42	0.66	0.88	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.7	19.9	20.21	20.6	20.85	20.97	20.99	20.99	20.91	20.57	20.09	19.68	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.2	20.2	20.21	20.22	20.22	20.24	20.24	20.24	20.23	20.22	20.22	20.21	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.91	0.81	0.65	0.45	0.31	0.36	0.6	0.85	0.95	0.97	(89)

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

(90)m=	18.46	18.74	19.19	19.73	20.07	20.21	20.23	20.23	20.15	19.71	19.02	18.43	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	325.58	250.15	198.08	97.79	36	0	0	0	0	104.45	219.61	331.75	

Total per year (kWh/year) = Sum(98)1...5,9...12 = 1563.42 (98)

Space heating requirement in kWh/m²/year 22.46 (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		1563.42	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1641.6	(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		2024.72	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2125.95	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	37.68	(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		170.14	(330a)

DER WorkSheet: New dwelling design stage

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (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) + (312) + (315) + (331) + (332)...(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 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	=	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)			=	717.9	(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) =				717.9	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		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)
EI rating (section 14)					89.3	(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 10:43:07

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.62m²

Site Reference : Highgate Road - GREEN **Plot 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

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	$8.97m^2$	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	$3.0 m^3/m^2h$	
Party Walls U-value	$0 W/m^2K$	
Community heating, heat from electric heat pump		
Photovoltaic array		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 04 - F

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(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 heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows			8.97	x1/[1/(1.4)+ 0.04]		=	11.89			(27)
Walls Type1	31.4	8.97	22.43	x	0.18	=	4.04	60	1345.8	(29)
Walls Type2	22.92	0	22.92	x	0.17	=	3.85	60	1375.2	(29)
Roof	50.62	0	50.62	x	0.13	=	6.58	9	455.58	(30)
Total area of elements, m²			104.94							(31)
Party wall			30.08	x	0	=	0	45	1353.6	(32)
Party floor			50.62					40	2024.8	(32a)
Internal wall **			83.2					9	748.8	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 26.36 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7303.78 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 144.29 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 32.6 (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=	13.86	13.69	13.52	12.69	12.53	11.7	11.7	11.53	12.03	12.53	12.86	13.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	46.45	46.29	46.12	45.29	45.12	44.29	44.29	44.13	44.63	45.12	45.46	45.79	

Average = Sum(39)$_{1…12}$ /12= 45.25 (39)

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Heat loss parameter (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

Average = Sum(40)$_{1…12}$ /12= 0.89 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.71 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 74.77 (43)

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=	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 = Sum(44)$_{1…12}$ = 897.28 (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=	121.98	106.68	110.09	95.97	92.09	79.47	73.64	84.5	85.51	99.65	108.78	118.13

Total = Sum(45)$_{1…12}$ = 1176.48 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.3	16	16.51	14.4	13.81	11.92	11.05	12.68	12.83	14.95	16.32	17.72	(46)

Water storage loss:

Storage volume (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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.78	139	154.93	162.27	173.4	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	177.25	156.61	165.36	149.47	147.37	132.96	128.91	139.78	139	154.93	162.27	173.4

Output from water heater (annual)$_{1...12}$ 1827.32 (64)

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

(65)m=	84.78	75.41	80.82	74.71	74.84	69.22	68.71	72.32	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 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=	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	85.42	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	13.59	12.07	9.81	7.43	5.55	4.69	5.07	6.59	8.84	11.22	13.1	13.97	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	31.54	(69)
Pumps and fans gains (Table 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=	-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 (Table 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 internal gains =						(66)m + (67)m + (68)m + (69)m + (70)m + (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 gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	8.97	x	11.28	x	0.63	x	0.7	=	30.93	(75)
Northeast 0.9x	0.77	x	8.97	x	22.97	x	0.63	x	0.7	=	62.96	(75)
Northeast 0.9x	0.77	x	8.97	x	41.38	x	0.63	x	0.7	=	113.43	(75)
Northeast 0.9x	0.77	x	8.97	x	67.96	x	0.63	x	0.7	=	186.29	(75)
Northeast 0.9x	0.77	x	8.97	x	91.35	x	0.63	x	0.7	=	250.41	(75)

DER WorkSheet: New dwelling design stage

Northeast	0.9x	0.77	x	8.97	x	97.38	x	0.63	x	0.7	=	266.96	(75)
Northeast	0.9x	0.77	x	8.97	x	91.1	x	0.63	x	0.7	=	249.74	(75)
Northeast	0.9x	0.77	x	8.97	x	72.63	x	0.63	x	0.7	=	199.1	(75)
Northeast	0.9x	0.77	x	8.97	x	50.42	x	0.63	x	0.7	=	138.22	(75)
Northeast	0.9x	0.77	x	8.97	x	28.07	x	0.63	x	0.7	=	76.94	(75)
Northeast	0.9x	0.77	x	8.97	x	14.2	x	0.63	x	0.7	=	38.92	(75)
Northeast	0.9x	0.77	x	8.97	x	9.21	x	0.63	x	0.7	=	25.26	(75)

Solar gains in watts, calculated for each 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 and 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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.96	0.93	0.85	0.7	0.51	0.38	0.43	0.68	0.89	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.72	19.89	20.19	20.59	20.85	20.97	20.99	20.99	20.9	20.56	20.09	19.7	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.15	20.16	20.16	20.17	20.17	20.19	20.19	20.19	20.18	20.17	20.17	20.16	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.96	0.92	0.82	0.65	0.45	0.31	0.36	0.62	0.86	0.95	0.97	(89)

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

(90)m=	18.45	18.68	19.12	19.67	20.02	20.16	20.18	20.18	20.09	19.65	18.99	18.42	(90)

fLA = Living area ÷ (4) = 0.49 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.07	19.27	19.64	20.12	20.43	20.56	20.58	20.58	20.49	20.1	19.53	19.05	(92)

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

(93)m=	19.07	19.27	19.64	20.12	20.43	20.56	20.58	20.58	20.49	20.1	19.53	19.05	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.95	0.91	0.82	0.67	0.48	0.34	0.39	0.64	0.86	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	342.25	365.64	388.32	396.27	354.46	255.99	174.71	181.67	260.98	312.14	322.6	330.69	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	686.17	665.29	606.21	508.18	393.82	263.86	176.3	184.35	285.2	428.51	565.03	679.91	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	255.88	201.37	162.11	80.57	29.28	0	0	0	0	86.58	174.55	259.82	(98)

DER WorkSheet: New dwelling design stage

	Total per year (kWh/year) = Sum(98)1...5,9...12 =	1250.16	(98)
Space heating requirement in kWh/m²/year		24.7	(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		1250.16	
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		1827.32	
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)…(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): mechanical ventilation - balanced, extract or positive input from outside		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/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)
Electrical energy for heat distribution	[(313) x	0.52	=	16.77	(372)

DER WorkSheet: New dwelling design stage

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	(373) + (374) + (375) =				615.73	(376)
CO2 associated with electricity for pumps and fans 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 (334) as applicable Item 1		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)
EI rating (section 14)					89.63	(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 10:43:05

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.92m²

Site Reference : Highgate Road - GREEN **Plot 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
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	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 04 - G

Address :

1. Overall dwelling dimensions:

	Area(m²)			**Av. Height(m)**			**Volume(m³)**	
Ground floor	63.92	(1a)	x	2.65	(2a)	=	169.39	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.92	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			169.39	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 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	61.09	18.32	42.77	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	x	0.13	=	8.31	9	575.28	(30)
Total area of elements, m²			128.87							(31)
Party wall			37.5	x	0	=	0	45	1687.5	(32)
Party floor			63.92					40	2556.8	(32a)
Internal wall **			113.47					9	1021.23	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 40.94 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8638.61 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 135.15 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.3 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

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	15.82	14.77	14.77	14.56	15.19	15.82	16.24	16.66	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	66.74	66.53	66.32	65.27	65.06	64.01	64.01	63.8	64.43	65.06	65.48	65.9	

Average = Sum(39)$_{1…12}$ /12= 65.22 (39)

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Heat loss parameter (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

Average = Sum(40)1...12 /12= 1.02 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.09 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 83.84 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	92.22	88.87	85.51	82.16	78.81	75.45	75.45	78.81	82.16	85.51	88.87	92.22

Total = Sum(44)1...12 = 1006.06 (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=	136.76	119.61	123.43	107.61	103.25	89.1	82.56	94.74	95.88	111.73	121.97	132.45

Total = Sum(45)1...12 = 1319.1 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.51	17.94	18.51	16.14	15.49	13.37	12.38	14.21	14.38	16.76	18.29	19.87	(46)

Water storage loss:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.02	149.37	167.01	175.46	187.72	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	192.04	169.54	178.71	161.1	158.53	142.59	137.84	150.02	149.37	167.01	175.46	187.72	

Output from water heater (annual)$_{1...12}$ 1969.94 (64)

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

(65)m=	89.69	79.71	85.26	78.58	78.55	72.42	71.67	75.72	74.67	81.37	83.35	88.26	(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=	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 gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	33.45	(69)

Pumps and fans gains (Table 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=	-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 (Table 5)

(72)m=	120.56	118.62	114.6	109.13	105.58	100.58	96.34	101.78	103.71	109.37	115.76	118.63	(72)

Total internal gains = (66)m + (67)m + (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	298.82	308.23	326.92	348.4	364.37	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	9.56	x	11.28	x	0.63	x	0.7	=	32.96	(75)
Northeast 0.9x	0.77	x	9.56	x	22.97	x	0.63	x	0.7	=	67.1	(75)
Northeast 0.9x	0.77	x	9.56	x	41.38	x	0.63	x	0.7	=	120.89	(75)
Northeast 0.9x	0.77	x	9.56	x	67.96	x	0.63	x	0.7	=	198.54	(75)
Northeast 0.9x	0.77	x	9.56	x	91.35	x	0.63	x	0.7	=	266.88	(75)

Northeast	0.9x	0.77	x	9.56	x	97.38	x	0.63	x	0.7	=	284.52	(75)
Northeast	0.9x	0.77	x	9.56	x	91.1	x	0.63	x	0.7	=	266.17	(75)
Northeast	0.9x	0.77	x	9.56	x	72.63	x	0.63	x	0.7	=	212.19	(75)
Northeast	0.9x	0.77	x	9.56	x	50.42	x	0.63	x	0.7	=	147.31	(75)
Northeast	0.9x	0.77	x	9.56	x	28.07	x	0.63	x	0.7	=	82	(75)
Northeast	0.9x	0.77	x	9.56	x	14.2	x	0.63	x	0.7	=	41.48	(75)
Northeast	0.9x	0.77	x	9.56	x	9.21	x	0.63	x	0.7	=	26.92	(75)
Southeast	0.9x	0.77	x	8.76	x	36.79	x	0.63	x	0.7	=	98.5	(77)
Southeast	0.9x	0.77	x	8.76	x	62.67	x	0.63	x	0.7	=	167.79	(77)
Southeast	0.9x	0.77	x	8.76	x	85.75	x	0.63	x	0.7	=	229.57	(77)
Southeast	0.9x	0.77	x	8.76	x	106.25	x	0.63	x	0.7	=	284.45	(77)
Southeast	0.9x	0.77	x	8.76	x	119.01	x	0.63	x	0.7	=	318.61	(77)
Southeast	0.9x	0.77	x	8.76	x	118.15	x	0.63	x	0.7	=	316.31	(77)
Southeast	0.9x	0.77	x	8.76	x	113.91	x	0.63	x	0.7	=	304.95	(77)
Southeast	0.9x	0.77	x	8.76	x	104.39	x	0.63	x	0.7	=	279.47	(77)
Southeast	0.9x	0.77	x	8.76	x	92.85	x	0.63	x	0.7	=	248.58	(77)
Southeast	0.9x	0.77	x	8.76	x	69.27	x	0.63	x	0.7	=	185.44	(77)
Southeast	0.9x	0.77	x	8.76	x	44.07	x	0.63	x	0.7	=	117.98	(77)
Southeast	0.9x	0.77	x	8.76	x	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	234.89	350.47	483	585.49	600.83	571.12	491.66	395.89	267.44	159.46	111.22	(83)

Total gains – internal and 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 internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.96	0.93	0.87	0.76	0.6	0.44	0.32	0.36	0.58	0.82	0.94	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.5	19.8	20.19	20.61	20.86	20.97	20.99	20.99	20.91	20.55	19.96	19.45	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.05	20.05	20.05	20.07	20.07	20.08	20.08	20.08	20.08	20.07	20.06	20.06	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.85	0.73	0.55	0.38	0.26	0.29	0.51	0.79	0.92	0.96	(89)

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

(90)m=	18.07	18.48	19.03	19.61	19.92	20.05	20.08	20.08	20	19.55	18.73	18	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)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	(92)

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

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(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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 = (94)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	955.2	936.83	860.35	723.65	558.12	371.3	244.8	256.62	402.24	607.14	792.19	945.94	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	356.35	260.14	195.33	92.11	33.47	0	0	0	0	105.06	237.69	367.43	

	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1647.58	(98)
Space heating requirement in kWh/m²/year		25.78	(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		1647.58	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1729.96	(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		1969.94	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2068.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	37.98	(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		135.98	(330a)

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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) =		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) + (312) + (315) + (331) + (332)...(237b) =			4113.22	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(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)			=	723.77	(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) =				723.77	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable						
Item 1		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)
EI rating (section 14)					89.09	(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 10:43:03

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: $60.34m^2$

Site Reference : Highgate Road - GREEN **Plot Reference:** 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	
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.47	
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	4.7m²	
Windows facing: South East	6.09m²	
Windows facing: North West	2.92m²	
Ventilation rate:	6.00	

10 Key features

Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 04 - H

Address :

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	60.34	(1a)	x	2.65	(2a)	=	159.9	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	60.34	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			159.9	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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 and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			4.7	x1/[1/(1.4)+ 0.04]		=	6.23			(27)
Windows Type 2			6.09	x1/[1/(1.4)+ 0.04]		=	8.07			(27)
Windows Type 3			2.92	x1/[1/(1.4)+ 0.04]		=	3.87			(27)
Walls Type1	52.8	13.71	39.09	x	0.18	=	7.04	60	2345.4	(29)
Walls Type2	27.31	0	27.31	x	0.17	=	4.59	60	1638.6	(29)
Roof	60.34	0	60.34	x	0.13	=	7.84	9	543.06	(30)
Total area of elements, m²			140.45							(31)
Party wall			16.88	x	0	=	0	45	759.6	(32)
Party floor			60.34					40	2413.6	(32a)
Internal wall **			107.91					9	971.1901	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*
*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 37.64 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8671.45 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 143.71 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.99 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 45.63 (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

DER WorkSheet: New dwelling design stage

(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)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	62.15	61.95	61.75	60.76	60.56	59.57	59.57	59.38	59.97	60.56	60.96	61.35	

Average = Sum(39)$_{1…12}$ /12= 60.71 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.02	1.01	1	0.99	0.99	0.98	0.99	1	1.01	1.02

Average = Sum(40)$_{1…12}$ /12= 1.01 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.99 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 81.49 (43)
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=	89.64	86.38	83.12	79.86	76.6	73.34	73.34	76.6	79.86	83.12	86.38	89.64

Total = Sum(44)$_{1…12}$ = 977.9 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	132.93	116.27	119.98	104.6	100.36	86.61	80.25	92.09	93.19	108.61	118.55	128.74

Total = Sum(45)$_{1…12}$ = 1282.18 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	19.94	17.44	18	15.69	15.05	12.99	12.04	13.81	13.98	16.29	17.78	19.31	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

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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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)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	172.05	184.02	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	188.21	166.19	175.25	158.09	155.64	140.1	135.53	147.37	146.69	163.88	172.05	184.02

Output from water heater (annual) 1…12 | 1933.02 | (64)

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

(65)m=	88.42	78.6	84.11	77.57	77.59	71.59	70.91	74.84	73.78	80.33	82.21	87.03	(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=	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 Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.49	13.76	11.19	8.47	6.33	5.35	5.78	7.51	10.08	12.8	14.94	15.93	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see 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	166.13	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see 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 (negative values) (Table 5)

(71)m=	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	(71)

Water heating gains (Table 5)

(72)m=	118.85	116.96	113.06	107.74	104.29	99.43	95.3	100.59	102.47	107.97	114.19	116.97	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	361.01	359.2	348.18	330.47	312.67	295.34	283.98	289.2	298.19	316.08	336.65	351.9	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast	0.9x	0.77	x	6.09	x	36.79	x	0.63	x	0.7	=	68.48	(77)
Southeast	0.9x	0.77	x	6.09	x	62.67	x	0.63	x	0.7	=	116.65	(77)

Southeast	0.9x	0.77	x	6.09	x	85.75	x	0.63	x	0.7	=	159.6	(77)
Southeast	0.9x	0.77	x	6.09	x	106.25	x	0.63	x	0.7	=	197.75	(77)
Southeast	0.9x	0.77	x	6.09	x	119.01	x	0.63	x	0.7	=	221.5	(77)
Southeast	0.9x	0.77	x	6.09	x	118.15	x	0.63	x	0.7	=	219.9	(77)
Southeast	0.9x	0.77	x	6.09	x	113.91	x	0.63	x	0.7	=	212.01	(77)
Southeast	0.9x	0.77	x	6.09	x	104.39	x	0.63	x	0.7	=	194.29	(77)
Southeast	0.9x	0.77	x	6.09	x	92.85	x	0.63	x	0.7	=	172.81	(77)
Southeast	0.9x	0.77	x	6.09	x	69.27	x	0.63	x	0.7	=	128.92	(77)
Southeast	0.9x	0.77	x	6.09	x	44.07	x	0.63	x	0.7	=	82.02	(77)
Southeast	0.9x	0.77	x	6.09	x	31.49	x	0.63	x	0.7	=	58.6	(77)
Southwest	0.9x	0.77	x	4.7	x	36.79		0.63	x	0.7	=	52.85	(79)
Southwest	0.9x	0.77	x	4.7	x	62.67		0.63	x	0.7	=	90.02	(79)
Southwest	0.9x	0.77	x	4.7	x	85.75		0.63	x	0.7	=	123.17	(79)
Southwest	0.9x	0.77	x	4.7	x	106.25		0.63	x	0.7	=	152.62	(79)
Southwest	0.9x	0.77	x	4.7	x	119.01		0.63	x	0.7	=	170.94	(79)
Southwest	0.9x	0.77	x	4.7	x	118.15		0.63	x	0.7	=	169.71	(79)
Southwest	0.9x	0.77	x	4.7	x	113.91		0.63	x	0.7	=	163.62	(79)
Southwest	0.9x	0.77	x	4.7	x	104.39		0.63	x	0.7	=	149.94	(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	69.27		0.63	x	0.7	=	99.49	(79)
Southwest	0.9x	0.77	x	4.7	x	44.07		0.63	x	0.7	=	63.3	(79)
Southwest	0.9x	0.77	x	4.7	x	31.49		0.63	x	0.7	=	45.23	(79)
Northwest	0.9x	0.77	x	2.92	x	11.28	x	0.63	x	0.7	=	10.07	(81)
Northwest	0.9x	0.77	x	2.92	x	22.97	x	0.63	x	0.7	=	20.5	(81)
Northwest	0.9x	0.77	x	2.92	x	41.38	x	0.63	x	0.7	=	36.93	(81)
Northwest	0.9x	0.77	x	2.92	x	67.96	x	0.63	x	0.7	=	60.64	(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	x	97.38	x	0.63	x	0.7	=	86.9	(81)
Northwest	0.9x	0.77	x	2.92	x	91.1	x	0.63	x	0.7	=	81.3	(81)
Northwest	0.9x	0.77	x	2.92	x	72.63	x	0.63	x	0.7	=	64.81	(81)
Northwest	0.9x	0.77	x	2.92	x	50.42	x	0.63	x	0.7	=	44.99	(81)
Northwest	0.9x	0.77	x	2.92	x	28.07	x	0.63	x	0.7	=	25.05	(81)
Northwest	0.9x	0.77	x	2.92	x	14.2	x	0.63	x	0.7	=	12.67	(81)
Northwest	0.9x	0.77	x	2.92	x	9.21	x	0.63	x	0.7	=	8.22	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	131.4	227.17	319.7	411.01	473.96	476.51	456.92	409.05	351.18	253.46	157.99	112.06	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(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)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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(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 internal temperature in living area T1 (follow steps 3 to 7 in Table 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)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°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 factor for gains for rest of dwelling, h2,m (see 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 internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.25	18.64	19.13	19.63	19.93	20.06	20.09	20.09	20.02	19.63	18.88	18.19	(90)

fLA = Living area ÷ (4) = 0.44 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.86	19.2	19.63	20.07	20.34	20.46	20.49	20.49	20.42	20.06	19.4	18.81	(92)

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

(93)m=	18.86	19.2	19.63	20.07	20.34	20.46	20.49	20.49	20.42	20.06	19.4	18.81	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.95	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, hmGm , W = (94)m x (84)m													
(95)m=	465.42	533.41	568.62	555.14	476.73	338.83	229.49	239.5	355.24	448.51	451.25	442.25	(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	4.2	(96)
Heat loss rate for mean internal temperature, 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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	327.12	237.01	180.1	89.01	34.61	0	0	0	0	92.73	215.16	337.84	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1513.58 (98)

Space heating requirement in kWh/m²/year 25.08 (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 1513.58

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Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1589.26	(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		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)…(307e) + (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) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		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) + (330b) + (330g) =	128.36	(331)
Energy for lighting (calculated in Appendix L)		273.64	(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) =		3912.12	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	670.8	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	18.78	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	689.58	(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) =				689.58	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	66.62	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	142.02	(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) =				841.74	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.95	(384)
EI rating (section 14)					89.29	(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 10:43:01

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 103.81m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	13.21m²	
Windows facing: South East	5.5m²	
Windows facing: North West	4.61m²	
Ventilation rate:	6.00	

10 Key features

Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 05 - A

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	103.81	(1a) x	2.65	(2a) =	275.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	103.81	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		275.1	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			13.21	x1/[1/(1.4)+ 0.04] =	17.51			(27)
Windows Type 2			5.5	x1/[1/(1.4)+ 0.04] =	7.29			(27)
Windows Type 3			4.61	x1/[1/(1.4)+ 0.04] =	6.11			(27)
Walls Type1	76.16	23.32	52.84	x 0.18 =	9.51	60	3170.4	(29)
Walls Type2	49.77	0	49.77	x 0.17 =	8.36	60	2986.2	(29)
Total area of elements, m²			125.93					(31)
Party wall			12.14	x 0 =	0	45	546.3	(32)
Party floor			103.81			40	4152.4	(32a)
Party ceiling			103.81			30	3114.3	(32b)
Internal wall **			193.17			9	1738.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 48.78 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 15708.13 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 151.32 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.77 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.55 (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

DER WorkSheet: New dwelling design stage

(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 transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	87.35	87.01	86.67	84.97	84.63	82.93	82.93	82.59	83.61	84.63	85.31	85.99	

Average = Sum(39)1...12 /12= 84.89 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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

Average = Sum(40)1...12 /12= 0.82 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.77 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 100.04 (43)
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=	110.04	106.04	102.04	98.04	94.04	90.03	90.03	94.04	98.04	102.04	106.04	110.04

Total = Sum(44)1...12 = 1200.45 (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=	163.19	142.73	147.28	128.4	123.2	106.32	98.52	113.05	114.4	133.32	145.53	158.04

Total = Sum(45)1...12 = 1573.98 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(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:

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(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 contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	218.46	192.65	202.56	181.9	178.48	159.81	153.79	168.33	167.89	188.6	199.03	213.32

Output from water heater (annual)1…12 | 2224.82 | (64)

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

(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 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=	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)

(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)

(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 + (71)m + (72)m

(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 applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
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)

Southeast	0.9x	0.77	x	5.5	x	85.75	x	0.63	x	0.7	=	144.14	(77)
Southeast	0.9x	0.77	x	5.5	x	106.25	x	0.63	x	0.7	=	178.6	(77)
Southeast	0.9x	0.77	x	5.5	x	119.01	x	0.63	x	0.7	=	200.04	(77)
Southeast	0.9x	0.77	x	5.5	x	118.15	x	0.63	x	0.7	=	198.6	(77)
Southeast	0.9x	0.77	x	5.5	x	113.91	x	0.63	x	0.7	=	191.47	(77)
Southeast	0.9x	0.77	x	5.5	x	104.39	x	0.63	x	0.7	=	175.47	(77)
Southeast	0.9x	0.77	x	5.5	x	92.85	x	0.63	x	0.7	=	156.07	(77)
Southeast	0.9x	0.77	x	5.5	x	69.27	x	0.63	x	0.7	=	116.43	(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	x	31.49	x	0.63	x	0.7	=	52.93	(77)
Southwest	0.9x	0.77	x	13.21	x	36.79		0.63	x	0.7	=	148.54	(79)
Southwest	0.9x	0.77	x	13.21	x	62.67		0.63	x	0.7	=	253.02	(79)
Southwest	0.9x	0.77	x	13.21	x	85.75		0.63	x	0.7	=	346.2	(79)
Southwest	0.9x	0.77	x	13.21	x	106.25		0.63	x	0.7	=	428.95	(79)
Southwest	0.9x	0.77	x	13.21	x	119.01		0.63	x	0.7	=	480.46	(79)
Southwest	0.9x	0.77	x	13.21	x	118.15		0.63	x	0.7	=	476.99	(79)
Southwest	0.9x	0.77	x	13.21	x	113.91		0.63	x	0.7	=	459.87	(79)
Southwest	0.9x	0.77	x	13.21	x	104.39		0.63	x	0.7	=	421.44	(79)
Southwest	0.9x	0.77	x	13.21	x	92.85		0.63	x	0.7	=	374.86	(79)
Southwest	0.9x	0.77	x	13.21	x	69.27		0.63	x	0.7	=	279.64	(79)
Southwest	0.9x	0.77	x	13.21	x	44.07		0.63	x	0.7	=	177.92	(79)
Southwest	0.9x	0.77	x	13.21	x	31.49		0.63	x	0.7	=	127.12	(79)
Northwest	0.9x	0.77	x	4.61	x	11.28	x	0.63	x	0.7	=	15.9	(81)
Northwest	0.9x	0.77	x	4.61	x	22.97	x	0.63	x	0.7	=	32.36	(81)
Northwest	0.9x	0.77	x	4.61	x	41.38	x	0.63	x	0.7	=	58.3	(81)
Northwest	0.9x	0.77	x	4.61	x	67.96	x	0.63	x	0.7	=	95.74	(81)
Northwest	0.9x	0.77	x	4.61	x	91.35	x	0.63	x	0.7	=	128.7	(81)
Northwest	0.9x	0.77	x	4.61	x	97.38	x	0.63	x	0.7	=	137.2	(81)
Northwest	0.9x	0.77	x	4.61	x	91.1	x	0.63	x	0.7	=	128.35	(81)
Northwest	0.9x	0.77	x	4.61	x	72.63	x	0.63	x	0.7	=	102.32	(81)
Northwest	0.9x	0.77	x	4.61	x	50.42	x	0.63	x	0.7	=	71.04	(81)
Northwest	0.9x	0.77	x	4.61	x	28.07	x	0.63	x	0.7	=	39.54	(81)
Northwest	0.9x	0.77	x	4.61	x	14.2	x	0.63	x	0.7	=	20	(81)
Northwest	0.9x	0.77	x	4.61	x	9.21	x	0.63	x	0.7	=	12.98	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	226.28	390.73	548.63	703.29	809.2	812.79	779.69	699.23	601.97	435.62	272	193.03	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	708.96	871.2	1013.57	1143	1223.01	1201.81	1152.72	1078.65	994.43	853.54	719.21	662.48	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

DER WorkSheet: New dwelling design stage

(86)m=	0.98	0.95	0.89	0.77	0.61	0.44	0.32	0.35	0.56	0.83	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 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)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.22	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 gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.87	0.74	0.57	0.39	0.26	0.29	0.5	0.8	0.94	0.98	(89)

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

(90)m=	18.75	19.14	19.58	19.99	20.18	20.25	20.25	20.26	20.22	19.95	19.3	18.69	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.19	19.54	19.93	20.3	20.47	20.53	20.54	20.54	20.51	20.26	19.68	19.14	(92)

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

(93)m=	19.19	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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.93	0.86	0.74	0.58	0.4	0.28	0.32	0.52	0.8	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	684.71	810.29	876.63	848.5	708.01	486.63	325.87	340.61	519.7	681.17	673.32	644.36	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1300.79	1273.63	1164.02	968.27	742.05	491.85	326.66	341.91	535.72	817.5	1073.07	1284.7	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	458.37	311.36	213.82	86.23	25.32	0	0	0	0	101.43	287.82	476.41	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1960.76 (98)

Space heating requirement in kWh/m²/year 18.89 (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 1960.76

DER WorkSheet: New dwelling design stage

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2058.8	(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		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)…(307e) + (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) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		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) + (330b) + (330g) =	253.73	(331)
Energy for lighting (calculated in Appendix L)		412.99	(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) =		4952.76	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	814.62	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	22.81	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	837.43	(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) =				837.43	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	131.68	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	214.34	(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) =				1126.98	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				10.86	(384)
EI rating (section 14)					89.85	(385)

Regulations Compliance Report

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Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.56m²

Site Reference : Highgate Road - GREEN **Plot 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	**OK**
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 05 - B

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.56	(1a) x	2.65	(2a) =	165.78	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.56	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	165.78	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows 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	46.72	16.17	30.55	x	0.18	=	5.5	60	1833	(29)
Walls Type2	13.75	0	13.75	x	0.17	=	2.31	60	825	(29)
Total area of elements, m²			60.47							(31)
Party wall			30.32	x	0	=	0	45	1364.4	(32)
Party floor			62.56					40	2502.4	(32a)
Party ceiling			62.56					30	1876.8	(32b)
Internal wall **			100.8					9	907.2	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.25 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9308.8 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 148.8 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.33 (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=	17.36	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 coefficient, 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	

Average = Sum(39)$_{1…12}$ /12= 52.19 (39)

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Heat loss parameter (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 days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.05 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 82.96 (43)

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=	91.25	87.94	84.62	81.3	77.98	74.66	74.66	77.98	81.3	84.62	87.94	91.25

Total = Sum(44)1…12 = 995.51 (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=	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 = Sum(45)1…12 = 1305.27 (45)

If instantaneous water heating 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 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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	190.61	168.29	177.41	159.97	157.45	141.66	136.98	149.03	148.36	165.84	174.18	186.34	

Output from water heater (annual)$_{1...12}$ 1956.11 (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 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	75.39	74.34	80.98	82.92	87.8	(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=	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	102.65	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	15.99	14.2	11.55	8.74	6.54	5.52	5.96	7.75	10.4	13.21	15.42	16.43	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	33.27	(69)

Pumps and fans gains (Table 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=	-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 (Table 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 + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	369.06	367.21	355.89	337.69	319.37	301.56	289.88	295.2	304.45	322.84	343.98	359.68	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	12.71	x	11.28	x	0.63	x	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	x	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	0.9x	0.77	x	12.71	x	97.38	x	0.63	x	0.7	=	378.27	(75)
Northeast	0.9x	0.77	x	12.71	x	91.1	x	0.63	x	0.7	=	353.87	(75)
Northeast	0.9x	0.77	x	12.71	x	72.63	x	0.63	x	0.7	=	282.11	(75)
Northeast	0.9x	0.77	x	12.71	x	50.42	x	0.63	x	0.7	=	195.85	(75)
Northeast	0.9x	0.77	x	12.71	x	28.07	x	0.63	x	0.7	=	109.02	(75)
Northeast	0.9x	0.77	x	12.71	x	14.2	x	0.63	x	0.7	=	55.15	(75)
Northeast	0.9x	0.77	x	12.71	x	9.21	x	0.63	x	0.7	=	35.79	(75)
Northwest	0.9x	0.77	x	3.46	x	11.28	x	0.63	x	0.7	=	11.93	(81)
Northwest	0.9x	0.77	x	3.46	x	22.97	x	0.63	x	0.7	=	24.29	(81)
Northwest	0.9x	0.77	x	3.46	x	41.38	x	0.63	x	0.7	=	43.75	(81)
Northwest	0.9x	0.77	x	3.46	x	67.96	x	0.63	x	0.7	=	71.86	(81)
Northwest	0.9x	0.77	x	3.46	x	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest	0.9x	0.77	x	3.46	x	97.38	x	0.63	x	0.7	=	102.98	(81)
Northwest	0.9x	0.77	x	3.46	x	91.1	x	0.63	x	0.7	=	96.33	(81)
Northwest	0.9x	0.77	x	3.46	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest	0.9x	0.77	x	3.46	x	50.42	x	0.63	x	0.7	=	53.32	(81)
Northwest	0.9x	0.77	x	3.46	x	28.07	x	0.63	x	0.7	=	29.68	(81)
Northwest	0.9x	0.77	x	3.46	x	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest	0.9x	0.77	x	3.46	x	9.21	x	0.63	x	0.7	=	9.74	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	55.76	113.5	204.48	335.82	451.41	481.25	450.2	358.9	249.17	138.7	70.16	45.53	(83)

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) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	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	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)

fLA = 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)

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

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(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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 = (94)m x (84)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 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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(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 heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	288.59	216.28	156.66	60.76	15.58	0	0	0	0	82.12	191.38	294.91	

	Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ =	1306.29	(98)
Space heating requirement in kWh/m²/year		20.88	(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		1306.29	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1371.61	(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		1956.11	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2053.91	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307e) + (310a)…(310e)] =	34.26	(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		152.91	(330a)

DER WorkSheet: New dwelling design stage

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =			152.91	(331)
Energy for lighting (calculated in Appendix L)				282.38	(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) =				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 (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	=	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)			=	652.72	(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) =				652.72	(376)
CO2 associated with electricity for pumps and fans 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) as applicable						
Item 1		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)
EI rating (section 14)					89.76	(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 10:42:59

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 72.62m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 05 - C

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 05 - C

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	72.62	(1a) x	2.65	(2a) =	192.44	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	72.62	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	192.44	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows 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	72.62	16.17	56.45	x	0.18	=	10.16	60	3387	(29)
Walls Type2	17.78	0	17.78	x	0.17	=	2.99	60	1066.8	(29)
Total area of elements, m²			90.4							(31)
Party wall			30.32	x	0	=	0	45	1364.4	(32)
Party floor			72.62					40	2904.8	(32a)
Party ceiling			72.62					30	2178.6	(32b)
Internal wall **			146.17					9	1315.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.58 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 12217.13 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 168.23 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 7.11 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.69 (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=	20.15	19.91	19.67	18.48	18.24	17.05	17.05	16.81	17.53	18.24	18.72	19.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.84	61.6	61.36	60.17	59.93	58.74	58.74	58.51	59.22	59.93	60.41	60.89	

Average = Sum(39)$_{1…12}$ /12= 60.11 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.85	0.85	0.84	0.83	0.83	0.81	0.81	0.81	0.82	0.83	0.83	0.84

Average = Sum(40)$_{1…12}$ /12= 0.83 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.31 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 89.02 (43)

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=	97.92	94.36	90.8	87.24	83.67	80.11	80.11	83.67	87.24	90.8	94.36	97.92	
											Total = Sum(44)$_{1…12}$ =	1068.18	(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=	145.21	127	131.05	114.25	109.63	94.6	87.66	100.59	101.8	118.63	129.5	140.63	
											Total = Sum(45)$_{1…12}$ =	1400.56	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)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	(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)

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

DER WorkSheet: New dwelling design stage

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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	200.48	176.93	186.33	167.75	164.91	148.1	142.94	155.87	155.29	173.91	182.99	195.9	

Output from water heater (annual)$_{1...12}$ 2051.4 (64)

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

(65)m=	92.5	82.17	87.8	80.78	80.67	74.25	73.37	77.67	76.64	83.67	85.85	90.98	(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=	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	115.4	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	18.13	16.1	13.09	9.91	7.41	6.26	6.76	8.79	11.79	14.97	17.48	18.63	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 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 (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	34.54	(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=	-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 + (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 calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	12.71	x	11.28	x	0.63	x	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	x	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	0.9x	0.77	x	12.71	x	97.38	x	0.63	x	0.7	=	378.27	(75)
Northeast	0.9x	0.77	x	12.71	x	91.1	x	0.63	x	0.7	=	353.87	(75)
Northeast	0.9x	0.77	x	12.71	x	72.63	x	0.63	x	0.7	=	282.11	(75)
Northeast	0.9x	0.77	x	12.71	x	50.42	x	0.63	x	0.7	=	195.85	(75)
Northeast	0.9x	0.77	x	12.71	x	28.07	x	0.63	x	0.7	=	109.02	(75)
Northeast	0.9x	0.77	x	12.71	x	14.2	x	0.63	x	0.7	=	55.15	(75)
Northeast	0.9x	0.77	x	12.71	x	9.21	x	0.63	x	0.7	=	35.79	(75)
Northwest	0.9x	0.77	x	3.46	x	11.28	x	0.63	x	0.7	=	11.93	(81)
Northwest	0.9x	0.77	x	3.46	x	22.97	x	0.63	x	0.7	=	24.29	(81)
Northwest	0.9x	0.77	x	3.46	x	41.38	x	0.63	x	0.7	=	43.75	(81)
Northwest	0.9x	0.77	x	3.46	x	67.96	x	0.63	x	0.7	=	71.86	(81)
Northwest	0.9x	0.77	x	3.46	x	91.35	x	0.63	x	0.7	=	96.59	(81)
Northwest	0.9x	0.77	x	3.46	x	97.38	x	0.63	x	0.7	=	102.98	(81)
Northwest	0.9x	0.77	x	3.46	x	91.1	x	0.63	x	0.7	=	96.33	(81)
Northwest	0.9x	0.77	x	3.46	x	72.63	x	0.63	x	0.7	=	76.8	(81)
Northwest	0.9x	0.77	x	3.46	x	50.42	x	0.63	x	0.7	=	53.32	(81)
Northwest	0.9x	0.77	x	3.46	x	28.07	x	0.63	x	0.7	=	29.68	(81)
Northwest	0.9x	0.77	x	3.46	x	14.2	x	0.63	x	0.7	=	15.01	(81)
Northwest	0.9x	0.77	x	3.46	x	9.21	x	0.63	x	0.7	=	9.74	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	55.76	113.5	204.48	335.82	451.41	481.25	450.2	358.9	249.17	138.7	70.16	45.53	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	459.17	514.94	593.33	704.36	799.39	809.34	765.31	679.71	580.35	490.4	445.43	438.43	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.94	0.84	0.65	0.46	0.34	0.39	0.66	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.91	20.08	20.38	20.74	20.93	20.99	21	21	20.95	20.66	20.23	19.89	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.21	20.21	20.21	20.23	20.23	20.25	20.25	20.25	20.24	20.23	20.23	20.22	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.81	0.61	0.41	0.28	0.33	0.6	0.89	0.97	0.99	(89)

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

(90)m=	18.74	18.99	19.42	19.93	20.17	20.24	20.24	20.25	20.2	19.84	19.23	18.72	(90)

fLA = Living area ÷ (4) = | 0.38 | (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.19	19.41	19.79	20.24	20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17	(92)

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

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(93)m=	19.19	19.41	19.79	20.24	20.46	20.53	20.53	20.54	20.49	20.15	19.61	19.17	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)
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	431.1	(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	4.2	(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	911.39	(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	0	103.45	234.84	357.33	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ =	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 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		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: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2153.97	(310a)
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): mechanical ventilation - balanced, extract or positive input from outside		177.49	(330a)

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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 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 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)
EI rating (section 14)					89.36	(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 10:42:58

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.96m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 05 - D

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.47	
Maximum	1.5	**OK**
MVHR efficiency:	89%	
Minimum	70%	**OK**
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	$12.07m^2$	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	$3.0\ m^3/m^2h$	
Party Walls U-value	$0\ W/m^2K$	
Community heating, heat from electric heat pump		
Photovoltaic array		

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 05 - D

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	53.96	(1a) x	2.65	(2a) =	142.99	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	53.96	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	142.99	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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 and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.65 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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 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	(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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) 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 area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows			12.07	x1/[1/(1.4)+ 0.04]		=	16			(27)
Walls Type1	27.66	12.07	15.59	x	0.18	=	2.81	60	935.4	(29)
Walls Type2	24.24	0	24.24	x	0.17	=	4.07	60	1454.4	(29)
Roof	53.96	0	53.96	x	0.13	=	7.01	9	485.64	(30)
Total area of elements, m²			105.86							(31)
Party wall			31.67	x	0	=	0	45	1425.15	(32)
Party floor			53.96					40	2158.4	(32a)
Internal wall **			95.03					9	855.27	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 29.89 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7314.26 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 135.55 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 6.35 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.25 (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=	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 coefficient, W/K (39)m = (37) + (38)m

(39)m=	51.01	50.84	50.66	49.78	49.6	48.71	48.71	48.54	49.07	49.6	49.95	50.31	

Average = Sum(39)$_{1…12}$ /12= 49.73 (39)

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Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)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

Average = Sum(40)$_{1…12}$ /12= 0.92 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.81 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 77.11 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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 = Sum(44)$_{1…12}$ = 925.35 (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=	125.79	110.02	113.53	98.98	94.97	81.95	75.94	87.14	88.18	102.77	112.18	121.82

Total = Sum(45)$_{1…12}$ = 1213.27 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.87	16.5	17.03	14.85	14.25	12.29	11.39	13.07	13.23	15.42	16.83	18.27	(46)

Water storage loss:

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)

Enter (50) or (54) in (55) 1.03 (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	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	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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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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 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)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	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	181.07	159.94	168.8	152.47	150.25	135.45	131.22	142.42	141.68	158.05	165.67	177.1	

Output from water heater (annual)1…12 | 1864.11 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(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)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	14.04	12.47	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	157.5	159.14	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	(71)

Water heating gains (Table 5)

(72)m=	115.65	113.87	110.17	105.15	101.88	97.28	93.38	98.38	100.16	105.37	111.24	113.88	(72)

Total internal gains = (66)m + (67)m + (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	271.49	279.71	296.15	315.03	328.97	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (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	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)

DER WorkSheet: New dwelling design stage

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, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	41.62	84.72	152.64	250.67	336.95	359.23	336.05	267.9	185.99	103.53	52.37	33.99	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	378.92	420.3	478.07	559.85	629.86	636.24	602.59	539.39	465.7	399.68	367.4	362.95	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.96	0.92	0.82	0.65	0.47	0.35	0.41	0.65	0.88	0.95	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.6	19.79	20.14	20.58	20.85	20.97	20.99	20.99	20.9	20.52	20	19.57	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.13	20.13	20.13	20.15	20.15	20.17	20.17	20.17	20.16	20.15	20.15	20.14	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.79	0.61	0.42	0.29	0.34	0.59	0.85	0.94	0.97	(89)

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

(90)m=	18.26	18.54	19.03	19.64	20	20.14	20.16	20.16	20.06	19.58	18.84	18.22	(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.89	19.13	19.56	20.08	20.4	20.53	20.55	20.55	20.46	20.02	19.39	18.86	(92)

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

(93)m=	18.89	19.13	19.56	20.08	20.4	20.53	20.55	20.55	20.46	20.02	19.39	18.86	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.94	0.89	0.79	0.62	0.44	0.32	0.37	0.61	0.85	0.93	0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	362.43	394.14	426.56	439.99	391.78	280.7	190.8	198.37	285.09	337.91	343.31	349	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	744.25	723.35	661.41	556.62	431.6	288.86	192.56	201.41	311.87	467.27	613.87	737.48	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	284.07	221.23	174.73	83.98	29.63	0	0	0	0	96.24	194.8	289.02	

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	Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1373.7	(98)
Space heating requirement in kWh/m²/year		25.46	(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		1373.7	
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	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			
Annual water heating requirement		1864.11	
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) + (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 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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	630.16	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	17.64	(372)

DER WorkSheet: New dwelling design stage

Total CO2 associated with community systems	(363)…(366) + (368)...(372)		=	647.8	(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) =			647.8	(376)
CO2 associated with electricity for pumps and fans within dwelling	(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 applicable 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)
EI 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	15.46m²	
Windows facing: South West	5.57m²	
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	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 05 - E

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		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 heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							0	x 10 =	0	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

DER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation:	0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0.5	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	74.8	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			15.46	x1/[1/(1.4)+ 0.04] =	20.5			(27)
Windows Type 2			5.57	x1/[1/(1.4)+ 0.04] =	7.38			(27)
Windows Type 3			5.9	x1/[1/(1.4)+ 0.04] =	7.82			(27)
Walls Type1	62.71	26.93	35.78	x 0.18 =	6.44	60	2146.8	(29)
Walls Type2	20.9	0	20.9	x 0.17 =	3.51	60	1254	(29)
Roof	86.78	0	86.78	x 0.13 =	11.28	9	781.02	(30)
Total area of elements, m²			170.39					(31)
Party wall			26.3	x 0 =	0	45	1183.5	(32)
Party floor			86.78			40	3471.2	(32a)
Internal wall **			169.02			9	1521.18	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*
*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U)	(26)…(30) + (32) =	56.93	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	10357.7	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	= (34) ÷ (4) =	119.36	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K		8.51	(36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	65.44	(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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	89.52	89.24	88.95	87.53	87.24	85.82	85.82	85.54	86.39	87.24	87.81	88.38	

Average = $Sum(39)_{1...12}$ /12= 87.46 (39)

Heat loss parameter (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	

Average = $Sum(40)_{1...12}$ /12= 1.01 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.58 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 95.45 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	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	

Total = $Sum(44)_{1...12}$ = 1145.42 (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=	155.71	136.18	140.53	122.52	117.56	101.44	94	107.87	109.16	127.21	138.86	150.79	

Total = $Sum(45)_{1...12}$ = 1501.83 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(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 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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	210.98	186.11	195.81	176.01	172.83	154.94	149.28	163.15	162.65	182.49	192.36	206.07	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	210.98	186.11	195.81	176.01	172.83	154.94	149.28	163.15	162.65	182.49	192.36	206.07

Output from water heater (annual)$_{1...12}$ | 2152.67 | (64)

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

(65)m=	95.99	85.22	90.95	83.53	83.31	76.52	75.48	80.09	79.09	86.52	88.97	94.36	(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=	128.95	128.95	128.95	128.95	128.95	128.95	128.95	128.95	128.95	128.95	128.95	128.95	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	20.77	18.45	15.01	11.36	8.49	7.17	7.75	10.07	13.52	17.16	20.03	21.35	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	233.03	235.45	229.35	216.38	200	184.61	174.33	171.91	178.01	190.98	207.36	222.75	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	35.9	35.9	35.9	35.9	35.9	35.9	35.9	35.9	35.9	35.9	35.9	35.9	(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=	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	(71)
Water heating gains (Table 5)													
(72)m=	129.02	126.82	122.24	116.02	111.97	106.28	101.45	107.64	109.85	116.29	123.56	126.83	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	444.51	442.4	428.28	405.44	382.16	359.75	345.21	351.31	363.06	386.12	412.63	432.61	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	15.46	x	11.28	x	0.63	x	0.7	=	53.31	(75)
Northeast 0.9x	0.77	x	15.46	x	22.97	x	0.63	x	0.7	=	108.51	(75)

Northeast 0.9x	0.77	x	15.46	x	41.38	x	0.63	x	0.7	=	195.51	(75)
Northeast 0.9x	0.77	x	15.46	x	67.96	x	0.63	x	0.7	=	321.08	(75)
Northeast 0.9x	0.77	x	15.46	x	91.35	x	0.63	x	0.7	=	431.59	(75)
Northeast 0.9x	0.77	x	15.46	x	97.38	x	0.63	x	0.7	=	460.12	(75)
Northeast 0.9x	0.77	x	15.46	x	91.1	x	0.63	x	0.7	=	430.43	(75)
Northeast 0.9x	0.77	x	15.46	x	72.63	x	0.63	x	0.7	=	343.15	(75)
Northeast 0.9x	0.77	x	15.46	x	50.42	x	0.63	x	0.7	=	238.23	(75)
Northeast 0.9x	0.77	x	15.46	x	28.07	x	0.63	x	0.7	=	132.61	(75)
Northeast 0.9x	0.77	x	15.46	x	14.2	x	0.63	x	0.7	=	67.08	(75)
Northeast 0.9x	0.77	x	15.46	x	9.21	x	0.63	x	0.7	=	43.54	(75)
Southwest0.9x	0.77	x	5.57	x	36.79		0.63	x	0.7	=	62.63	(79)
Southwest0.9x	0.77	x	5.9	x	36.79		0.63	x	0.7	=	66.34	(79)
Southwest0.9x	0.77	x	5.57	x	62.67		0.63	x	0.7	=	106.69	(79)
Southwest0.9x	0.77	x	5.9	x	62.67		0.63	x	0.7	=	113.01	(79)
Southwest0.9x	0.77	x	5.57	x	85.75		0.63	x	0.7	=	145.97	(79)
Southwest0.9x	0.77	x	5.9	x	85.75		0.63	x	0.7	=	154.62	(79)
Southwest0.9x	0.77	x	5.57	x	106.25		0.63	x	0.7	=	180.87	(79)
Southwest0.9x	0.77	x	5.9	x	106.25		0.63	x	0.7	=	191.58	(79)
Southwest0.9x	0.77	x	5.57	x	119.01		0.63	x	0.7	=	202.59	(79)
Southwest0.9x	0.77	x	5.9	x	119.01		0.63	x	0.7	=	214.59	(79)
Southwest0.9x	0.77	x	5.57	x	118.15		0.63	x	0.7	=	201.12	(79)
Southwest0.9x	0.77	x	5.9	x	118.15		0.63	x	0.7	=	213.04	(79)
Southwest0.9x	0.77	x	5.57	x	113.91		0.63	x	0.7	=	193.9	(79)
Southwest0.9x	0.77	x	5.9	x	113.91		0.63	x	0.7	=	205.39	(79)
Southwest0.9x	0.77	x	5.57	x	104.39		0.63	x	0.7	=	177.7	(79)
Southwest0.9x	0.77	x	5.9	x	104.39		0.63	x	0.7	=	188.23	(79)
Southwest0.9x	0.77	x	5.57	x	92.85		0.63	x	0.7	=	158.06	(79)
Southwest0.9x	0.77	x	5.9	x	92.85		0.63	x	0.7	=	167.42	(79)
Southwest0.9x	0.77	x	5.57	x	69.27		0.63	x	0.7	=	117.91	(79)
Southwest0.9x	0.77	x	5.9	x	69.27		0.63	x	0.7	=	124.9	(79)
Southwest0.9x	0.77	x	5.57	x	44.07		0.63	x	0.7	=	75.02	(79)
Southwest0.9x	0.77	x	5.9	x	44.07		0.63	x	0.7	=	79.46	(79)
Southwest0.9x	0.77	x	5.57	x	31.49		0.63	x	0.7	=	53.6	(79)
Southwest0.9x	0.77	x	5.9	x	31.49		0.63	x	0.7	=	56.78	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	182.29	328.21	496.1	693.53	848.77	874.28	829.73	709.07	563.71	375.42	221.56	153.91	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(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)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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(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 internal temperature in living area T1 (follow steps 3 to 7 in Table 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)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°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 factor for gains for rest of dwelling, h2,m (see 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 internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 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)

fLA = Living area ÷ (4) = 0.51 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	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)

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

(93)m=	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)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	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)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	590.72	696.66	772.99	785.01	686.06	490.24	334.19	347.32	501.44	599.93	577.95	557.72	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	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)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	509.59	374.23	284.08	137.26	52.57	0	0	0	0	161.35	346.68	524.48	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2390.24 (98)

Space heating requirement in kWh/m²/year 27.54 (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 2390.24

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Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2509.76	(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		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)…(307e) + (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 dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		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) + (330b) + (330g) =	212.1	(331)
Energy for lighting (calculated in Appendix L)		366.89	(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) =		5240.23	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	884.17	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	24.76	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	908.92	(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) =				908.92	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	110.08	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	190.41	(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) =				1152.94	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.29	(384)
EI rating (section 14)					88.28	(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 10:42:56

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 103.81m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 06 - A

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	
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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature		
Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	13.21m²	
Windows facing: South East	5.5m²	
Windows facing: North West	4.61m²	
Ventilation rate:	6.00	

10 Key features	
Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 06 - A

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	103.81	(1a) x	2.65	(2a) =	275.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	103.81	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		275.1	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.15	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			13.21	x1/[1/(1.4)+ 0.04] =	17.51			(27)
Windows Type 2			5.5	x1/[1/(1.4)+ 0.04] =	7.29			(27)
Windows Type 3			4.61	x1/[1/(1.4)+ 0.04] =	6.11			(27)
Walls Type1	76.16	23.32	52.84	x 0.18 =	9.51	60	3170.4	(29)
Walls Type2	49.77	0	49.77	x 0.17 =	8.36	60	2986.2	(29)
Roof	103.81	0	103.81	x 0.13 =	13.5	9	934.29	(30)
Total area of elements, m²			229.74					(31)
Party wall			12.14	x 0 =	0	45	546.3	(32)
Party floor			103.81			40	4152.4	(32a)
Internal wall **			193.17			9	1738.53	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 62.28 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13528.12 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 130.32 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.29 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 72.57 (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

DER WorkSheet: New dwelling design stage

(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 transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	101.37	101.03	100.69	98.99	98.65	96.94	96.94	96.6	97.63	98.65	99.33	100.01

Average = Sum(39)$_{1...12}$ /12= 98.9 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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

Average = Sum(40)$_{1...12}$ /12= 0.95 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.77 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 100.04 (43)
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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

Total = Sum(44)$_{1...12}$ = 1200.45 (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=	163.19	142.73	147.28	128.4	123.2	106.32	98.52	113.05	114.4	133.32	145.53	158.04

Total = Sum(45)$_{1...12}$ = 1573.98 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(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:

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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

DER WorkSheet: New dwelling design stage

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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(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 contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	218.46	192.65	202.56	181.9	178.48	159.81	153.79	168.33	167.89	188.6	199.03	213.32

Output from water heater (annual)$_{1…12}$ | 2224.82 | (64)

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

(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 from community heating

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m=	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)													
(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)													
(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 + (71)m + (72)m													
(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 applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
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)

Southeast	0.9x	0.77	x	5.5	x	85.75	x	0.63	x	0.7	=	144.14	(77)
Southeast	0.9x	0.77	x	5.5	x	106.25	x	0.63	x	0.7	=	178.6	(77)
Southeast	0.9x	0.77	x	5.5	x	119.01	x	0.63	x	0.7	=	200.04	(77)
Southeast	0.9x	0.77	x	5.5	x	118.15	x	0.63	x	0.7	=	198.6	(77)
Southeast	0.9x	0.77	x	5.5	x	113.91	x	0.63	x	0.7	=	191.47	(77)
Southeast	0.9x	0.77	x	5.5	x	104.39	x	0.63	x	0.7	=	175.47	(77)
Southeast	0.9x	0.77	x	5.5	x	92.85	x	0.63	x	0.7	=	156.07	(77)
Southeast	0.9x	0.77	x	5.5	x	69.27	x	0.63	x	0.7	=	116.43	(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	x	31.49	x	0.63	x	0.7	=	52.93	(77)
Southwest	0.9x	0.77	x	13.21	x	36.79		0.63	x	0.7	=	148.54	(79)
Southwest	0.9x	0.77	x	13.21	x	62.67		0.63	x	0.7	=	253.02	(79)
Southwest	0.9x	0.77	x	13.21	x	85.75		0.63	x	0.7	=	346.2	(79)
Southwest	0.9x	0.77	x	13.21	x	106.25		0.63	x	0.7	=	428.95	(79)
Southwest	0.9x	0.77	x	13.21	x	119.01		0.63	x	0.7	=	480.46	(79)
Southwest	0.9x	0.77	x	13.21	x	118.15		0.63	x	0.7	=	476.99	(79)
Southwest	0.9x	0.77	x	13.21	x	113.91		0.63	x	0.7	=	459.87	(79)
Southwest	0.9x	0.77	x	13.21	x	104.39		0.63	x	0.7	=	421.44	(79)
Southwest	0.9x	0.77	x	13.21	x	92.85		0.63	x	0.7	=	374.86	(79)
Southwest	0.9x	0.77	x	13.21	x	69.27		0.63	x	0.7	=	279.64	(79)
Southwest	0.9x	0.77	x	13.21	x	44.07		0.63	x	0.7	=	177.92	(79)
Southwest	0.9x	0.77	x	13.21	x	31.49		0.63	x	0.7	=	127.12	(79)
Northwest	0.9x	0.77	x	4.61	x	11.28	x	0.63	x	0.7	=	15.9	(81)
Northwest	0.9x	0.77	x	4.61	x	22.97	x	0.63	x	0.7	=	32.36	(81)
Northwest	0.9x	0.77	x	4.61	x	41.38	x	0.63	x	0.7	=	58.3	(81)
Northwest	0.9x	0.77	x	4.61	x	67.96	x	0.63	x	0.7	=	95.74	(81)
Northwest	0.9x	0.77	x	4.61	x	91.35	x	0.63	x	0.7	=	128.7	(81)
Northwest	0.9x	0.77	x	4.61	x	97.38	x	0.63	x	0.7	=	137.2	(81)
Northwest	0.9x	0.77	x	4.61	x	91.1	x	0.63	x	0.7	=	128.35	(81)
Northwest	0.9x	0.77	x	4.61	x	72.63	x	0.63	x	0.7	=	102.32	(81)
Northwest	0.9x	0.77	x	4.61	x	50.42	x	0.63	x	0.7	=	71.04	(81)
Northwest	0.9x	0.77	x	4.61	x	28.07	x	0.63	x	0.7	=	39.54	(81)
Northwest	0.9x	0.77	x	4.61	x	14.2	x	0.63	x	0.7	=	20	(81)
Northwest	0.9x	0.77	x	4.61	x	9.21	x	0.63	x	0.7	=	12.98	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	226.28	390.73	548.63	703.29	809.2	812.79	779.69	699.23	601.97	435.62	272	193.03	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	708.96	871.2	1013.57	1143	1223.01	1201.81	1152.72	1078.65	994.43	853.54	719.21	662.48	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) — 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(86)m=	0.97	0.94	0.89	0.8	0.66	0.49	0.36	0.4	0.61	0.85	0.95	0.98	(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	0.97	(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 × T1 + (1 – fLA) × 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

(93)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	(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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.92	0.86	0.76	0.62	0.45	0.32	0.36	0.57	0.81	0.93	0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	677.35	802.16	875.29	871.39	759.09	544.33	369.74	385.37	565.31	690.11	666.56	637.87	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1448.29	1421.99	1304.63	1095.25	846.29	565	374.25	392.01	612.12	921.41	1200.31	1432.83	(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	0	172.08	384.3	591.45	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 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; 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	2683.43

DER WorkSheet: New dwelling design stage

Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2817.6	(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		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)…(307e) + (310a)…(310e)] =	51.54	(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		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) + (330b) + (330g) =	253.73	(331)
Energy for lighting (calculated in Appendix L)		412.99	(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) =		5711.56	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	955.27	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	26.75	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	982.01	(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) =				982.01	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	131.68	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	214.34	(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) =				1271.57	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.25	(384)
EI rating (section 14)					88.55	(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 10:42:55

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 133.02m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 06 - B

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: 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	OK
Hot water controls:	No cylinder thermostat No cylinder	

Regulations Compliance Report

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.54	
Maximum	1.5	**OK**
MVHR efficiency:	88%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	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 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from electric heat pump	
Photovoltaic array	

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Neil Ingham	**Stroma Number:**	STRO010943
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: 06 - B

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	133.02	(1a) x	2.65	(2a) =	352.5	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	133.02	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	352.5	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	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) ÷ 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 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												
(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

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Adjusted infiltration rate (allowing for shelter and wind 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 effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 74.8 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)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	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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 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	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) 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	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Windows Type 1			28.56	x1/[1/(1.4)+ 0.04]	=	37.86			(27)
Windows Type 2			5.5	x1/[1/(1.4)+ 0.04]	=	7.29			(27)
Windows Type 3			5.47	x1/[1/(1.4)+ 0.04]	=	7.25			(27)
Walls Type1	95.16	39.53	55.63	x 0.18	=	10.01	60	3337.8	(29)
Walls Type2	41.02	0	41.02	x 0.17	=	6.89	60	2461.2	(29)
Roof	133.02	0	133.02	x 0.13	=	17.29	9	1197.18	(30)
Total area of elements, m²			269.2						(31)
Party wall			12.16	x 0	=	0	45	547.2	(32)
Party floor			133.02				40	5320.8	(32a)
Internal wall **			196.47				9	1768.23	(32c)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 86.6 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 14632.41 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K = (34) ÷ (4) = 110 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 11.16 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 97.77 (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

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(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	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	134.67	134.23	133.8	131.62	131.18	129	129	128.56	129.87	131.18	132.05	132.93	

Average = Sum(39)$_{1...12}$ /12= 131.51 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(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

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.9 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 103.13 (43)

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)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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

Total = Sum(44)$_{1...12}$ = 1237.59 (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=	168.24	147.14	151.84	132.37	127.02	109.61	101.57	116.55	117.94	137.45	150.03	162.93

Total = Sum(45)$_{1...12}$ = 1622.67 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(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 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)

Enter (50) or (54) in (55) 1.03 (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	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	32.01	30.98	32.01	30.98	32.01	(57)

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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 thermostat)

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)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	192.72	203.53	218.2	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	223.51	197.07	207.11	185.87	182.29	163.1	156.84	171.82	171.43	192.72	203.53	218.2

Output from water heater (annual)$_{1...12}$ | 2273.51 | (64)

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

(65)m=	100.16	88.87	94.71	86.81	86.45	79.24	77.99	82.97	82.01	89.92	92.68	98.4	(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=	145.12	145.12	145.12	145.12	145.12	145.12	145.12	145.12	145.12	145.12	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

(68)m=	301.32	304.45	296.57	279.8	258.62	238.72	225.43	222.3	230.18	246.95	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	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	(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	120.86	128.72	132.25	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	529.35	527.09	509.81	481.59	452.34	424.58	406.81	413.38	428.09	456.54	489.29	514.43	(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 Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	28.56	x	11.28	x	0.63	x	0.7	=	98.48	(75)
Northeast 0.9x	0.77	x	28.56	x	22.97	x	0.63	x	0.7	=	200.46	(75)

Northeast 0.9x	0.77	x	28.56	x	41.38	x	0.63	x	0.7	=	361.17	(75)
Northeast 0.9x	0.77	x	28.56	x	67.96	x	0.63	x	0.7	=	593.14	(75)
Northeast 0.9x	0.77	x	28.56	x	91.35	x	0.63	x	0.7	=	797.3	(75)
Northeast 0.9x	0.77	x	28.56	x	97.38	x	0.63	x	0.7	=	850	(75)
Northeast 0.9x	0.77	x	28.56	x	91.1	x	0.63	x	0.7	=	795.16	(75)
Northeast 0.9x	0.77	x	28.56	x	72.63	x	0.63	x	0.7	=	633.91	(75)
Northeast 0.9x	0.77	x	28.56	x	50.42	x	0.63	x	0.7	=	440.09	(75)
Northeast 0.9x	0.77	x	28.56	x	28.07	x	0.63	x	0.7	=	244.98	(75)
Northeast 0.9x	0.77	x	28.56	x	14.2	x	0.63	x	0.7	=	123.91	(75)
Northeast 0.9x	0.77	x	28.56	x	9.21	x	0.63	x	0.7	=	80.42	(75)
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)
Southeast 0.9x	0.77	x	5.5	x	85.75	x	0.63	x	0.7	=	144.14	(77)
Southeast 0.9x	0.77	x	5.5	x	106.25	x	0.63	x	0.7	=	178.6	(77)
Southeast 0.9x	0.77	x	5.5	x	119.01	x	0.63	x	0.7	=	200.04	(77)
Southeast 0.9x	0.77	x	5.5	x	118.15	x	0.63	x	0.7	=	198.6	(77)
Southeast 0.9x	0.77	x	5.5	x	113.91	x	0.63	x	0.7	=	191.47	(77)
Southeast 0.9x	0.77	x	5.5	x	104.39	x	0.63	x	0.7	=	175.47	(77)
Southeast 0.9x	0.77	x	5.5	x	92.85	x	0.63	x	0.7	=	156.07	(77)
Southeast 0.9x	0.77	x	5.5	x	69.27	x	0.63	x	0.7	=	116.43	(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	x	31.49	x	0.63	x	0.7	=	52.93	(77)
Northwest 0.9x	0.77	x	5.47	x	11.28	x	0.63	x	0.7	=	18.86	(81)
Northwest 0.9x	0.77	x	5.47	x	22.97	x	0.63	x	0.7	=	38.39	(81)
Northwest 0.9x	0.77	x	5.47	x	41.38	x	0.63	x	0.7	=	69.17	(81)
Northwest 0.9x	0.77	x	5.47	x	67.96	x	0.63	x	0.7	=	113.6	(81)
Northwest 0.9x	0.77	x	5.47	x	91.35	x	0.63	x	0.7	=	152.7	(81)
Northwest 0.9x	0.77	x	5.47	x	97.38	x	0.63	x	0.7	=	162.8	(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	x	5.47	x	72.63	x	0.63	x	0.7	=	121.41	(81)
Northwest 0.9x	0.77	x	5.47	x	50.42	x	0.63	x	0.7	=	84.29	(81)
Northwest 0.9x	0.77	x	5.47	x	28.07	x	0.63	x	0.7	=	46.92	(81)
Northwest 0.9x	0.77	x	5.47	x	14.2	x	0.63	x	0.7	=	23.73	(81)
Northwest 0.9x	0.77	x	5.47	x	9.21	x	0.63	x	0.7	=	15.4	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	179.19	344.2	574.48	885.34	1150.04	1211.39	1138.92	930.79	680.45	408.33	221.72	148.75	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	708.54	871.29	1084.29	1366.93	1602.38	1635.98	1545.73	1344.17	1108.54	864.87	711.01	663.18	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) | 21 | (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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(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 temperature in living area T1 (follow steps 3 to 7 in Table 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 periods in rest of dwelling from Table 9, Th2 (°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 rest of dwelling, h2,m (see 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 temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 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)

fLA = Living area ÷ (4) = 0.51 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × 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 temperature from Table 4e, where appropriate

(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 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(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)m x (84)m													
(95)m=	684.11	819.77	961.78	1055.9	977.49	720.69	497.42	512.66	696.57	742.71	673.27	643.87	(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	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1861.34	1824.82	1686.06	1438.35	1126.8	760.2	508.39	530.98	812.05	1190.36	1541.61	1843.77	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	875.86	675.39	538.87	275.36	111.09	0	0	0	0	333.05	625.21	892.72	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4327.55 (98)

Space heating requirement in kWh/m²/year 32.53 (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	4327.55

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Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	4543.92	(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		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)…(307e) + (310a)…(310e)] =	69.31	(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): mechanical ventilation - balanced, extract or positive input from 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) + (330b) + (330g) =	325.12	(331)
Energy for lighting (calculated in Appendix L)		474.41	(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) =		7621.83	(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 fuel				280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x		0.52	=	1284.73	(367)
Electrical energy for heat distribution	[(313) x		0.52	=	35.97	(372)
Total CO2 associated with community systems	(363)…(366) + (368)...(372)			=	1320.7	(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) =				1320.7	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x		0.52	=	168.74	(378)
CO2 associated with electricity for lighting	(332))) x		0.52	=	246.22	(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) =				1679.19	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.62	(384)
EI rating (section 14)					87.36	(385)