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

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

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

U_{i-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^2K]	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 11:12:30

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	21.44 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.52 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	52.5 kWh/m²	
		OK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(25)

3. Heat 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	1.2	=	3.06			(26)
Windows Type 1			5.49	x1/[1/(1.4)+ 0.04]		=	7.28			(27)
Windows Type 2			5.49	x1/[1/(1.4)+ 0.04]		=	7.28			(27)
Floor			63.84	x	0.13	=	8.2992			(28)
Walls Type1	27.27	13.53	13.74	x	0.18	=	2.47			(29)
Walls Type2	56.63	0	56.63	x	0.18	=	10.19			(29)
Roof	3.74	0	3.74	x	0.13	=	0.49			(30)
Total area of elements, m²			151.48							(31)
Party wall			21.76	x	0	=	0			(32)
Party ceiling			60.09							(32b)
Internal wall **			89.09							(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) = 39.07 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 10.98 (36)

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

Total fabric heat loss (33) + (36) = 50.05 (37)

TER 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=	34.07	33.83	33.59	32.49	32.29	31.33	31.33	31.15	31.7	32.29	32.7	33.14	(38)

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

(39)m=	84.12	83.88	83.64	82.54	82.34	81.38	81.38	81.2	81.75	82.34	82.75	83.19	

Average = $Sum(39)_{1...12}$ /12= 82.54 (39)

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

(40)m=	1.32	1.31	1.31	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.3	1.3	

Average = $Sum(40)_{1...12}$ /12= 1.29 (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)

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=	92.17	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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

TER WorkSheet: New dwelling design stage

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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	183.27	161.63	169.95	152.64	149.79	134.14	129.11	141.28	140.91	158.26	166.98	178.96	(62)

Solar DHW input calculated using 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=	183.27	161.63	169.95	152.64	149.79	134.14	129.11	141.28	140.91	158.26	166.98	178.96

Output from water heater (annual)$_{1...12}$ — 1866.91 — (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=	82.72	73.42	78.29	71.83	71.59	65.68	64.71	68.76	67.93	74.4	76.6	81.29	(65)

include (57)m in 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	111.18	109.25	105.23	99.77	96.22	91.22	86.98	92.42	94.35	100.01	106.39	109.26	(72)

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

(73)m=	367.77	365.85	354.28	335.72	317.03	298.92	287.09	292.5	301.99	320.74	342.27	358.25	(73)

6. Solar 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)

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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=	448.43	509.54	567.59	628.01	669.97	660.55	631.06	589.51	542.37	484.05	440.03	426.54	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.95	0.87	0.71	0.55	0.6	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=	19.63	19.79	20.06	20.43	20.74	20.93	20.98	20.97	20.84	20.44	19.98	19.61	(87)

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

(88)m=	19.83	19.83	19.83	19.85	19.85	19.86	19.86	19.86	19.86	19.85	19.84	19.84	(88)

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

(89)m=	0.99	0.99	0.98	0.93	0.82	0.61	0.42	0.47	0.76	0.95	0.99	1	(89)

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

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		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(90)m=		18.03	18.27	18.66	19.18	19.6	19.81	19.85	19.85	19.73	19.22	18.54	18		(90)

fLA = Living area ÷ (4) = 0.58 (91)

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

(92)m=	18.96	19.15	19.47	19.9	20.26	20.46	20.51	20.5	20.37	19.93	19.37	18.93	(92)

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

(93)m=	18.96	19.15	19.47	19.9	20.26	20.46	20.51	20.5	20.37	19.93	19.37	18.93	(93)

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	0.93	0.84	0.67	0.49	0.55	0.8	0.95	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	445.45	503.31	552.83	587	563.55	441.95	311.29	322.42	432.96	460.76	434.53	424.26	(95)
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=	1232.9	1195.23	1085.01	908.06	704.61	476.82	318.03	333.1	512.96	767.89	1015.7	1225.53	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	585.87	464.97	395.94	231.16	104.95	0	0	0	0	228.5	418.45	596.14	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3025.98 (98)

Space heating requirement in kWh/m²/year 47.4 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	585.87	464.97	395.94	231.16	104.95	0	0	0	0	228.5	418.45	596.14	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	626.6	497.3	423.47	247.23	112.25	0	0	0	0	244.39	447.54	637.59	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 3236.35 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)

183.27	161.63	169.95	152.64	149.79	134.14	129.11	141.28	140.91	158.26	166.98	178.96

Efficiency of water heater 79.8 (216)

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(217)m=	87.7	87.47	87	85.92	83.89	79.8	79.8	79.8	79.8	85.79	87.17	87.78	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.98	184.77	195.35	177.65	178.56	168.09	161.79	177.04	176.58	184.47	191.57	203.87

Total = Sum(219a)$_{1...12}$ = 2208.72 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			3236.35	
Water heating fuel used			2208.72	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			295.76	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5815.83	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	699.05	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	477.08	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1176.14	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	153.5	(268)
Total CO2, kg/year			sum of (265)…(271) =		1368.56	(272)

TER = 21.44 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	22.43 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.42 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	54.0 kWh/m²	
		OK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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	$6.56m^2$
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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.37	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(25)

3. Heat losses and heat loss 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	1.2	=	4.188			(26)
Windows			6.56	x1/[1/(1.4)+ 0.04]		=	8.7			(27)
Floor			60.42	x	0.13	=	7.854599			(28)
Walls Type1	19.85	10.05	9.8	x	0.18	=	1.76			(29)
Walls Type2	51.2	0	51.2	x	0.18	=	9.22			(29)
Roof	5.68	0	5.68	x	0.13	=	0.74			(30)
Total area of elements, m²			137.15							(31)
Party wall			21.92	x	0	=	0			(32)
Party ceiling			54.74							(32b)
Internal wall **			85.22							(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) = 32.46 (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 Indicative Value: Medium 250 (35)

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

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

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

Total fabric heat loss (33) + (36) = 42.71 (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

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(38)m=	32.46	32.22	31.99	30.91	30.71	29.77	29.77	29.6	30.13	30.71	31.12	31.55	(38)

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

(39)m=	75.16	74.93	74.7	73.62	73.42	72.48	72.48	72.31	72.84	73.42	73.83	74.25	

Average = Sum(39)$_{1...12}$ /12= 73.62 (39)

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

(40)m=	1.24	1.24	1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.22	1.23	

Average = Sum(40)$_{1...12}$ /12= 1.22 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	179.62	158.43	166.65	149.76	147.02	131.76	126.9	138.75	138.35	155.27	163.72	175.42	(62)

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

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

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

Output from water heater

(64)m=	179.62	158.43	166.65	149.76	147.02	131.76	126.9	138.75	138.35	155.27	163.72	175.42	

Output from water heater (annual)$_{1...12}$	1831.64	(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=	81.51	72.35	77.19	70.88	70.67	64.89	63.98	67.92	67.08	73.41	75.52	80.11	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	109.55	107.67	103.76	98.44	94.99	90.12	85.99	91.29	93.17	98.67	104.89	107.67	(72)

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

(73)m=	357.06	355.01	343.63	325.54	307.43	289.95	278.63	284.09	293.44	311.72	332.59	347.99	(73)

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=	379.68	401.06	426.59	461.78	490.56	485.19	461.28	429.69	394.52	367.99	361.05	366.47	(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	1	0.99	0.98	0.93	0.81	0.65	0.71	0.91	0.98	1	1	(86)

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

(87)m=	19.66	19.77	19.99	20.33	20.65	20.89	20.97	20.96	20.78	20.38	19.98	19.65	(87)

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

(88)m=	19.88	19.89	19.89	19.91	19.91	19.92	19.92	19.92	19.92	19.91	19.9	19.9	(88)

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

(89)m=	1	1	0.99	0.97	0.9	0.72	0.51	0.57	0.86	0.98	0.99	1	(89)

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

(90)m=	18.11	18.27	18.6	19.09	19.55	19.84	19.91	19.9	19.72	19.18	18.58	18.1	(90)

fLA = Living area ÷ (4) = 0.6 (91)

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

(92)m=	19.04	19.17	19.44	19.83	20.21	20.47	20.55	20.54	20.36	19.9	19.42	19.03	(92)

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

(93)m=	19.04	19.17	19.44	19.83	20.21	20.47	20.55	20.54	20.36	19.9	19.42	19.03	(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=	1	0.99	0.99	0.97	0.91	0.77	0.6	0.66	0.88	0.98	0.99	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	378.09	398.63	421.62	447.54	446.98	374.06	274.83	281.48	348.28	359.08	358.44	365.18	(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]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(97)m=	1108.2	1069.22	966.28	805.02	625.04	425.69	286.21	299.19	455.95	683.09	909.79	1101.43	(97)

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

(98)m=	543.2	450.63	405.23	257.39	132.48	0	0	0	0	241.06	396.97	547.77	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2974.73 (98)

Space heating requirement in kWh/m²/year 49.23 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	543.2	450.63	405.23	257.39	132.48	0	0	0	0	241.06	396.97	547.77		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	580.96	481.96	433.4	275.28	141.69	0	0	0	0	257.82	424.57	585.85		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													3181.53	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Output from water heater (calculated above)	179.62	158.43	166.65	149.76	147.02	131.76	126.9	138.75	138.35	155.27	163.72	175.42		
Efficiency of water heater													79.8	(216)
(217)m=	87.58	87.45	87.1	86.25	84.54	79.8	79.8	79.8	79.8	85.98	87.09	87.65		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	205.08	181.16	191.34	173.64	173.92	165.11	159.02	173.87	173.36	180.58	187.99	200.14		
Total = Sum(219a)$_{1...12}$ =													2165.22	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			3181.53	
Water heating fuel used			2165.22	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			310.83	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5732.59	(338)

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12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	687.21	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	467.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1154.9	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	161.32	(268)
Total CO2, kg/year			sum of (265)…(271) =		1355.15	(272)

TER =	22.43	(273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	21.78 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.95 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	52.3 kWh/m²	
		OK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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	$9.01m^2$	
Ventilation rate:	2.00	

10 Key features

Air permeablility	$3.0 m^3/m^2h$
Party Walls U-value	$0 W/m^2K$
Community heating, heat from boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(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) =	0.38	(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

0.48	0.47	0.46	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(25)

3. Heat 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	1.2	=	3.528			(26)
Windows			9.01	x1/[1/(1.4)+ 0.04]		=	11.95			(27)
Floor			59.22	x	0.13	=	7.6986			(28)
Walls Type1	23.47	11.95	11.52	x	0.18	=	2.07			(29)
Walls Type2	35.26	0	35.26	x	0.18	=	6.35			(29)
Roof	6.91	0	6.91	x	0.13	=	0.9			(30)
Total area of elements, m²			124.86							(31)
Party wall			26	x	0	=	0			(32)
Party ceiling			52.3							(32b)
Internal wall **			101.81							(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) = 13038.48 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 10.18 (36)

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

Total fabric heat loss (33) + (36) = 42.67 (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=	31.89	31.66	31.43	30.36	30.16	29.22	29.22	29.05	29.58	30.16	30.56	30.99	(38)

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

(39)m=	74.56	74.33	74.1	73.03	72.83	71.9	71.9	71.72	72.26	72.83	73.24	73.66	

Average = $Sum(39)_{1...12}$ /12= 73.03 (39)

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

(40)m=	1.26	1.26	1.25	1.23	1.23	1.21	1.21	1.21	1.22	1.23	1.24	1.24	

Average = $Sum(40)_{1...12}$ /12= 1.23 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	178.3	157.28	165.46	148.72	146.03	130.9	126.11	137.84	137.42	154.2	162.55	174.14	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution 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=	178.3	157.28	165.46	148.72	146.03	130.9	126.11	137.84	137.42	154.2	162.55	174.14

Output from water heater (annual)$_{1...12}$ | 1818.94 | (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=	81.07	71.97	76.8	70.53	70.34	64.6	63.71	67.61	66.77	73.05	75.13	79.69	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is 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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	108.96	107.1	103.22	97.96	94.54	89.73	85.64	90.88	92.74	98.19	104.34	107.11	(72)

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

(73)m=	351.4	349.51	338.5	320.9	303.25	286.12	274.93	280.19	289.19	306.98	327.36	342.44	(73)

6. Solar gains:

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=	382.46	412.75	452.44	508.02	554.77	554.27	525.78	480.18	428.03	384.26	366.46	367.81	(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=	1	1	0.99	0.97	0.9	0.74	0.58	0.65	0.88	0.98	0.99	1	(86)

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

(87)m=	19.66	19.78	20.02	20.39	20.72	20.92	20.98	20.97	20.81	20.4	19.98	19.64	(87)

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

(88)m=	19.87	19.88	19.88	19.89	19.9	19.91	19.91	19.91	19.9	19.9	19.89	19.89	(88)

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

(89)m=	1	0.99	0.99	0.96	0.86	0.65	0.45	0.51	0.82	0.97	0.99	1	(89)

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

(90)m=	18.1	18.27	18.64	19.17	19.62	19.86	19.9	19.9	19.75	19.2	18.58	18.08	(90)

fLA = Living area ÷ (4) = 0.45 (91)

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

(92)m=	18.8	18.95	19.26	19.72	20.11	20.34	20.39	20.38	20.23	19.74	19.21	18.79	(92)

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

(93)m=	18.8	18.95	19.26	19.72	20.11	20.34	20.39	20.38	20.23	19.74	19.21	18.79	(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	0.86	0.69	0.51	0.57	0.84	0.97	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	380.54	409.52	444.95	483.88	479.81	381.5	266.7	275.61	359.97	371.9	363.19	366.28	(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=	1081.08	1044.4	945.61	789.93	612.71	412.53	272.36	285.53	442.62	665.81	886.93	1074.37	(97)

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

(98)m=	521.2	426.64	372.49	220.35	98.88	0	0	0	0	218.67	377.09	526.82

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2762.14 (98)

Space heating requirement in kWh/m²/year 46.64 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.5 (206)

Efficiency of secondary/supplementary heating system, % 0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	521.2	426.64	372.49	220.35	98.88	0	0	0	0	218.67	377.09	526.82	
(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	557.43	456.3	398.39	235.67	105.75	0	0	0	0	233.87	403.31	563.45	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2954.16 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)	178.3	157.28	165.46	148.72	146.03	130.9	126.11	137.84	137.42	154.2	162.55	174.14	
Efficiency of water heater													79.8 (216)
(217)m=	87.51	87.35	86.92	85.86	83.8	79.8	79.8	79.8	79.8	85.75	86.99	87.58	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	203.75	180.06	190.37	173.21	174.26	164.03	158.03	172.73	172.21	179.83	186.87	198.83

Total = Sum(219a)$_{1...12}$ = 2154.18 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2954.16	
Water heating fuel used			2154.18	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			283.72	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5467.06	(338)

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12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	638.1	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	465.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1103.4	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	147.25	(268)
Total CO2, kg/year			sum of (265)…(271) =		1289.58	(272)

TER = 21.78 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	20.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.58 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	48.2 kWh/m²	
		OK

2 Fabric U-values

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas		

TER 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							2	x 10 =	20	(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) =	20	÷ (5) = 0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.47	0.46	0.45	0.4	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(25)

3. Heat 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	1.2	=	3.132			(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			(28)
Walls Type1	45.34	14.42	30.92	x	0.18	=	5.57			(29)
Walls Type2	4.69	0	4.69	x	0.18	=	0.84			(29)
Roof	6.8	0	6.8	x	0.13	=	0.88			(30)
Total area of elements, m²			121.24							(31)
Party wall			47.16	x	0	=	0			(32)
Party ceiling			57.61							(32b)
Internal wall **			91.05							(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) = 34.46 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 11.53 (36)

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

Total fabric heat loss (33) + (36) = 45.98 (37)

TER 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=	34.34	34.1	33.86	32.76	32.55	31.59	31.59	31.41	31.96	32.55	32.97	33.41	(38)

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

(39)m=	80.32	80.08	79.84	78.74	78.53	77.57	77.57	77.4	77.94	78.53	78.95	79.39	

Average = Sum(39)1…12 /12= 78.74 (39)

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

(40)m=	1.25	1.24	1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.23	1.23	

Average = Sum(40)1…12 /12= 1.22 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

TER WorkSheet: New dwelling design stage

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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	183.87	162.15	170.49	153.1	150.23	134.52	129.47	141.69	141.32	158.75	167.51	179.54	(62)

Solar DHW 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=	183.87	162.15	170.49	153.1	150.23	134.52	129.47	141.69	141.32	158.75	167.51	179.54

Output from water heater (annual)$_{1...12}$ — 1872.64 (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=	82.92	73.59	78.47	71.99	71.74	65.81	64.83	68.9	68.07	74.57	76.78	81.48	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	111.45	109.51	105.47	99.98	96.42	91.4	87.14	92.6	94.54	100.22	106.64	109.51	(72)

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

(73)m=	369.61	367.71	356.1	337.44	318.65	300.42	288.5	293.93	303.45	322.3	343.94	360.03	(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)

TER WorkSheet: New dwelling design stage

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=	462.73	532.15	596.57	661.36	705.16	694.55	664.16	621.29	572.57	508.21	456.53	439.03	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.94	0.84	0.67	0.5	0.56	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=	19.74	19.91	20.18	20.52	20.8	20.95	20.99	20.98	20.89	20.53	20.07	19.71	(87)

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

(88)m=	19.88	19.89	19.89	19.9	19.9	19.92	19.92	19.92	19.91	19.9	19.9	19.89	(88)

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

(89)m=	0.99	0.99	0.97	0.92	0.79	0.57	0.38	0.43	0.72	0.94	0.99	1	(89)

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

TER WorkSheet: New dwelling design stage

(90)m=	18.22	18.47	18.86	19.36	19.72	19.89	19.91	19.91	19.83	19.37	18.72	18.19		(90)
										fLA = Living area ÷ (4) =			0.63	(91)

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

(92)m=	19.18	19.38	19.69	20.09	20.4	20.56	20.59	20.59	20.49	20.1	19.57	19.15	(92)

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

(93)m=	19.18	19.38	19.69	20.09	20.4	20.56	20.59	20.59	20.49	20.1	19.57	19.15	(93)

8. Space 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	0.81	0.63	0.46	0.51	0.77	0.94	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	459.47	524.79	578.34	609.82	574.23	438.61	305.6	317.49	438.8	479.41	450.23	436.58	(95)
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=	1195.07	1159.34	1053.22	881.3	683.47	462.34	309.76	324.24	498.45	746.03	984.84	1187.02	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	547.28	426.41	353.31	195.47	81.28	0	0	0	0	198.37	384.92	558.33	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2745.37 (98)

Space heating requirement in kWh/m²/year 42.62 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	547.28	426.41	353.31	195.47	81.28	0	0	0	0	198.37	384.92	558.33		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	585.33	456.06	377.87	209.06	86.93	0	0	0	0	212.16	411.67	597.14		
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2936.22	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

Output from water heater (calculated above)

183.87	162.15	170.49	153.1	150.23	134.52	129.47	141.69	141.32	158.75	167.51	179.54

Efficiency of water heater 79.8 (216)

TER WorkSheet: New dwelling design stage

(217)m=	87.55	87.28	86.72	85.47	83.26	79.8	79.8	79.8	79.8	85.41	86.96	87.64	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	210.02	185.78	196.6	179.14	180.45	168.58	162.24	177.56	177.1	185.86	192.62	204.85

Total = Sum(219a)$_{1...12}$ = 2220.81 (219)

Annual totals		kWh/year	kWh/year	
Space heating fuel used, main system 1			2936.22	
Water heating fuel used			2220.81	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			294.9	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5526.93	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	634.22	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	479.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1113.92	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	153.05	(268)
Total CO2, kg/year		sum of (265)…(271) =		1305.9	(272)

TER = 20.27 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	20.45 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.55 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.8 kWh/m²	
		OK

2 Fabric U-values

Element	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 - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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	9.14m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from boilers – mains gas	

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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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.47	0.46	0.46	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(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	1.2	=	3.132			(26)
Windows			9.14	x1/[1/(1.4)+ 0.04]		=	12.12			(27)
Floor			61.88	x	0.13	=	8.0444			(28)
Walls Type1	21.92	11.75	10.17	x	0.18	=	1.83			(29)
Walls Type2	27.99	0	27.99	x	0.18	=	5.04			(29)
Roof	24.98	0	24.98	x	0.13	=	3.25			(30)
Total area of elements, m²			136.77							(31)
Party wall			42.78	x	0	=	0			(32)
Party ceiling			36.89							(32b)
Internal wall **			120.68							(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) = 33.41 (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 Indicative Value: Medium 250 (35)

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

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

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

Total fabric heat loss (33) + (36) = 44.82 (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=	33.14	32.91	32.67	31.59	31.38	30.44	30.44	30.26	30.8	31.38	31.79	32.23		(38)

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

(39)m=	77.96	77.73	77.49	76.41	76.2	75.26	75.26	75.08	75.62	76.2	76.62	77.05		
										Average = Sum(39)$_{1...12}$ /12=			76.41	(39)

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

(40)m=	1.26	1.26	1.25	1.23	1.23	1.22	1.22	1.21	1.22	1.23	1.24	1.25		
										Average = Sum(40)$_{1...12}$ /12=			1.23	(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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	181.2	159.81	168.08	151	148.22	132.78	127.86	139.84	139.45	156.56	165.13	176.95	(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=	181.2	159.81	168.08	151	148.22	132.78	127.86	139.84	139.45	156.56	165.13	176.95	

Output from water heater (annual)$_{1…12}$ | 1846.88 | (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=	82.03	72.81	77.67	71.29	71.07	65.23	64.29	68.28	67.45	73.84	75.99	80.62	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	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=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	-81.37	(71)

Water heating gains (Table 5)

(72)m=	110.26	108.35	104.39	99.01	95.52	90.6	86.42	91.78	93.68	99.25	105.54	108.36	(72)

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

(73)m=	361.23	359.29	347.9	329.68	311.38	293.66	282.11	287.5	296.83	315.24	336.34	351.96	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the 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=	464.01	534.36	587.43	626.47	643.82	623.69	600.29	579.09	556.2	508.73	459.44	439.92	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.99	0.98	0.94	0.86	0.71	0.54	0.58	0.8	0.95	0.99	1	(86)

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

(87)m=	19.75	19.92	20.18	20.5	20.77	20.94	20.99	20.98	20.88	20.54	20.09	19.72	(87)

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

(88)m=	19.87	19.88	19.88	19.89	19.89	19.91	19.91	19.91	19.9	19.89	19.89	19.88	(88)

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

(89)m=	0.99	0.99	0.97	0.92	0.81	0.61	0.41	0.45	0.72	0.93	0.99	0.99	(89)

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

(90)m=	18.23	18.49	18.86	19.32	19.67	19.87	19.9	19.9	19.81	19.38	18.74	18.2	(90)

fLA = Living area ÷ (4) = 0.56 (91)

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

(92)m=	19.08	19.29	19.6	19.98	20.29	20.47	20.51	20.51	20.41	20.03	19.49	19.05	(92)

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

(93)m=	19.08	19.29	19.6	19.98	20.29	20.47	20.51	20.51	20.41	20.03	19.49	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=	0.99	0.98	0.97	0.92	0.83	0.66	0.48	0.52	0.76	0.93	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	460.04	525.46	567.59	579.12	536.34	413.19	289.24	301.19	421.97	475.46	451.72	436.93	(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=	1152.33	1118.51	1015.02	846.62	654.45	441.5	294.18	308.29	477.43	718.56	949.46	1144.26	(97)

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

(98)m=	515.06	398.53	332.89	192.6	87.87	0	0	0	0	180.86	358.37	526.26	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2592.45 (98)

Space heating requirement in kWh/m²/year 41.89 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	515.06	398.53	332.89	192.6	87.87	0	0	0	0	180.86	358.37	526.26		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	550.87	426.23	356.03	205.99	93.98	0	0	0	0	193.44	383.29	562.84		(211)
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													2772.67	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)

Water heating

Output from water heater (calculated above)	181.2	159.81	168.08	151	148.22	132.78	127.86	139.84	139.45	156.56	165.13	176.95		
Efficiency of water heater													79.8	(216)
(217)m=	87.45	87.16	86.6	85.46	83.47	79.8	79.8	79.8	79.8	85.2	86.83	87.55		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	207.2	183.36	194.07	176.68	177.56	166.4	160.22	175.24	174.75	183.76	190.18	202.12		
Total = Sum(219a)$_{1...12}$ =													2191.56	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2772.67	
Water heating fuel used			2191.56	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			296.65	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5335.88	(338)

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12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	598.9	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	473.38	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1072.27	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	153.96	(268)
Total CO2, kg/year			sum of (265)…(271) =		1265.16	(272)

TER = 20.45 (273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	21.58 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.58 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.3 kWh/m²	
		OK

2 Fabric U-values

Element	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 - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.52	0.51	0.5	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses 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			(28)
Walls Type1	35.3	11.54	23.76	x	0.18	=	4.28			(29)
Walls Type2	35.99	0	35.99	x	0.18	=	6.48			(29)
Total area of elements, m²			120.25							(31)
Party wall			14.89	x	0	=	0			(32)
Party ceiling			48.96							(32b)
Internal wall **			96.46							(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) = 32.42 (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 Indicative Value: Medium 250 (35)

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

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

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

Total fabric heat loss (33) + (36) = 41.44 (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	
(38)m=	27.09	26.87	26.65	25.64	25.45	24.56	24.56	24.4	24.9	25.45	25.83	26.24	(38)

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

(39)m=	68.53	68.31	68.09	67.08	66.89	66	66	65.84	66.34	66.89	67.27	67.67	

Average = $Sum(39)_{1…12}$ /12= 67.08 (39)

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

(40)m=	1.4	1.4	1.39	1.37	1.37	1.35	1.35	1.34	1.36	1.37	1.37	1.38

Average = Sum(40)$_{1…12}$ /12= 1.37 (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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H													
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	(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=	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	

Output from water heater (annual)$_{1...12}$ 1706.85 (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=	77.2	68.59	73.31	67.49	67.42	62.09	61.38	64.94	64.06	69.9	71.68	75.94	(65)

include (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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	103.77	102.07	98.54	93.74	90.62	86.23	82.5	87.28	88.98	93.95	99.56	102.08	(72)

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

(73)m=	312.08	310.44	300.99	285.88	270.83	256.08	246.33	251.05	258.66	273.94	291.48	304.37	(73)

6. Solar 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)

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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=	441.84	531.47	603.42	660.61	690.55	672.76	648.06	619.21	586.13	518.23	446.91	415.42	(84)

7. Mean internal temperature (heating season)

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

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	0.6	0.44	0.48	0.7	0.91	0.98	0.99	(86)

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

(87)m=	19.7	19.93	20.24	20.58	20.83	20.96	20.99	20.99	20.92	20.59	20.08	19.67	(87)

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

(88)m=	19.76	19.77	19.77	19.79	19.79	19.8	19.8	19.81	19.8	19.79	19.78	19.78	(88)

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

(89)m=	0.99	0.97	0.93	0.85	0.7	0.5	0.32	0.36	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=	18.09	18.42	18.86	19.34	19.64	19.78	19.8	19.8	19.74	19.36	18.65	18.04	(90)

fLA = Living area ÷ (4) = 0.5 (91)

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

(92)m=	18.89	19.17	19.54	19.95	20.23	20.37	20.39	20.39	20.32	19.97	19.36	18.85	(92)

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

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(93)m=	18.89	19.17	19.54	19.95	20.23	20.37	20.39	20.39	20.32	19.97	19.36	18.85	(93)

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	0.86	0.73	0.55	0.38	0.42	0.65	0.88	0.97	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	434.43	513.15	561.81	566.72	503.88	366.69	247.99	259.33	382.34	457.42	432.3	409.87		(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=	999.78	974.96	888.12	741.54	570.71	380.53	250.26	262.72	412.89	626.57	824.88	991.34		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	420.62	310.34	242.77	125.87	49.73	0	0	0	0	125.85	282.66	432.61		
								Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =					1990.45	(98)
Space heating requirement in kWh/m²/year													40.65	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	420.62	310.34	242.77	125.87	49.73	0	0	0	0	125.85	282.66	432.61		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	449.86	331.91	259.65	134.62	53.18	0	0	0	0	134.6	302.31	462.68		
								Total (kWh/year) =Sum(211)$_{1...5,10....12}$=					2128.82	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Total (kWh/year) =Sum(215)$_{1...5,10....12}$=					0	(215)

Water heating

Output from water heater (calculated above)														
	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89		
Efficiency of water heater													79.8	(216)
(217)m=	87.18	86.76	86.01	84.54	82.39	79.8	79.8	79.8	79.8	84.44	86.44	87.3		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	191.18	169.56	180.19	165.1	166.59	154.54	149.24	162.64	162	171.36	176.05	186.59		
								Total = Sum(219a)$_{1...12}$ =					2035.04	(219)

Annual totals	kWh/year	kWh/year
Space heating fuel used, main system 1		2128.82

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Water heating fuel used		2035.04	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	75	(231)
Electricity for lighting		227.56	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4466.42	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	459.83	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	439.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =			899.39	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	118.1	(268)
Total CO2, kg/year		sum of (265)…(271) =		1056.42	(272)

TER = 21.58 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	20.26 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.51 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.5 kWh/m²	
		OK

2 Fabric U-values

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

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas		

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(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) =	0.39	(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

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross 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			9.44	x1/[1/(1.4)+ 0.04]		=	12.52			(27)
Windows Type 2			3.93	x1/[1/(1.4)+ 0.04]		=	5.21			(27)
Floor			53.46	x	0.13	=	6.9498			(28)
Walls Type1	40.04	13.37	26.67	x	0.18	=	4.8			(29)
Walls Type2	12.16	0	12.16	x	0.18	=	2.19			(29)
Total area of elements, m²			105.66							(31)
Party wall			27.88	x	0	=	0			(32)
Party ceiling			53.46							(32b)
Internal wall **			102.03							(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) = 31.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10115.97 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

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

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

Total fabric heat loss (33) + (36) = 40.47 (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=	29.19	28.96	28.74	27.7	27.51	26.6	26.6	26.44	26.95	27.51	27.9	28.31	(38)

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

(39)m=	69.66	69.44	69.22	68.18	67.98	67.08	67.08	66.91	67.43	67.98	68.38	68.79

Average = $Sum(39)_{1…12}$ /12= 68.18 (39)

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

(40)m=	1.3	1.3	1.29	1.28	1.27	1.25	1.25	1.25	1.26	1.27	1.28	1.29

Average = Sum(40)$_{1…12}$ /12= 1.28 (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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	(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=	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	

Output from water heater (annual)$_{1...12}$ 1756.39 (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=	78.91	70.08	74.85	68.83	68.71	63.2	62.41	66.12	65.26	71.29	73.2	77.6	(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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	106.06	104.29	100.61	95.6	92.35	87.78	83.89	88.87	90.64	95.82	101.67	104.3	(72)

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

(73)m=	329.08	327.37	317.29	301.15	285	269.22	258.82	263.74	271.91	288.23	306.98	320.81	(73)

6. Solar 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	9.44	x	36.79	0.63	x	0.7	=	106.15	(79)
Southwest 0.9x	0.77	x	9.44	x	62.67	0.63	x	0.7	=	180.81	(79)
Southwest 0.9x	0.77	x	9.44	x	85.75	0.63	x	0.7	=	247.4	(79)
Southwest 0.9x	0.77	x	9.44	x	106.25	0.63	x	0.7	=	306.53	(79)
Southwest 0.9x	0.77	x	9.44	x	119.01	0.63	x	0.7	=	343.34	(79)

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Southwest	0.9x	0.77	x	9.44	x	118.15		0.63	x	0.7	=	340.86	(79)
Southwest	0.9x	0.77	x	9.44	x	113.91		0.63	x	0.7	=	328.63	(79)
Southwest	0.9x	0.77	x	9.44	x	104.39		0.63	x	0.7	=	301.16	(79)
Southwest	0.9x	0.77	x	9.44	x	92.85		0.63	x	0.7	=	267.88	(79)
Southwest	0.9x	0.77	x	9.44	x	69.27		0.63	x	0.7	=	199.84	(79)
Southwest	0.9x	0.77	x	9.44	x	44.07		0.63	x	0.7	=	127.14	(79)
Southwest	0.9x	0.77	x	9.44	x	31.49		0.63	x	0.7	=	90.84	(79)
Northwest	0.9x	0.77	x	3.93	x	11.28	x	0.63	x	0.7	=	13.55	(81)
Northwest	0.9x	0.77	x	3.93	x	22.97	x	0.63	x	0.7	=	27.58	(81)
Northwest	0.9x	0.77	x	3.93	x	41.38	x	0.63	x	0.7	=	49.7	(81)
Northwest	0.9x	0.77	x	3.93	x	67.96	x	0.63	x	0.7	=	81.62	(81)
Northwest	0.9x	0.77	x	3.93	x	91.35	x	0.63	x	0.7	=	109.71	(81)
Northwest	0.9x	0.77	x	3.93	x	97.38	x	0.63	x	0.7	=	116.96	(81)
Northwest	0.9x	0.77	x	3.93	x	91.1	x	0.63	x	0.7	=	109.42	(81)
Northwest	0.9x	0.77	x	3.93	x	72.63	x	0.63	x	0.7	=	87.23	(81)
Northwest	0.9x	0.77	x	3.93	x	50.42	x	0.63	x	0.7	=	60.56	(81)
Northwest	0.9x	0.77	x	3.93	x	28.07	x	0.63	x	0.7	=	33.71	(81)
Northwest	0.9x	0.77	x	3.93	x	14.2	x	0.63	x	0.7	=	17.05	(81)
Northwest	0.9x	0.77	x	3.93	x	9.21	x	0.63	x	0.7	=	11.07	(81)

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

(83)m=	119.7	208.4	297.09	388.15	453.06	457.83	438.04	388.39	328.43	233.55	144.19	101.91	(83)

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

(84)m=	448.78	535.77	614.39	689.3	738.05	727.04	696.87	652.14	600.34	521.78	451.17	422.72	(84)

7. Mean internal temperature (heating season)

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

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	0.75	0.57	0.42	0.46	0.71	0.92	0.98	0.99	(86)

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

(87)m=	19.77	19.99	20.29	20.63	20.87	20.97	20.99	20.99	20.93	20.61	20.13	19.74	(87)

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

(88)m=	19.84	19.84	19.84	19.86	19.86	19.88	19.88	19.88	19.87	19.86	19.86	19.85	(88)

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

(89)m=	0.99	0.98	0.94	0.85	0.69	0.48	0.31	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)

(90)m=	18.24	18.55	18.98	19.46	19.75	19.86	19.87	19.88	19.82	19.45	18.77	18.2	(90)

fLA = Living area ÷ (4) = | 0.45 | (91)

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

(92)m=	18.93	19.2	19.57	19.99	20.25	20.36	20.38	20.38	20.32	19.97	19.38	18.89	(92)

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

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(93)m=	18.93	19.2	19.57	19.99	20.25	20.36	20.38	20.38	20.32	19.97	19.38	18.89	(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	0.86	0.71	0.52	0.36	0.4	0.65	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	442.72	520.51	576.44	591.55	526.33	376.92	252.15	263.9	392.2	466.47	438.98	418.22	(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=	1019.3	992.95	904.69	756.11	581.52	386.54	253.56	266.26	419.45	637.19	839.98	1010.84	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	428.97	317.48	244.22	118.48	41.06	0	0	0	0	127.01	288.72	440.91	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2006.86 (98)

Space heating requirement in kWh/m²/year 37.54 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	428.97	317.48	244.22	118.48	41.06	0	0	0	0	127.01	288.72	440.91	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	458.79	339.55	261.19	126.72	43.91	0	0	0	0	135.84	308.79	471.56	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2146.37 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	
Efficiency of water heater												79.8	(216)
(217)m=	87.16	86.74	85.95	84.31	81.98	79.8	79.8	79.8	79.8	84.39	86.42	87.27	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	197.13	174.78	185.71	170.36	172.15	158.74	153.12	167.1	166.51	176.43	181.39	192.34	

Total = Sum(219a)$_{1...12}$ = 2095.76 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2146.37

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Water heating fuel used			2095.76	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			245.94	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4563.07	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	463.62	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	452.68	(264)
Space and water heating	(261) + (262) + (263) + (264) =			916.3	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	127.64	(268)
Total CO2, kg/year		sum of (265)…(271) =		1082.87	(272)

TER = 20.26 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	20.63 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.18 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
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 - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.37	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(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			11.97	x1/[1/(1.4)+ 0.04]		=	15.87			(27)
Windows Type 2			3.26	x1/[1/(1.4)+ 0.04]		=	4.32			(27)
Floor			60.89	x	0.13	=	7.915699			(28)
Walls Type1	29.71	15.23	14.48	x	0.18	=	2.61			(29)
Walls Type2	13.52	0	13.52	x	0.18	=	2.43			(29)
Total area of elements, m²			104.12							(31)
Party wall			29.71	x	0	=	0			(32)
Party ceiling			60.89							(32b)
Internal wall **			146.17							(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) = 33.15 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10725.93 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 10.46 (36)

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

Total fabric heat loss (33) + (36) = 43.61 (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=	32.68	32.44	32.21	31.13	30.93	29.98	29.98	29.81	30.35	30.93	31.34	31.76	(38)

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

(39)m=	76.29	76.05	75.82	74.74	74.54	73.6	73.6	73.42	73.96	74.54	74.95	75.38	

Average = Sum(39)$_{1…12}$ /12= 74.74 (39)

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

(40)m=	1.25	1.25	1.25	1.23	1.22	1.21	1.21	1.21	1.21	1.22	1.23	1.24

Average = Sum(40)$_{1…12}$ /12= 1.23 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	180.13	158.88	167.11	150.16	147.41	132.09	127.21	139.1	138.7	155.69	164.18	175.92	(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=	180.13	158.88	167.11	150.16	147.41	132.09	127.21	139.1	138.7	155.69	164.18	175.92	

Output from water heater (annual)$_{1…12}$ | 1836.57 | (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=	81.68	72.5	77.35	71.01	70.8	65	64.08	68.03	67.2	73.55	75.67	80.27	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	109.78	107.89	103.96	98.62	95.16	90.28	86.13	91.44	93.33	98.86	105.1	107.9	(72)

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

(73)m=	356.68	354.86	343.77	325.93	308	290.56	279.11	284.36	293.42	311.43	332.14	347.5	(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	11.97	x	11.28	x	0.63	x	0.7	=	41.28	(75)
Northeast 0.9x	0.77	x	11.97	x	22.97	x	0.63	x	0.7	=	84.02	(75)
Northeast 0.9x	0.77	x	11.97	x	41.38	x	0.63	x	0.7	=	151.37	(75)
Northeast 0.9x	0.77	x	11.97	x	67.96	x	0.63	x	0.7	=	248.6	(75)
Northeast 0.9x	0.77	x	11.97	x	91.35	x	0.63	x	0.7	=	334.16	(75)

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Northeast 0.9x	0.77	x	11.97	x	97.38	x	0.63	x	0.7	=	356.25	(75)
Northeast 0.9x	0.77	x	11.97	x	91.1	x	0.63	x	0.7	=	333.27	(75)
Northeast 0.9x	0.77	x	11.97	x	72.63	x	0.63	x	0.7	=	265.68	(75)
Northeast 0.9x	0.77	x	11.97	x	50.42	x	0.63	x	0.7	=	184.45	(75)
Northeast 0.9x	0.77	x	11.97	x	28.07	x	0.63	x	0.7	=	102.68	(75)
Northeast 0.9x	0.77	x	11.97	x	14.2	x	0.63	x	0.7	=	51.93	(75)
Northeast 0.9x	0.77	x	11.97	x	9.21	x	0.63	x	0.7	=	33.71	(75)
Northwest 0.9x	0.77	x	3.26	x	11.28	x	0.63	x	0.7	=	11.24	(81)
Northwest 0.9x	0.77	x	3.26	x	22.97	x	0.63	x	0.7	=	22.88	(81)
Northwest 0.9x	0.77	x	3.26	x	41.38	x	0.63	x	0.7	=	41.23	(81)
Northwest 0.9x	0.77	x	3.26	x	67.96	x	0.63	x	0.7	=	67.7	(81)
Northwest 0.9x	0.77	x	3.26	x	91.35	x	0.63	x	0.7	=	91.01	(81)
Northwest 0.9x	0.77	x	3.26	x	97.38	x	0.63	x	0.7	=	97.02	(81)
Northwest 0.9x	0.77	x	3.26	x	91.1	x	0.63	x	0.7	=	90.76	(81)
Northwest 0.9x	0.77	x	3.26	x	72.63	x	0.63	x	0.7	=	72.36	(81)
Northwest 0.9x	0.77	x	3.26	x	50.42	x	0.63	x	0.7	=	50.23	(81)
Northwest 0.9x	0.77	x	3.26	x	28.07	x	0.63	x	0.7	=	27.96	(81)
Northwest 0.9x	0.77	x	3.26	x	14.2	x	0.63	x	0.7	=	14.14	(81)
Northwest 0.9x	0.77	x	3.26	x	9.21	x	0.63	x	0.7	=	9.18	(81)

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

(83)m=	52.52	106.9	192.6	316.3	425.17	453.27	424.03	338.04	234.68	130.64	66.08	42.89	(83)

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

(84)m=	409.2	461.76	536.36	642.23	733.17	743.83	703.14	622.4	528.1	442.07	398.22	390.39	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.93	0.8	0.61	0.45	0.53	0.81	0.97	0.99	1	(86)

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

(87)m=	19.69	19.84	20.13	20.54	20.84	20.97	20.99	20.99	20.88	20.47	20.02	19.67	(87)

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

(88)m=	19.88	19.88	19.88	19.9	19.9	19.91	19.91	19.92	19.91	19.9	19.9	19.89	(88)

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

(89)m=	1	0.99	0.98	0.91	0.74	0.51	0.35	0.41	0.73	0.95	0.99	1	(89)

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

(90)m=	18.15	18.37	18.79	19.37	19.75	19.89	19.91	19.91	19.81	19.3	18.64	18.13	(90)

fLA = Living area ÷ (4) = 0.46 (91)

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

(92)m=	18.85	19.04	19.41	19.91	20.25	20.39	20.41	20.4	20.3	19.84	19.27	18.83	(92)

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

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(93)m=	18.85	19.04	19.41	19.91	20.25	20.39	20.41	20.4	20.3	19.84	19.27	18.83	(93)

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	0.91	0.76	0.56	0.4	0.47	0.76	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	406.81	456.8	521.69	585.39	560.65	413.1	278.24	289.86	403.93	421.46	393.85	388.55	(95)
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=	1110.29	1075.68	978.68	822.59	637.55	425.92	280.23	294.03	458.65	688.43	912.25	1103.02	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	523.39	415.89	340	170.79	57.21	0	0	0	0	198.63	373.25	531.56	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 2610.73 (98)

Space heating requirement in kWh/m²/year 42.88 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	523.39	415.89	340	170.79	57.21	0	0	0	0	198.63	373.25	531.56	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	559.78	444.8	363.64	182.66	61.19	0	0	0	0	212.44	399.2	568.51	

Total (kWh/year) =$Sum(211)_{1...5,10....12}$= 2792.22 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =$Sum(215)_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	180.13	158.88	167.11	150.16	147.41	132.09	127.21	139.1	138.7	155.69	164.18	175.92	
Efficiency of water heater												79.8	(216)
(217)m=	87.5	87.27	86.67	85.16	82.53	79.8	79.8	79.8	79.8	85.46	86.94	87.58	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	205.87	182.06	192.81	176.33	178.62	165.52	159.41	174.31	173.81	182.17	188.84	200.86	

Total = $Sum(219a)_{1...12}$ = 2180.63 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2792.22

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Water heating fuel used			2180.63	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			275.82	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5323.67	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	603.12	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	471.02	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1074.14	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	143.15	(268)
Total CO2, kg/year			sum of (265)…(271) =		1256.21	(272)

TER = 20.63 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	20.41 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.53 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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	12.07m²
Ventilation rate:	4.00

10 Key features

Air permeablility	3.0 m³/m²h
Party Walls U-value	0 W/m²K
Community heating, heat from boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.47	0.46	0.46	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(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			(28)
Walls Type1	30.87	12.07	18.8	x	0.18	=	3.38			(29)
Walls Type2	27.45	0	27.45	x	0.18	=	4.94			(29)
Total area of elements, m²			120.3							(31)
Party wall			31.67	x	0	=	0			(32)
Party ceiling			61.89							(32b)
Internal wall **			95.03							(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) = 32.38 (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 Indicative Value: Medium 250 (35)

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

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

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

Total fabric heat loss (33) + (36) = 41.82 (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=	33.19	32.95	32.72	31.63	31.43	30.48	30.48	30.31	30.85	31.43	31.84	32.27	(38)

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

(39)m=	75.01	74.77	74.54	73.45	73.25	72.3	72.3	72.12	72.66	73.25	73.66	74.09	

Average = Sum(39)$_{1…12}$ /12= 73.45 (39)

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

(40)m=	1.21	1.21	1.2	1.19	1.18	1.17	1.17	1.16	1.17	1.18	1.19	1.2

Average = Sum(40)$_{1…12}$ /12= 1.19 (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)

	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=	90.84	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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	181.3	159.9	168.17	151.09	148.3	132.85	127.92	139.92	139.53	156.65	165.23	177.05	(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=	181.3	159.9	168.17	151.09	148.3	132.85	127.92	139.92	139.53	156.65	165.23	177.05	

Output from water heater (annual)$_{1...12}$ 1847.91 (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=	82.07	72.84	77.7	71.32	71.09	65.25	64.32	68.31	67.47	73.87	76.02	80.65	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	110.3	108.4	104.44	99.05	95.55	90.63	86.45	91.81	93.71	99.29	105.58	108.41	(72)

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

(73)m=	360.79	358.94	347.67	329.57	311.36	293.66	282.08	287.38	296.6	314.89	335.89	351.49	(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=	402.41	443.66	500.3	580.24	648.31	652.89	618.12	555.28	482.59	418.42	388.26	385.48	(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=	1	0.99	0.99	0.95	0.85	0.67	0.51	0.58	0.85	0.98	0.99	1	(86)

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

(87)m=	19.72	19.86	20.12	20.49	20.8	20.96	20.99	20.98	20.86	20.47	20.04	19.71	(87)

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

(88)m=	19.91	19.91	19.92	19.93	19.93	19.95	19.95	19.95	19.94	19.93	19.93	19.92	(88)

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

(89)m=	1	0.99	0.98	0.94	0.8	0.57	0.39	0.46	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=	18.22	18.42	18.8	19.34	19.75	19.92	19.94	19.94	19.83	19.32	18.7	18.21	(90)

fLA = Living area ÷ (4) = 0.41 (91)

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

(92)m=	18.84	19.01	19.34	19.82	20.18	20.35	20.37	20.37	20.25	19.79	19.25	18.82	(92)

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

(93)m=	18.84	19.01	19.34	19.82	20.18	20.35	20.37	20.37	20.25	19.79	19.25	18.82	(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	0.93	0.81	0.61	0.44	0.51	0.8	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	400.34	439.74	489.8	541.74	526.97	398.31	270.23	281.13	385.42	402.15	384.55	383.86	(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=	1090.5	1054.87	957.2	801.78	621.28	415.45	272.87	286.36	447.13	673.03	894.82	1083.36	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	513.48	413.37	347.75	187.23	70.16	0	0	0	0	201.54	367.4	520.43	(98)

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Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2621.35	(98)
Space heating requirement in kWh/m²/year	42.29	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	513.48	413.37	347.75	187.23	70.16	0	0	0	0	201.54	367.4	520.43		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	549.17	442.11	371.92	200.24	75.04	0	0	0	0	215.55	392.94	556.61		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2803.59	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)	181.3	159.9	168.17	151.09	148.3	132.85	127.92	139.92	139.53	156.65	165.23	177.05		
Efficiency of water heater													79.8	(216)
(217)m=	87.44	87.24	86.71	85.39	82.95	79.8	79.8	79.8	79.8	85.49	86.89	87.52		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	207.35	183.3	193.95	176.94	178.78	166.48	160.3	175.33	174.85	183.25	190.16	202.3		
Total = Sum(219a)$_{1...12}$ =													2192.99	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2803.59	
Water heating fuel used			2192.99	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			282.93	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5354.5	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

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

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

TER = 20.41 (273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	16.69 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.29 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas		

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.11	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(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) =	0.36	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 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

0.46	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59	(24d)

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

(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59	(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			(29)
Walls Type2	16.73	0	16.73	x	0.18	=	3.01			(29)
Total area of elements, m²			58.24							(31)
Party wall			40.43	x	0	=	0			(32)
Party floor			69.44							(32a)
Party ceiling			69.44							(32b)
Internal wall **			136.21							(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) = 24.11 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.83 (36)

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

Total fabric heat loss (33) + (36) = 30.94 (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=	36.71	36.47	36.22	35.09	34.88	33.89	33.89	33.7	34.27	34.88	35.31	35.76	(38)

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

(39)m=	67.65	67.4	67.16	66.03	65.82	64.83	64.83	64.64	65.21	65.82	66.25	66.69	

Average = Sum(39)$_{1…12}$ /12= 66.03 (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=	0.97	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	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 2.23 (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)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m 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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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)

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=	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	(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=	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	

Output from water heater (annual)$_{1...12}$ 1920.94 (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=	84.58	75.04	79.97	73.3	72.99	66.89	65.84	70.05	69.24	75.93	78.26	83.09	(65)

include (57)m in 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	113.69	111.67	107.49	101.8	98.11	92.91	88.49	94.15	96.16	102.05	108.7	111.68	(72)

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

(73)m=	387.16	385.17	372.87	353.12	333.17	313.88	301.31	306.95	317.07	337.03	359.93	377.01	(73)

6. Solar gains:

Solar gains are calculated 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=	450.92	504.05	562.83	634.22	689.78	686.28	652.7	599.2	538.15	475.78	438.18	430.36	(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=	1	0.99	0.98	0.93	0.8	0.59	0.44	0.49	0.77	0.96	0.99	1	(86)

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

(87)m=	20.05	20.18	20.41	20.71	20.91	20.99	21	21	20.95	20.68	20.32	20.03	(87)

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

(88)m=	20.1	20.11	20.11	20.12	20.13	20.14	20.14	20.14	20.13	20.13	20.12	20.12	(88)

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

(89)m=	1	0.99	0.98	0.91	0.75	0.52	0.35	0.4	0.7	0.94	0.99	1	(89)

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

(90)m=	18.84	19.03	19.36	19.79	20.05	20.13	20.14	20.14	20.1	19.76	19.24	18.82	(90)

fLA = Living area ÷ (4) = 0.34 (91)

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

(92)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24	(92)

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

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(93)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24	(93)

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	0.91	0.76	0.54	0.38	0.43	0.72	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	448.52	498.69	547.41	578.07	525.27	372.74	248.03	259.75	387.12	448.63	433.16	428.57	(95)
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=	1011.55	979.19	888.07	739.88	568.97	377.65	248.52	260.77	410.09	623.73	828.81	1002.75	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1986.58 (98)

Space heating requirement in kWh/m²/year 28.61 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	448.02	345.34	271.07	124.6	34.78	0	0	0	0	139.32	304.67	456.89	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2124.68 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	
Efficiency of water heater												79.8	(216)
(217)m=	86.88	86.55	85.8	84.03	81.48	79.8	79.8	79.8	79.8	84.23	86.15	86.98	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	217.4	192.4	203.97	186.89	189.02	172.67	166.03	181.91	181.5	193.33	199.62	211.98	

Total = Sum(219a)$_{1...12}$ = 2296.71 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2124.68

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Water heating fuel used			2296.71	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			317.84	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4814.23	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	458.93	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	496.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				955.02	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	164.96	(268)
Total CO2, kg/year			sum of (265)…(271) =		1158.9	(272)

TER = 16.69 (273)

Regulations Compliance Report

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

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.61m²

Site Reference : 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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	16.77 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.35 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.11	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(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) =	0.36	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

Wind Factor (22a)m = (22)m ÷ 4

	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
(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

0.46	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(24d)

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

(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(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			(29)
Walls Type2	18.41	0	18.41	x	0.18	=	3.31			(29)
Total area of elements, m²			60							(31)
Party wall			38.68	x	0	=	0			(32)
Party floor			69.61							(32a)
Party ceiling			69.61							(32b)
Internal wall **			136.21							(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) = 24.42 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.83 (36)

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

Total fabric heat loss (33) + (36) = 31.26 (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=	36.79	36.55	36.3	35.17	34.96	33.97	33.97	33.78	34.35	34.96	35.39	35.84	(38)

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

(39)m=	68.05	67.8	67.56	66.42	66.21	65.22	65.22	65.04	65.6	66.21	66.64	67.09	

Average = Sum(39)$_{1…12}$ /12= 66.42 (39)

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

(40)m=	0.98	0.97	0.97	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.96	0.96

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 2.24 (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)

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=	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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	(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=	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	

Output from water heater (annual)$_{1…12}$ 1922.5 (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=	84.64	75.09	80.02	73.34	73.03	66.93	65.87	70.09	69.28	75.97	78.31	83.14	(65)

include (57)m in 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	113.76	111.74	107.55	101.86	98.16	92.96	88.53	94.2	96.22	102.11	108.77	111.75	(72)

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

(73)m=	387.74	385.74	373.42	353.63	333.64	314.32	301.73	307.38	317.52	337.51	360.46	377.56	(73)

6. Solar 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)
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=	451.5	504.63	563.38	634.74	690.26	686.72	653.12	599.63	538.6	476.27	438.71	430.92	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.93	0.8	0.6	0.44	0.49	0.77	0.96	0.99	1	(86)

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

(87)m=	20.04	20.18	20.41	20.71	20.91	20.99	21	21	20.95	20.68	20.31	20.03	(87)

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

(88)m=	20.1	20.11	20.11	20.12	20.12	20.14	20.14	20.14	20.13	20.12	20.12	20.11	(88)

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

(89)m=	1	0.99	0.98	0.91	0.75	0.52	0.35	0.4	0.7	0.94	0.99	1	(89)

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

(90)m=	18.83	19.02	19.35	19.78	20.04	20.13	20.14	20.14	20.09	19.75	19.23	18.81	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27	(92)

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

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(93)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27	(93)

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	0.91	0.77	0.55	0.39	0.44	0.72	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	449.14	499.38	548.31	579.82	528.59	376.65	251.51	263.23	390.23	449.79	433.81	429.17	(95)
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=	1020.07	987.36	895.47	746.2	574.32	381.94	252.05	264.36	414.51	629.39	836	1011.25	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2021.06 (98)

Space heating requirement in kWh/m²/year 29.03 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	454.3	350.72	276.24	128.12	36.39	0	0	0	0	142.92	309.71	463.17		
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2161.56	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)
Water heating														
Output from water heater (calculated above)														
	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54		
Efficiency of water heater													79.8	(216)
(217)m=	86.91	86.59	85.85	84.1	81.54	79.8	79.8	79.8	79.8	84.29	86.19	87.01		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	217.51	192.48	204.02	186.88	189.02	172.8	166.15	182.05	181.64	193.34	199.7	212.08		
Total = Sum(219a)$_{1...12}$ =													2297.68	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2161.56

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Water heating fuel used				2297.68	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year		sum of (230a)…(230g) =		75	(231)
Electricity for lighting				318.62	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =				4852.86	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	466.9	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	496.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =			963.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	165.36	(268)
Total CO2, kg/year		sum of (265)…(271) =		1167.48	(272)

TER =	16.77	(273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	19.64 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.45 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.7 kWh/m²	
		OK

2 Fabric U-values

Element	**Average**	**Highest**	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

0.51	0.5	0.49	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat 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			(29)
Walls Type2	22.92	0	22.92	x	0.18	=	4.13			(29)
Total area of elements, m²			54.32							(31)
Party wall			30.08	x	0	=	0			(32)
Party floor			50.62							(32a)
Party ceiling			50.62							(32b)
Internal wall **			83.2							(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) = 20.06 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 5.76 (36)

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

Total fabric heat loss (33) + (36) = 25.82 (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=	27.86	27.64	27.42	26.4	26.21	25.32	25.32	25.15	25.66	26.21	26.6	27	(38)

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

(39)m=	53.68	53.46	53.24	52.21	52.02	51.13	51.13	50.97	51.47	52.02	52.41	52.82	

Average = Sum(39)$_{1…12}$ /12= 52.21 (39)

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

(40)m=	1.06	1.06	1.05	1.03	1.03	1.01	1.01	1.01	1.02	1.03	1.04	1.04

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 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)

(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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72	(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=	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72	

Output from water heater (annual)$_{1...12}$ 1725.1 (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=	77.83	69.14	73.88	67.99	67.9	62.5	61.76	65.37	64.51	70.41	72.24	76.55	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	104.61	102.89	99.3	94.42	91.26	86.8	83.01	87.87	89.59	94.64	100.34	102.89	(72)

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

(73)m=	318.67	316.97	307.24	291.69	276.19	261.04	251.06	255.89	263.76	279.47	297.51	310.76	(73)

6. Solar 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=	349.6	379.93	420.67	477.98	526.6	528	500.8	454.98	401.98	356.42	336.43	336.02	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.94	0.81	0.6	0.45	0.51	0.79	0.96	0.99	1	(86)

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

(87)m=	19.97	20.09	20.32	20.65	20.89	20.98	21	20.99	20.93	20.62	20.25	19.95	(87)

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

(88)m=	20.03	20.04	20.04	20.06	20.06	20.07	20.07	20.08	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	0.99	0.98	0.92	0.76	0.52	0.35	0.41	0.72	0.95	0.99	1	(89)

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

(90)m=	18.66	18.84	19.18	19.66	19.96	20.06	20.07	20.08	20.01	19.63	19.09	18.66	(90)

fLA = Living area ÷ (4) = 0.49 (91)

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

(92)m=	19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.53	20.46	20.12	19.66	19.29	(92)

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

(93)m=	19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.53	20.46	20.12	19.66	19.29	(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	0.78	0.56	0.4	0.46	0.75	0.95	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	347.34	375.78	409.84	438.96	408.92	296.5	200.02	208.76	301.18	337.88	332.19	334.24	(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=	805.22	777.89	704.94	587.07	453.33	302.4	200.76	210.27	327.5	495.13	658.33	797.1	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	340.66	270.21	219.55	106.64	33.04	0	0	0	0	116.99	234.82	344.37	

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Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1666.28	(98)
Space heating requirement in kWh/m²/year	32.92	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	340.66	270.21	219.55	106.64	33.04	0	0	0	0	116.99	234.82	344.37		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	364.34	289	234.82	114.05	35.33	0	0	0	0	125.13	251.14	368.31		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1782.12	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72		
Efficiency of water heater													79.8	(216)
(217)m=	86.65	86.39	85.71	84.08	81.66	79.8	79.8	79.8	79.8	84.23	85.94	86.74		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	194.53	172.21	182.79	167.78	169.84	156.09	150.67	164.28	163.66	173.64	179.05	189.91		
Total = Sum(219a)$_{1...12}$ =													2064.45	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1782.12	
Water heating fuel used			2064.45	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			239.96	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4161.53	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

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

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

TER = 19.64 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	17.67 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.46 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(25)

3. Heat 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			8.34	x1/[1/(1.4)+ 0.04]		=	11.06			(27)
Windows Type 2			7.64	x1/[1/(1.4)+ 0.04]		=	10.13			(27)
Walls Type1	61.09	15.98	45.11	x	0.18	=	8.12			(29)
Walls Type2	3.86	0	3.86	x	0.18	=	0.69			(29)
Total area of elements, m²			64.95							(31)
Party wall			37.5	x	0	=	0			(32)
Party floor			63.92							(32a)
Party ceiling			63.92							(32b)
Internal wall **			113.47							(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) = 30 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10121.33 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.91 (36)

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

Total fabric heat loss (33) + (36) = 37.91 (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=	34.1	33.87	33.63	32.53	32.32	31.37	31.37	31.19	31.74	32.32	32.74	33.18	(38)

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

(39)m=	72.01	71.77	71.54	70.44	70.23	69.28	69.28	69.1	69.65	70.23	70.65	71.09	

Average = Sum(39)$_{1…12}$ /12= 70.44 (39)

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

(40)m=	1.13	1.12	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11

Average = Sum(40)$_{1...12}$ /12= 1.1 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	(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=	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	

Output from water heater (annual)$_{1...12}$ 1867.72 (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=	82.75	73.44	78.32	71.85	71.61	65.7	64.73	68.78	67.95	74.43	76.63	81.31	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	111.22	109.29	105.26	99.8	96.25	91.25	87	92.44	94.38	100.04	106.43	109.29	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	367.58	365.71	354.21	335.72	317.08	298.97	287.12	292.49	301.9	320.59	342.07	358.04	(73)

6. Solar 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	8.34	x	11.28	x	0.63	x	0.7	=	28.76	(75)
Northeast 0.9x	0.77	x	8.34	x	22.97	x	0.63	x	0.7	=	58.54	(75)
Northeast 0.9x	0.77	x	8.34	x	41.38	x	0.63	x	0.7	=	105.47	(75)
Northeast 0.9x	0.77	x	8.34	x	67.96	x	0.63	x	0.7	=	173.21	(75)
Northeast 0.9x	0.77	x	8.34	x	91.35	x	0.63	x	0.7	=	232.82	(75)

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Northeast	0.9x	0.77	x	8.34	x	97.38	x	0.63	x	0.7	=	248.21	(75)
Northeast	0.9x	0.77	x	8.34	x	91.1	x	0.63	x	0.7	=	232.2	(75)
Northeast	0.9x	0.77	x	8.34	x	72.63	x	0.63	x	0.7	=	185.11	(75)
Northeast	0.9x	0.77	x	8.34	x	50.42	x	0.63	x	0.7	=	128.51	(75)
Northeast	0.9x	0.77	x	8.34	x	28.07	x	0.63	x	0.7	=	71.54	(75)
Northeast	0.9x	0.77	x	8.34	x	14.2	x	0.63	x	0.7	=	36.19	(75)
Northeast	0.9x	0.77	x	8.34	x	9.21	x	0.63	x	0.7	=	23.49	(75)
Southeast	0.9x	0.77	x	7.64	x	36.79	x	0.63	x	0.7	=	85.91	(77)
Southeast	0.9x	0.77	x	7.64	x	62.67	x	0.63	x	0.7	=	146.34	(77)
Southeast	0.9x	0.77	x	7.64	x	85.75	x	0.63	x	0.7	=	200.22	(77)
Southeast	0.9x	0.77	x	7.64	x	106.25	x	0.63	x	0.7	=	248.09	(77)
Southeast	0.9x	0.77	x	7.64	x	119.01	x	0.63	x	0.7	=	277.88	(77)
Southeast	0.9x	0.77	x	7.64	x	118.15	x	0.63	x	0.7	=	275.87	(77)
Southeast	0.9x	0.77	x	7.64	x	113.91	x	0.63	x	0.7	=	265.96	(77)
Southeast	0.9x	0.77	x	7.64	x	104.39	x	0.63	x	0.7	=	243.74	(77)
Southeast	0.9x	0.77	x	7.64	x	92.85	x	0.63	x	0.7	=	216.8	(77)
Southeast	0.9x	0.77	x	7.64	x	69.27	x	0.63	x	0.7	=	161.73	(77)
Southeast	0.9x	0.77	x	7.64	x	44.07	x	0.63	x	0.7	=	102.9	(77)
Southeast	0.9x	0.77	x	7.64	x	31.49	x	0.63	x	0.7	=	73.52	(77)

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

(83)m=	114.67	204.87	305.69	421.29	510.7	524.08	498.16	428.85	345.31	233.27	139.08	97.01	(83)

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

(84)m=	482.24	570.59	659.9	757.01	827.78	823.06	785.28	721.34	647.21	553.86	481.15	455.04	(84)

7. Mean 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	0.96	0.88	0.73	0.53	0.39	0.44	0.7	0.93	0.99	1	(86)

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

(87)m=	19.93	20.12	20.41	20.73	20.92	20.99	21	21	20.95	20.68	20.25	19.9	(87)

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

(88)m=	19.98	19.98	19.99	20	20	20.01	20.01	20.02	20.01	20	20	19.99	(88)

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

(89)m=	0.99	0.98	0.95	0.85	0.67	0.45	0.3	0.35	0.61	0.9	0.98	0.99	(89)

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

(90)m=	18.57	18.85	19.25	19.7	19.93	20.01	20.01	20.02	19.98	19.65	19.05	18.54	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.09	19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06	(92)

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

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(93)m=	19.09	19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06	(93)

8. Space 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	0.95	0.86	0.69	0.48	0.33	0.38	0.64	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	477.6	558.2	624.35	647.45	567.74	395.74	261.85	274.51	415.81	500.89	471.24	451.67	(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=	1065.09	1036.14	943.75	788.38	604.7	400.4	262.39	275.56	435.18	663.3	876.26	1056.17	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	437.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1987.06 (98)

Space heating requirement in kWh/m²/year 31.09 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	437.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	467.48	343.5	254.15	108.52	29.41	0	0	0	0	129.24	311.89	481.01	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2125.2 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	
Efficiency of water heater												79.8	(216)
(217)m=	87.05	86.61	85.71	83.75	81.29	79.8	79.8	79.8	79.8	84.1	86.29	87.17	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	210.63	186.7	198.38	182.32	184.34	168.16	161.85	177.12	176.65	188.25	193.61	205.39	

Total = Sum(219a)$_{1...12}$ = 2233.4 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2125.2

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Water heating fuel used			2233.4	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			287.67	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4721.27	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	459.04	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	482.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =				941.46	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	149.3	(268)
Total CO2, kg/year			sum of (265)…(271) =		1129.68	(272)

TER = 17.67 (273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	18.05 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.55 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(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) =	0.38	(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

0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(25)

3. Heat losses and heat loss 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			(29)
Walls Type2	27.31	0	27.31	x 0.18 =	4.92			(29)
Total area of elements, m²			80.11					(31)
Party wall			16.88	x 0 =	0			(32)
Party floor			60.34					(32a)
Party ceiling			60.34					(32b)
Internal wall **			107.91					(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) = 30.13 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.3 (36)

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

Total fabric heat loss (33) + (36) = 37.43 (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=	32.42	32.18	31.95	30.87	30.67	29.73	29.73	29.56	30.1	30.67	31.08	31.51	(38)

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

(39)m=	69.85	69.61	69.38	68.31	68.1	67.16	67.16	66.99	67.53	68.1	68.51	68.94	

Average = Sum(39)$_{1...12}$ /12= 68.3 (39)

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

(40)m=	1.16	1.15	1.15	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.14	1.14	

Average = Sum(40)$_{1...12}$ /12= 1.13 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34	(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=	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34

Output from water heater (annual)1…12 | 1830.8 | (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=	81.48	72.33	77.17	70.85	70.65	64.87	63.96	67.9	67.06	73.39	75.49	80.08	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot 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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	(71)
Water heating gains (Table 5)													
(72)m=	109.51	107.63	103.72	98.41	94.96	90.1	85.97	91.26	93.14	98.64	104.85	107.64	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	354.68	352.87	341.84	324.13	306.33	289.01	277.64	282.86	291.85	309.75	330.31	345.57	(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)

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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=	486.08	580.03	661.54	735.15	780.29	765.52	734.56	691.91	643.03	563.21	488.31	457.62	(84)

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

TER WorkSheet: New dwelling design stage

(86)m=	0.99	0.98	0.95	0.88	0.74	0.55	0.4	0.44	0.68	0.92	0.98	0.99	(86)

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

(87)m=	19.94	20.14	20.42	20.72	20.91	20.98	21	21	20.96	20.7	20.26	19.9	(87)

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

(88)m=	19.95	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.99	19.98	19.97	19.97	(88)

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

(89)m=	0.99	0.98	0.94	0.85	0.68	0.47	0.31	0.35	0.6	0.88	0.98	0.99	(89)

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

(90)m=	18.56	18.86	19.25	19.67	19.9	19.98	19.99	19.99	19.95	19.66	19.05	18.52	(90)

fLA = Living area ÷ (4) = 0.44 (91)

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

(92)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13	(92)

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

(93)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13	(93)

8. 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	0.85	0.7	0.5	0.35	0.39	0.63	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	480.21	564.23	620.58	627.23	547	385.18	256.89	269.11	406.58	500.6	475.73	453.36	(95)
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=	1038.68	1011.35	920.55	767.42	588.89	391.27	257.65	270.39	425.27	648.19	855.43	1029.57	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1883.14 (98)

Space heating requirement in kWh/m²/year 31.21 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	444.39	321.35	238.69	107.95	33.33	0	0	0	0	117.44	292.39	458.5	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2014.05 (211)

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Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
									Total (kWh/year) =Sum(215)$_{1...5,10...12}$=				0	(215)

Water heating

Output from water heater (calculated above)

	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34		
Efficiency of water heater													79.8	(216)
(217)m=	86.98	86.5	85.59	83.79	81.49	79.8	79.8	79.8	79.8	83.91	86.17	87.11		(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	206.4	183.07	194.6	178.65	180.35	165.04	158.96	173.79	173.29	184.96	189.9	201.28		
									Total = Sum(219a)$_{1...12}$ =				2190.29	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2014.05	
Water heating fuel used			2190.29	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			273.64	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4552.98	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	435.03	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	473.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =			908.14	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	142.02	(268)
Total CO2, kg/year		sum of (265)…(271) =		1089.08	(272)

TER = 18.05 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	19.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.43 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

0.52	0.51	0.5	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses 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			(29)
Walls Type2	35.99	0	35.99	x	0.18	=	6.48			(29)
Total area of elements, m²			71.29							(31)
Party wall			14.89	x	0	=	0			(32)
Party floor			48.96							(32a)
Party ceiling			48.96							(32b)
Internal wall **			96.46							(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) = 26.05 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.09 (36)

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

Total fabric heat loss (33) + (36) = 32.15 (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=	27.09	26.87	26.65	25.64	25.45	24.56	24.56	24.4	24.9	25.45	25.83	26.24	(38)

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

(39)m=	59.24	59.02	58.8	57.79	57.6	56.71	56.71	56.55	57.05	57.6	57.98	58.38	

Average = Sum(39)$_{1\ldots12}$ /12= 57.78 (39)

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

(40)m=	1.21	1.21	1.2	1.18	1.18	1.16	1.16	1.15	1.17	1.18	1.18	1.19

Average = Sum(40)$_{1…12}$ /12= 1.18 (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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H													
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	(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=	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	

Output from water heater (annual)$_{1...12}$ 1706.85 (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=	77.2	68.59	73.31	67.49	67.42	62.09	61.38	64.94	64.06	69.9	71.68	75.94	(65)

include (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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	103.77	102.07	98.54	93.74	90.62	86.23	82.5	87.28	88.98	93.95	99.56	102.08	(72)

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

(73)m=	312.08	310.44	300.99	285.88	270.83	256.08	246.33	251.05	258.66	273.94	291.48	304.37	(73)

6. Solar 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)

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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=	441.84	531.47	603.42	660.61	690.55	672.76	648.06	619.21	586.13	518.23	446.91	415.42	(84)

7. Mean internal temperature (heating season)

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

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	0.97	0.94	0.85	0.71	0.53	0.38	0.42	0.64	0.89	0.97	0.99	(86)

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

(87)m=	19.95	20.18	20.45	20.74	20.92	20.98	21	21	20.96	20.73	20.29	19.92	(87)

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

(88)m=	19.91	19.92	19.92	19.94	19.94	19.95	19.95	19.96	19.95	19.94	19.93	19.93	(88)

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

(89)m=	0.99	0.96	0.92	0.82	0.65	0.45	0.29	0.32	0.55	0.85	0.97	0.99	(89)

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

(90)m=	18.55	18.88	19.27	19.66	19.87	19.94	19.95	19.95	19.92	19.66	19.06	18.51	(90)

fLA = Living area ÷ (4) = 0.5 (91)

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

(92)m=	19.25	19.52	19.86	20.2	20.39	20.46	20.47	20.47	20.44	20.19	19.67	19.21	(92)

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

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(93)m=	19.25	19.52	19.86	20.2	20.39	20.46	20.47	20.47	20.44	20.19	19.67	19.21	(93)

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	0.83	0.68	0.49	0.34	0.37	0.59	0.86	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	433.98	510.71	553.96	545.79	467.37	327.35	218.89	229.22	348.34	444.13	430.33	409.63	(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=	885.41	862.97	785.37	652.83	500.34	332.38	219.54	230.24	361.63	552.53	728.96	876.25	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	335.86	236.72	172.17	77.07	24.53	0	0	0	0	80.65	215.01	347.16	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1489.17 (98)

Space heating requirement in kWh/m²/year 30.42 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	335.86	236.72	172.17	77.07	24.53	0	0	0	0	80.65	215.01	347.16	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	359.21	253.18	184.14	82.42	26.23	0	0	0	0	86.26	229.96	371.3	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1592.7 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	
Efficiency of water heater												79.8	(216)
(217)m=	86.65	86.08	85.09	83.3	81.26	79.8	79.8	79.8	79.8	83.33	85.74	86.78	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	192.37	170.91	182.12	167.55	168.92	154.54	149.24	162.64	162	173.66	177.5	187.7	

Total = Sum(219a)$_{1...12}$ = 2049.14 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1592.7

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Water heating fuel used			2049.14	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			227.56	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			3944.39	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	344.02	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	442.61	(264)
Space and water heating	(261) + (262) + (263) + (264) =				786.64	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	118.1	(268)
Total CO2, kg/year			sum of (265)…(271) =		943.66	(272)

TER = 19.27 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	18.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.38 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	35.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(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) =	0.39	(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

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross 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			9.44	x1/[1/(1.4)+ 0.04]	=	12.52			(27)
Windows Type 2			3.93	x1/[1/(1.4)+ 0.04]	=	5.21			(27)
Walls Type1	40.04	13.37	26.67	x 0.18	=	4.8			(29)
Walls Type2	12.16	0	12.16	x 0.18	=	2.19			(29)
Total area of elements, m²			52.2						(31)
Party wall			27.88	x 0	=	0			(32)
Party floor			53.46						(32a)
Party ceiling			53.46						(32b)
Internal wall **			102.03						(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) = 24.71 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9848.67 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.09 (36)

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

Total fabric heat loss (33) + (36) = 30.81 (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=	29.19	28.96	28.74	27.7	27.51	26.6	26.6	26.44	26.95	27.51	27.9	28.31	(38)

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

(39)m=	60	59.77	59.55	58.51	58.31	57.41	57.41	57.24	57.76	58.31	58.71	59.12	

Average = $Sum(39)_{1\ldots12}$ /12= 58.51 (39)

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

(40)m=	1.12	1.12	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.1	1.11

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 — 1.79 (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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	(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=	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	

Output from water heater (annual)$_{1...12}$ 1756.39 (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=	78.91	70.08	74.85	68.83	68.71	63.2	62.41	66.12	65.26	71.29	73.2	77.6	(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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	106.06	104.29	100.61	95.6	92.35	87.78	83.89	88.87	90.64	95.82	101.67	104.3	(72)

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

(73)m=	329.08	327.37	317.29	301.15	285	269.22	258.82	263.74	271.91	288.23	306.98	320.81	(73)

6. Solar 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	9.44	x	36.79	0.63	x	0.7	=	106.15	(79)
Southwest 0.9x	0.77	x	9.44	x	62.67	0.63	x	0.7	=	180.81	(79)
Southwest 0.9x	0.77	x	9.44	x	85.75	0.63	x	0.7	=	247.4	(79)
Southwest 0.9x	0.77	x	9.44	x	106.25	0.63	x	0.7	=	306.53	(79)
Southwest 0.9x	0.77	x	9.44	x	119.01	0.63	x	0.7	=	343.34	(79)

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Southwest	0.9x	0.77	x	9.44	x	118.15		0.63	x	0.7	=	340.86	(79)
Southwest	0.9x	0.77	x	9.44	x	113.91		0.63	x	0.7	=	328.63	(79)
Southwest	0.9x	0.77	x	9.44	x	104.39		0.63	x	0.7	=	301.16	(79)
Southwest	0.9x	0.77	x	9.44	x	92.85		0.63	x	0.7	=	267.88	(79)
Southwest	0.9x	0.77	x	9.44	x	69.27		0.63	x	0.7	=	199.84	(79)
Southwest	0.9x	0.77	x	9.44	x	44.07		0.63	x	0.7	=	127.14	(79)
Southwest	0.9x	0.77	x	9.44	x	31.49		0.63	x	0.7	=	90.84	(79)
Northwest	0.9x	0.77	x	3.93	x	11.28	x	0.63	x	0.7	=	13.55	(81)
Northwest	0.9x	0.77	x	3.93	x	22.97	x	0.63	x	0.7	=	27.58	(81)
Northwest	0.9x	0.77	x	3.93	x	41.38	x	0.63	x	0.7	=	49.7	(81)
Northwest	0.9x	0.77	x	3.93	x	67.96	x	0.63	x	0.7	=	81.62	(81)
Northwest	0.9x	0.77	x	3.93	x	91.35	x	0.63	x	0.7	=	109.71	(81)
Northwest	0.9x	0.77	x	3.93	x	97.38	x	0.63	x	0.7	=	116.96	(81)
Northwest	0.9x	0.77	x	3.93	x	91.1	x	0.63	x	0.7	=	109.42	(81)
Northwest	0.9x	0.77	x	3.93	x	72.63	x	0.63	x	0.7	=	87.23	(81)
Northwest	0.9x	0.77	x	3.93	x	50.42	x	0.63	x	0.7	=	60.56	(81)
Northwest	0.9x	0.77	x	3.93	x	28.07	x	0.63	x	0.7	=	33.71	(81)
Northwest	0.9x	0.77	x	3.93	x	14.2	x	0.63	x	0.7	=	17.05	(81)
Northwest	0.9x	0.77	x	3.93	x	9.21	x	0.63	x	0.7	=	11.07	(81)

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

(83)m=	119.7	208.4	297.09	388.15	453.06	457.83	438.04	388.39	328.43	233.55	144.19	101.91	(83)

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

(84)m=	448.78	535.77	614.39	689.3	738.05	727.04	696.87	652.14	600.34	521.78	451.17	422.72	(84)

7. Mean internal temperature (heating season)

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

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	0.85	0.69	0.5	0.36	0.4	0.64	0.9	0.98	0.99	(86)

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

(87)m=	20.02	20.23	20.5	20.78	20.94	20.99	21	21	20.97	20.75	20.34	19.98	(87)

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

(88)m=	19.98	19.99	19.99	20.01	20.01	20.02	20.02	20.02	20.02	20.01	20	20	(88)

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

(89)m=	0.99	0.97	0.93	0.81	0.63	0.43	0.28	0.32	0.56	0.86	0.97	0.99	(89)

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

(90)m=	18.7	19	19.38	19.77	19.96	20.02	20.02	20.02	20	19.75	19.17	18.66	(90)

fLA = Living area ÷ (4) = 0.45 (91)

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

(92)m=	19.29	19.55	19.89	20.23	20.4	20.46	20.46	20.46	20.44	20.2	19.7	19.26	(92)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(93)m=	19.29	19.55	19.89	20.23	20.4	20.46	20.46	20.46	20.44	20.2	19.7	19.26		(93)

8. Space 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	0.93	0.82	0.65	0.46	0.32	0.36	0.59	0.87	0.97	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	442.32	518.28	568.34	567.06	482.79	333.19	221.4	231.97	355.02	452.87	437.17	418.01		(95)
Monthly 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=	899.43	875.74	797.14	662.89	507.38	336.22	221.74	232.59	365.95	559.92	739.61	890.2		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	340.09	240.21	170.23	69	18.29	0	0	0	0	79.64	217.76	351.31		
Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =													1486.54	(98)
Space heating requirement in kWh/m²/year													27.81	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	340.09	240.21	170.23	69	18.29	0	0	0	0	79.64	217.76	351.31		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	363.74	256.91	182.06	73.8	19.56	0	0	0	0	85.18	232.89	375.73		
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													1589.89	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)
Water heating														
Output from water heater (calculated above)														
	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86		
Efficiency of water heater													79.8	(216)
(217)m=	86.6	86.04	84.99	82.98	80.9	79.8	79.8	79.8	79.8	83.23	85.69	86.74		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	198.4	176.21	187.81	173.07	174.46	158.74	153.12	167.1	166.51	178.9	182.94	193.53		
Total = Sum(219a)$_{1...12}$ =													2110.78	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1589.89

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Water heating fuel used		2110.78	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75	(231)
Electricity for lighting		245.94	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4021.61	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	343.42	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	455.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =				799.34	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	127.64	(268)
Total CO2, kg/year			sum of (265)…(271) =		965.91	(272)

TER = 18.07 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	18.46 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.74 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							3	x 10 =	30	(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) =	30	÷ (5) =	0.16	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.41	(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) =	0.41	(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

0.52	0.51	0.5	0.45	0.44	0.39	0.39	0.38	0.41	0.44	0.46	0.48

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	(24d)

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

(25)m=	0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	(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			(29)
Walls Type2	17.78	0	17.78	x	0.18	=	3.2			(29)
Total area of elements, m²			90.4							(31)
Party wall			30.32	x	0	=	0			(32)
Party floor			72.62							(32a)
Party ceiling			72.62							(32b)
Internal wall **			146.17							(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) = 34.8 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.11 (36)

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

Total fabric heat loss (33) + (36) = 41.91 (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=	40.26	39.93	39.6	38.08	37.8	36.47	36.47	36.23	36.98	37.8	38.37	38.98	(38)

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

(39)m=	82.16	81.83	81.51	79.99	79.71	78.38	78.38	78.14	78.89	79.71	80.28	80.88	

Average = Sum(39)$_{1…12}$ /12= 79.99 (39)

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

(40)m=	1.13	1.13	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11

Average = Sum(40)$_{1...12}$ /12= 1.1 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	(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=	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	

Output from water heater (annual)$_{1...12}$ 1949.18 (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=	85.56	75.9	80.85	74.06	73.73	67.53	66.42	70.72	69.92	76.72	79.13	84.03	(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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	115	112.94	108.67	102.87	99.1	93.79	89.28	95.06	97.11	103.12	109.9	112.95	(72)

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

(73)m=	397.08	395.1	382.51	362.21	341.65	321.75	308.78	314.47	324.85	345.36	368.93	386.56	(73)

6. Solar 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)

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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=	452.84	508.6	586.99	698.03	793.06	803.01	758.98	673.38	574.02	484.06	439.09	432.1	(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	1	0.99	0.94	0.81	0.6	0.45	0.52	0.82	0.97	1	1	(86)

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

(87)m=	19.81	19.95	20.22	20.59	20.87	20.98	21	20.99	20.9	20.53	20.11	19.79	(87)

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

(88)m=	19.98	19.98	19.98	20	20	20.02	20.02	20.02	20.01	20	20	19.99	(88)

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

(89)m=	1	0.99	0.98	0.92	0.75	0.52	0.35	0.42	0.74	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=	18.39	18.59	18.99	19.53	19.88	20	20.02	20.02	19.93	19.46	18.85	18.38	(90)

fLA = Living area ÷ (4) = | 0.38 | (91)

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

(92)m=	18.93	19.11	19.46	19.94	20.26	20.38	20.39	20.39	20.31	19.87	19.34	18.92	(92)

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

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(93)m=	18.93	19.11	19.46	19.94	20.26	20.38	20.39	20.39	20.31	19.87	19.34	18.92	(93)

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=	1	0.99	0.98	0.92	0.77	0.55	0.39	0.46	0.77	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	450.87	504.39	573.79	641.97	610.85	443.15	296.05	309.09	440.19	464.28	435.34	430.62	(95)
Monthly average external temperature from Table 8													
(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=	1202.21	1163.16	1056.33	883.13	682.47	452.97	297.33	311.94	489.65	739.07	982.47	1190.69	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	558.99	442.69	359.01	173.64	53.28	0	0	0	0	204.44	393.93	565.49	

Total per year (kWh/year) = $Sum(98)_{1...5,9...12}$ = 2751.48 (98)

Space heating requirement in kWh/m²/year 37.89 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	558.99	442.69	359.01	173.64	53.28	0	0	0	0	204.44	393.93	565.49	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	597.85	473.47	383.97	185.71	56.99	0	0	0	0	218.66	421.32	604.8	

Total (kWh/year) =$Sum(211)_{1...5,10...12}$= 2942.76 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =$Sum(215)_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	
Efficiency of water heater												79.8	(216)
(217)m=	87.5	87.27	86.65	85.04	82.27	79.8	79.8	79.8	79.8	85.38	86.92	87.58	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	219.2	193.76	205.01	187.37	189.88	175.06	168.24	184.45	184.07	193.51	200.86	213.77	

Total = $Sum(219a)_{1...12}$ = 2315.18 (219)

Annual totals	kWh/year	kWh/year
Space heating fuel used, main system 1		2942.76

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Water heating fuel used			2315.18	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			320.14	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5653.09	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	635.64	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	500.08	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1135.72	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.15	(268)
Total CO2, kg/year		sum of (265)…(271) =		1340.79	(272)

TER = 18.46 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	19.25 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.23 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(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) =	0.39	(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

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6	(24d)

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

(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6	(25)

3. Heat 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			(29)
Walls Type2	24.24	0	24.24	x	0.18	=	4.36			(29)
Total area of elements, m²			51.9							(31)
Party wall			31.67	x	0	=	0			(32)
Party floor			53.96							(32a)
Party ceiling			53.96							(32b)
Internal wall **			95.03							(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) = 23.17 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.04 (36)

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

Total fabric heat loss (33) + (36) = 29.21 (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=	29.42	29.2	28.98	27.93	27.74	26.83	26.83	26.66	27.18	27.74	28.13	28.55	(38)

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

(39)m=	58.63	58.41	58.18	57.14	56.95	56.04	56.04	55.87	56.39	56.95	57.34	57.75	

Average = Sum(39)$_{1…12}$ /12= 57.14 (39)

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

(40)m=	1.09	1.08	1.08	1.06	1.06	1.04	1.04	1.04	1.04	1.06	1.06	1.07

Average = Sum(40)$_{1…12}$ /12= 1.06 (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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	(62)

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

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

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

Output from water heater

(64)m=	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	

Output from water heater (annual)$_{1...12}$ 1761.89 (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=	79.1	70.25	75.02	68.98	68.85	63.32	62.53	66.25	65.39	71.45	73.37	77.78	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	(66)

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

(67)m=	14.04	12.47	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	(67)

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

(68)m=	157.5	159.14	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	(68)

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

(69)m=	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	(71)

Water heating gains (Table 5)

(72)m=	106.32	104.54	100.84	95.81	92.55	87.95	84.04	89.05	90.83	96.03	101.91	104.55	(72)

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

(73)m=	330.96	329.25	319.1	302.84	286.57	270.67	260.21	265.15	273.38	289.81	308.7	322.63	(73)

6. Solar gains:

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

Orientation:	Access Factor 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)

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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=	372.58	413.97	471.74	553.51	623.52	629.9	596.26	533.05	459.37	393.35	361.07	356.62	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.92	0.77	0.56	0.41	0.48	0.77	0.96	0.99	1	(86)

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

(87)m=	19.93	20.07	20.33	20.68	20.91	20.99	21	21	20.93	20.62	20.22	19.91	(87)

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

(88)m=	20.01	20.02	20.02	20.03	20.04	20.05	20.05	20.05	20.05	20.04	20.03	20.03	(88)

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

(89)m=	0.99	0.99	0.97	0.9	0.71	0.48	0.32	0.38	0.69	0.94	0.99	1	(89)

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

(90)m=	18.59	18.79	19.17	19.67	19.96	20.04	20.05	20.05	20	19.6	19.04	18.58	(90)

fLA = Living area ÷ (4) = | 0.47 | (91)

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

(92)m=	19.22	19.4	19.72	20.15	20.41	20.49	20.5	20.5	20.44	20.08	19.6	19.21	(92)

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

(93)m=	19.22	19.4	19.72	20.15	20.41	20.49	20.5	20.5	20.44	20.08	19.6	19.21	(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	0.9	0.73	0.52	0.37	0.43	0.72	0.94	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	370.17	409.06	457.35	497.41	457.34	325.31	217.85	227.64	332.1	371.03	356.45	354.76	(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=	874.98	846.6	769	642.6	495.76	330	218.42	228.93	357.48	540.07	716.56	866.86	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	375.57	294.03	231.87	104.53	28.59	0	0	0	0	125.77	259.28	381	

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Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1800.63	(98)
Space heating requirement in kWh/m²/year	33.37	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	375.57	294.03	231.87	104.53	28.59	0	0	0	0	125.77	259.28	381		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	401.68	314.47	247.99	111.8	30.57	0	0	0	0	134.51	277.3	407.49		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1925.81	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Output from water heater (calculated above)	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42		
Efficiency of water heater													79.8	(216)
(217)m=	86.84	86.54	85.8	83.97	81.42	79.8	79.8	79.8	79.8	84.36	86.14	86.93		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	198.52	175.75	186.62	171.56	173.88	159.2	153.55	167.59	167.01	177.06	182.58	193.74		
Total = Sum(219a)$_{1...12}$ =													2107.07	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1925.81	
Water heating fuel used			2107.07	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			247.96	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4355.84	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

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

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

TER = 19.25 (273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	16.69 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.29 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas		

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.11	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(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) =	0.36	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 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

0.46	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42

Calculate effective air change rate for the applicable case

If mechanical ventilation:	0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59	(24d)

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

(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59	(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			(29)
Walls Type2	16.73	0	16.73	x	0.18	=	3.01			(29)
Total area of elements, m²			58.24							(31)
Party wall			40.43	x	0	=	0			(32)
Party floor			69.44							(32a)
Party ceiling			69.44							(32b)
Internal wall **			136.21							(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) =	24.11	(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	Indicative Value: Medium	250	(35)

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

Thermal bridges : S (L x Y) calculated using Appendix K		6.83	(36)

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

Total fabric heat loss	(33) + (36) =	30.94	(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=	36.71	36.47	36.22	35.09	34.88	33.89	33.89	33.7	34.27	34.88	35.31	35.76	(38)

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

(39)m=	67.65	67.4	67.16	66.03	65.82	64.83	64.83	64.64	65.21	65.82	66.25	66.69	

Average = Sum(39)$_{1…12}$ /12= 66.03 (39)

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

(40)m=	0.97	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96

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 2.23 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	(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=	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	

Output from water heater (annual)$_{1...12}$ 1920.94 (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=	84.58	75.04	79.97	73.3	72.99	66.89	65.84	70.05	69.24	75.93	78.26	83.09	(65)

include (57)m in 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	113.69	111.67	107.49	101.8	98.11	92.91	88.49	94.15	96.16	102.05	108.7	111.68	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	387.16	385.17	372.87	353.12	333.17	313.88	301.31	306.95	317.07	337.03	359.93	377.01	(73)

6. Solar gains:

Solar gains are calculated 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)
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=	450.92	504.05	562.83	634.22	689.78	686.28	652.7	599.2	538.15	475.78	438.18	430.36	(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=	1	0.99	0.98	0.93	0.8	0.59	0.44	0.49	0.77	0.96	0.99	1	(86)

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

(87)m=	20.05	20.18	20.41	20.71	20.91	20.99	21	21	20.95	20.68	20.32	20.03	(87)

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

(88)m=	20.1	20.11	20.11	20.12	20.13	20.14	20.14	20.14	20.13	20.13	20.12	20.12	(88)

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

(89)m=	1	0.99	0.98	0.91	0.75	0.52	0.35	0.4	0.7	0.94	0.99	1	(89)

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

(90)m=	18.84	19.03	19.36	19.79	20.05	20.13	20.14	20.14	20.1	19.76	19.24	18.82	(90)

fLA = Living area ÷ (4) = 0.34 (91)

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

(92)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24	(92)

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

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(93)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24	(93)

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	0.91	0.76	0.54	0.38	0.43	0.72	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	448.52	498.69	547.41	578.07	525.27	372.74	248.03	259.75	387.12	448.63	433.16	428.57	(95)
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=	1011.55	979.19	888.07	739.88	568.97	377.65	248.52	260.77	410.09	623.73	828.81	1002.75	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1986.58 (98)

Space heating requirement in kWh/m²/year 28.61 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	448.02	345.34	271.07	124.6	34.78	0	0	0	0	139.32	304.67	456.89	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2124.68 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39

Efficiency of water heater 79.8 (216)

(217)m=	86.88	86.55	85.8	84.03	81.48	79.8	79.8	79.8	79.8	84.23	86.15	86.98	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	217.4	192.4	203.97	186.89	189.02	172.67	166.03	181.91	181.5	193.33	199.62	211.98

Total = Sum(219a)$_{1...12}$ = 2296.71 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2124.68

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Water heating fuel used			2296.71	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			317.84	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4814.23	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	458.93	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	496.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				955.02	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	164.96	(268)
Total CO2, kg/year			sum of (265)…(271) =		1158.9	(272)

TER =	16.69	(273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	16.77 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.35 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.11	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(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) =	0.36	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 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

0.46	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(24d)

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

(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(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			(29)
Walls Type2	18.41	0	18.41	x	0.18	=	3.31			(29)
Total area of elements, m²			60							(31)
Party wall			38.68	x	0	=	0			(32)
Party floor			69.61							(32a)
Party ceiling			69.61							(32b)
Internal wall **			136.21							(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) = 24.42 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.83 (36)

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

Total fabric heat loss (33) + (36) = 31.26 (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=	36.79	36.55	36.3	35.17	34.96	33.97	33.97	33.78	34.35	34.96	35.39	35.84	(38)

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

(39)m=	68.05	67.8	67.56	66.42	66.21	65.22	65.22	65.04	65.6	66.21	66.64	67.09	

Average = Sum(39)$_{1…12}$ /12= 66.42 (39)

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

(40)m=	0.98	0.97	0.97	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.96	0.96

Average = Sum(40)$_{1\ldots12}$ /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 2.24 (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)$_{1\ldots12}$ = 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)$_{1\ldots12}$ = 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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	(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=	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	

Output from water heater (annual)$_{1...12}$ 1922.5 (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=	84.64	75.09	80.02	73.34	73.03	66.93	65.87	70.09	69.28	75.97	78.31	83.14	(65)

include (57)m in 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	113.76	111.74	107.55	101.86	98.16	92.96	88.53	94.2	96.22	102.11	108.77	111.75	(72)

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

(73)m=	387.74	385.74	373.42	353.63	333.64	314.32	301.73	307.38	317.52	337.51	360.46	377.56	(73)

6. Solar 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)
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=	451.5	504.63	563.38	634.74	690.26	686.72	653.12	599.63	538.6	476.27	438.71	430.92	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.93	0.8	0.6	0.44	0.49	0.77	0.96	0.99	1	(86)

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

(87)m=	20.04	20.18	20.41	20.71	20.91	20.99	21	21	20.95	20.68	20.31	20.03	(87)

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

(88)m=	20.1	20.11	20.11	20.12	20.12	20.14	20.14	20.14	20.13	20.12	20.12	20.11	(88)

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

(89)m=	1	0.99	0.98	0.91	0.75	0.52	0.35	0.4	0.7	0.94	0.99	1	(89)

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

(90)m=	18.83	19.02	19.35	19.78	20.04	20.13	20.14	20.14	20.09	19.75	19.23	18.81	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27	(92)

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

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(93)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27	(93)

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	0.91	0.77	0.55	0.39	0.44	0.72	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	449.14	499.38	548.31	579.82	528.59	376.65	251.51	263.23	390.23	449.79	433.81	429.17	(95)
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=	1020.07	987.36	895.47	746.2	574.32	381.94	252.05	264.36	414.51	629.39	836	1011.25	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2021.06 (98)

Space heating requirement in kWh/m²/year 29.03 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	454.3	350.72	276.24	128.12	36.39	0	0	0	0	142.92	309.71	463.17	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2161.56 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	
Efficiency of water heater												79.8	(216)
(217)m=	86.91	86.59	85.85	84.1	81.54	79.8	79.8	79.8	79.8	84.29	86.19	87.01	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	217.51	192.48	204.02	186.88	189.02	172.8	166.15	182.05	181.64	193.34	199.7	212.08	

Total = Sum(219a)$_{1...12}$ = 2297.68 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2161.56

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Water heating fuel used		2297.68	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	75	(231)
Electricity for lighting		318.62	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4852.86	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	466.9	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	496.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =				963.2	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	165.36	(268)
Total CO2, kg/year			sum of (265)…(271) =		1167.48	(272)

TER = 16.77 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	19.64 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.45 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

0.51	0.5	0.49	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat 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			(29)
Walls Type2	22.92	0	22.92	x	0.18	=	4.13			(29)
Total area of elements, m²			54.32							(31)
Party wall			30.08	x	0	=	0			(32)
Party floor			50.62							(32a)
Party ceiling			50.62							(32b)
Internal wall **			83.2							(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) = 20.06 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 5.76 (36)

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

Total fabric heat loss (33) + (36) = 25.82 (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=	27.86	27.64	27.42	26.4	26.21	25.32	25.32	25.15	25.66	26.21	26.6	27	(38)

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

(39)m=	53.68	53.46	53.24	52.21	52.02	51.13	51.13	50.97	51.47	52.02	52.41	52.82	

Average = Sum(39)$_{1…12}$ /12= 52.21 (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=	1.06	1.06	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 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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m 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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72	(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=	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72	

Output from water heater (annual)$_{1...12}$ 1725.1 (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=	77.83	69.14	73.88	67.99	67.9	62.5	61.76	65.37	64.51	70.41	72.24	76.55	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	104.61	102.89	99.3	94.42	91.26	86.8	83.01	87.87	89.59	94.64	100.34	102.89	(72)

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

(73)m=	318.67	316.97	307.24	291.69	276.19	261.04	251.06	255.89	263.76	279.47	297.51	310.76	(73)

6. Solar 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)

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=	349.6	379.93	420.67	477.98	526.6	528	500.8	454.98	401.98	356.42	336.43	336.02	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.94	0.81	0.6	0.45	0.51	0.79	0.96	0.99	1	(86)

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

(87)m=	19.97	20.09	20.32	20.65	20.89	20.98	21	20.99	20.93	20.62	20.25	19.95	(87)

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

(88)m=	20.03	20.04	20.04	20.06	20.06	20.07	20.07	20.08	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	0.99	0.98	0.92	0.76	0.52	0.35	0.41	0.72	0.95	0.99	1	(89)

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

(90)m=	18.66	18.84	19.18	19.66	19.96	20.06	20.07	20.08	20.01	19.63	19.09	18.66	(90)

fLA = Living area ÷ (4) = | 0.49 | (91)

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

(92)m=	19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.53	20.46	20.12	19.66	19.29	(92)

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

(93)m=	19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.53	20.46	20.12	19.66	19.29	(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	0.78	0.56	0.4	0.46	0.75	0.95	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	347.34	375.78	409.84	438.96	408.92	296.5	200.02	208.76	301.18	337.88	332.19	334.24	(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=	805.22	777.89	704.94	587.07	453.33	302.4	200.76	210.27	327.5	495.13	658.33	797.1	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	340.66	270.21	219.55	106.64	33.04	0	0	0	0	116.99	234.82	344.37	(98)

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Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1666.28	(98)
Space heating requirement in kWh/m²/year	32.92	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	340.66	270.21	219.55	106.64	33.04	0	0	0	0	116.99	234.82	344.37		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	364.34	289	234.82	114.05	35.33	0	0	0	0	125.13	251.14	368.31		(211)
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													1782.12	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72		
Efficiency of water heater													79.8	(216)
(217)m=	86.65	86.39	85.71	84.08	81.66	79.8	79.8	79.8	79.8	84.23	85.94	86.74		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	194.53	172.21	182.79	167.78	169.84	156.09	150.67	164.28	163.66	173.64	179.05	189.91		
Total = Sum(219a)$_{1...12}$ =													2064.45	(219)

Annual totals

		kWh/year	kWh/year	
Space heating fuel used, main system 1			1782.12	
Water heating fuel used			2064.45	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			239.96	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4161.53	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

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

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

TER = 19.64 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	17.67 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.46 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas		

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(25)

3. Heat 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			8.34	x1/[1/(1.4)+ 0.04]		=	11.06			(27)
Windows Type 2			7.64	x1/[1/(1.4)+ 0.04]		=	10.13			(27)
Walls Type1	61.09	15.98	45.11	x	0.18	=	8.12			(29)
Walls Type2	3.86	0	3.86	x	0.18	=	0.69			(29)
Total area of elements, m²			64.95							(31)
Party wall			37.5	x	0	=	0			(32)
Party floor			63.92							(32a)
Party ceiling			63.92							(32b)
Internal wall **			113.47							(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) = 30 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10121.33 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.91 (36)

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

Total fabric heat loss (33) + (36) = 37.91 (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=	34.1	33.87	33.63	32.53	32.32	31.37	31.37	31.19	31.74	32.32	32.74	33.18	(38)

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

(39)m=	72.01	71.77	71.54	70.44	70.23	69.28	69.28	69.1	69.65	70.23	70.65	71.09	

Average = Sum(39)$_{1…12}$ /12= 70.44 (39)

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

(40)m=	1.13	1.12	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11

Average = Sum(40)$_{1…12}$ /12= 1.1 (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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = — 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = — 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	(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=	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	

Output from water heater (annual)1…12 1867.72 (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=	82.75	73.44	78.32	71.85	71.61	65.7	64.73	68.78	67.95	74.43	76.63	81.31	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	111.22	109.29	105.26	99.8	96.25	91.25	87	92.44	94.38	100.04	106.43	109.29	(72)

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

(73)m=	367.58	365.71	354.21	335.72	317.08	298.97	287.12	292.49	301.9	320.59	342.07	358.04	(73)

6. Solar 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	8.34	x	11.28	x	0.63	x	0.7	=	28.76	(75)
Northeast 0.9x	0.77	x	8.34	x	22.97	x	0.63	x	0.7	=	58.54	(75)
Northeast 0.9x	0.77	x	8.34	x	41.38	x	0.63	x	0.7	=	105.47	(75)
Northeast 0.9x	0.77	x	8.34	x	67.96	x	0.63	x	0.7	=	173.21	(75)
Northeast 0.9x	0.77	x	8.34	x	91.35	x	0.63	x	0.7	=	232.82	(75)

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Northeast	0.9x	0.77	x	8.34	x	97.38	x	0.63	x	0.7	=	248.21	(75)
Northeast	0.9x	0.77	x	8.34	x	91.1	x	0.63	x	0.7	=	232.2	(75)
Northeast	0.9x	0.77	x	8.34	x	72.63	x	0.63	x	0.7	=	185.11	(75)
Northeast	0.9x	0.77	x	8.34	x	50.42	x	0.63	x	0.7	=	128.51	(75)
Northeast	0.9x	0.77	x	8.34	x	28.07	x	0.63	x	0.7	=	71.54	(75)
Northeast	0.9x	0.77	x	8.34	x	14.2	x	0.63	x	0.7	=	36.19	(75)
Northeast	0.9x	0.77	x	8.34	x	9.21	x	0.63	x	0.7	=	23.49	(75)
Southeast	0.9x	0.77	x	7.64	x	36.79	x	0.63	x	0.7	=	85.91	(77)
Southeast	0.9x	0.77	x	7.64	x	62.67	x	0.63	x	0.7	=	146.34	(77)
Southeast	0.9x	0.77	x	7.64	x	85.75	x	0.63	x	0.7	=	200.22	(77)
Southeast	0.9x	0.77	x	7.64	x	106.25	x	0.63	x	0.7	=	248.09	(77)
Southeast	0.9x	0.77	x	7.64	x	119.01	x	0.63	x	0.7	=	277.88	(77)
Southeast	0.9x	0.77	x	7.64	x	118.15	x	0.63	x	0.7	=	275.87	(77)
Southeast	0.9x	0.77	x	7.64	x	113.91	x	0.63	x	0.7	=	265.96	(77)
Southeast	0.9x	0.77	x	7.64	x	104.39	x	0.63	x	0.7	=	243.74	(77)
Southeast	0.9x	0.77	x	7.64	x	92.85	x	0.63	x	0.7	=	216.8	(77)
Southeast	0.9x	0.77	x	7.64	x	69.27	x	0.63	x	0.7	=	161.73	(77)
Southeast	0.9x	0.77	x	7.64	x	44.07	x	0.63	x	0.7	=	102.9	(77)
Southeast	0.9x	0.77	x	7.64	x	31.49	x	0.63	x	0.7	=	73.52	(77)

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

(83)m=	114.67	204.87	305.69	421.29	510.7	524.08	498.16	428.85	345.31	233.27	139.08	97.01	(83)

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

(84)m=	482.24	570.59	659.9	757.01	827.78	823.06	785.28	721.34	647.21	553.86	481.15	455.04	(84)

7. Mean 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	0.96	0.88	0.73	0.53	0.39	0.44	0.7	0.93	0.99	1	(86)

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

(87)m=	19.93	20.12	20.41	20.73	20.92	20.99	21	21	20.95	20.68	20.25	19.9	(87)

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

(88)m=	19.98	19.98	19.99	20	20	20.01	20.01	20.02	20.01	20	20	19.99	(88)

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

(89)m=	0.99	0.98	0.95	0.85	0.67	0.45	0.3	0.35	0.61	0.9	0.98	0.99	(89)

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

(90)m=	18.57	18.85	19.25	19.7	19.93	20.01	20.01	20.02	19.98	19.65	19.05	18.54	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.09	19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06	(92)

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

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(93)m=	19.09	19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06	(93)

8. Space 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	0.95	0.86	0.69	0.48	0.33	0.38	0.64	0.9	0.98	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	477.6	558.2	624.35	647.45	567.74	395.74	261.85	274.51	415.81	500.89	471.24	451.67		(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=	1065.09	1036.14	943.75	788.38	604.7	400.4	262.39	275.56	435.18	663.3	876.26	1056.17		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	437.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =													1987.06	(98)
Space heating requirement in kWh/m²/year													31.09	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	437.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	467.48	343.5	254.15	108.52	29.41	0	0	0	0	129.24	311.89	481.01		
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													2125.2	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)

Water heating

Output from water heater (calculated above)														
	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04		
Efficiency of water heater													79.8	(216)
(217)m=	87.05	86.61	85.71	83.75	81.29	79.8	79.8	79.8	79.8	84.1	86.29	87.17		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	210.63	186.7	198.38	182.32	184.34	168.16	161.85	177.12	176.65	188.25	193.61	205.39		
Total = Sum(219a)$_{1...12}$ =													2233.4	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2125.2

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Water heating fuel used			2233.4	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			287.67	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4721.27	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	459.04	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	482.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =			941.46	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	149.3	(268)
Total CO2, kg/year		sum of (265)…(271) =		1129.68	(272)

TER = 17.67 (273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	18.05 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.55 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas		

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(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) =	0.38	(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

0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(25)

3. Heat losses and heat loss 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			(29)
Walls Type2	27.31	0	27.31	x 0.18	=	4.92			(29)
Total area of elements, m²			80.11						(31)
Party wall			16.88	x 0	=	0			(32)
Party floor			60.34						(32a)
Party ceiling			60.34						(32b)
Internal wall **			107.91						(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) = 30.13 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.3 (36)

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

Total fabric heat loss (33) + (36) = 37.43 (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=	32.42	32.18	31.95	30.87	30.67	29.73	29.73	29.56	30.1	30.67	31.08	31.51	(38)

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

(39)m=	69.85	69.61	69.38	68.31	68.1	67.16	67.16	66.99	67.53	68.1	68.51	68.94	

Average = Sum(39)$_{1\ldots12}$ /12= 68.3 (39)

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

(40)m=	1.16	1.15	1.15	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.14	1.14	

Average = Sum(40)$_{1\ldots12}$ /12= 1.13 (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)$_{1\ldots12}$ = 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)$_{1\ldots12}$ = 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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3												0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34	(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=	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34	

Output from water heater (annual)$_{1...12}$ 1830.8 (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=	81.48	72.33	77.17	70.85	70.65	64.87	63.96	67.9	67.06	73.39	75.49	80.08	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot 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=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	(71)

Water heating gains (Table 5)

(72)m=	109.51	107.63	103.72	98.41	94.96	90.1	85.97	91.26	93.14	98.64	104.85	107.64	(72)

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

(73)m=	354.68	352.87	341.84	324.13	306.33	289.01	277.64	282.86	291.85	309.75	330.31	345.57	(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)

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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=	486.08	580.03	661.54	735.15	780.29	765.52	734.56	691.91	643.03	563.21	488.31	457.62	(84)

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=	0.99	0.98	0.95	0.88	0.74	0.55	0.4	0.44	0.68	0.92	0.98	0.99	(86)

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

(87)m=	19.94	20.14	20.42	20.72	20.91	20.98	21	21	20.96	20.7	20.26	19.9	(87)

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

(88)m=	19.95	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.99	19.98	19.97	19.97	(88)

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

(89)m=	0.99	0.98	0.94	0.85	0.68	0.47	0.31	0.35	0.6	0.88	0.98	0.99	(89)

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

(90)m=	18.56	18.86	19.25	19.67	19.9	19.98	19.99	19.99	19.95	19.66	19.05	18.52	(90)

fLA = Living area ÷ (4) = 0.44 (91)

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

(92)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13	(92)

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

(93)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13	(93)

8. 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	0.85	0.7	0.5	0.35	0.39	0.63	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	480.21	564.23	620.58	627.23	547	385.18	256.89	269.11	406.58	500.6	475.73	453.36	(95)
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=	1038.68	1011.35	920.55	767.42	588.89	391.27	257.65	270.39	425.27	648.19	855.43	1029.57	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1883.14 (98)

Space heating requirement in kWh/m²/year 31.21 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	444.39	321.35	238.69	107.95	33.33	0	0	0	0	117.44	292.39	458.5	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2014.05 (211)

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Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Total (kWh/year) =Sum(215)$_{1...5,10...12}$=					0	(215)

Water heating

Output from water heater (calculated above)

	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34		
Efficiency of water heater													79.8	(216)
(217)m=	86.98	86.5	85.59	83.79	81.49	79.8	79.8	79.8	79.8	83.91	86.17	87.11		(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	206.4	183.07	194.6	178.65	180.35	165.04	158.96	173.79	173.29	184.96	189.9	201.28		
								Total = Sum(219a)$_{1...12}$ =					2190.29	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2014.05	
Water heating fuel used		2190.29	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year (sum of (230a)…(230g) =)		75	(231)
Electricity for lighting		273.64	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4552.98	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	435.03	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	473.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =			908.14	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	142.02	(268)
Total CO2, kg/year		sum of (265)…(271) =		1089.08	(272)

TER = 18.05 (273)

Regulations Compliance Report

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

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 48.96m²

Site Reference : Highgate Road - GREEN **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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	19.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.43 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

0.52	0.51	0.5	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses 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			(29)
Walls Type2	35.99	0	35.99	x	0.18	=	6.48			(29)
Total area of elements, m²			71.29							(31)
Party wall			14.89	x	0	=	0			(32)
Party floor			48.96							(32a)
Party ceiling			48.96							(32b)
Internal wall **			96.46							(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) = 26.05 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.09 (36)

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

Total fabric heat loss (33) + (36) = 32.15 (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=	27.09	26.87	26.65	25.64	25.45	24.56	24.56	24.4	24.9	25.45	25.83	26.24	(38)

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

(39)m=	59.24	59.02	58.8	57.79	57.6	56.71	56.71	56.55	57.05	57.6	57.98	58.38	

Average = Sum(39)$_{1…12}$ /12= 57.78 (39)

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

(40)m=	1.21	1.21	1.2	1.18	1.18	1.16	1.16	1.15	1.17	1.18	1.18	1.19

Average = Sum(40)$_{1…12}$ /12= 1.18 (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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = — 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = — 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	(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=	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	

Output from water heater (annual)$_{1...12}$ 1706.85 (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=	77.2	68.59	73.31	67.49	67.42	62.09	61.38	64.94	64.06	69.9	71.68	75.94	(65)

include (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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	103.77	102.07	98.54	93.74	90.62	86.23	82.5	87.28	88.98	93.95	99.56	102.08	(72)

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

(73)m=	312.08	310.44	300.99	285.88	270.83	256.08	246.33	251.05	258.66	273.94	291.48	304.37	(73)

6. Solar 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)

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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=	441.84	531.47	603.42	660.61	690.55	672.76	648.06	619.21	586.13	518.23	446.91	415.42	(84)

7. Mean internal temperature (heating season)

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

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	0.97	0.94	0.85	0.71	0.53	0.38	0.42	0.64	0.89	0.97	0.99	(86)

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

(87)m=	19.95	20.18	20.45	20.74	20.92	20.98	21	21	20.96	20.73	20.29	19.92	(87)

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

(88)m=	19.91	19.92	19.92	19.94	19.94	19.95	19.95	19.96	19.95	19.94	19.93	19.93	(88)

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

(89)m=	0.99	0.96	0.92	0.82	0.65	0.45	0.29	0.32	0.55	0.85	0.97	0.99	(89)

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

(90)m=	18.55	18.88	19.27	19.66	19.87	19.94	19.95	19.95	19.92	19.66	19.06	18.51	(90)

fLA = Living area ÷ (4) = | 0.5 | (91)

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

(92)m=	19.25	19.52	19.86	20.2	20.39	20.46	20.47	20.47	20.44	20.19	19.67	19.21	(92)

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

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(93)m=	19.25	19.52	19.86	20.2	20.39	20.46	20.47	20.47	20.44	20.19	19.67	19.21	(93)

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	0.83	0.68	0.49	0.34	0.37	0.59	0.86	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	433.98	510.71	553.96	545.79	467.37	327.35	218.89	229.22	348.34	444.13	430.33	409.63	(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=	885.41	862.97	785.37	652.83	500.34	332.38	219.54	230.24	361.63	552.53	728.96	876.25	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	335.86	236.72	172.17	77.07	24.53	0	0	0	0	80.65	215.01	347.16	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1489.17 (98)

Space heating requirement in kWh/m²/year 30.42 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	335.86	236.72	172.17	77.07	24.53	0	0	0	0	80.65	215.01	347.16	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	359.21	253.18	184.14	82.42	26.23	0	0	0	0	86.26	229.96	371.3	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1592.7 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	166.68	147.11	154.97	139.58	137.26	123.33	119.09	129.78	129.27	144.7	152.18	162.89	
Efficiency of water heater												79.8	(216)
(217)m=	86.65	86.08	85.09	83.3	81.26	79.8	79.8	79.8	79.8	83.33	85.74	86.78	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	192.37	170.91	182.12	167.55	168.92	154.54	149.24	162.64	162	173.66	177.5	187.7	

Total = Sum(219a)$_{1...12}$ = 2049.14 (219)

Annual totals	kWh/year	kWh/year
Space heating fuel used, main system 1		1592.7

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Water heating fuel used			2049.14	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			227.56	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			3944.39	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	344.02	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	442.61	(264)
Space and water heating	(261) + (262) + (263) + (264) =				786.64	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	118.1	(268)
Total CO2, kg/year			sum of (265)…(271) =		943.66	(272)

TER = 19.27 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	18.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.38 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	35.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(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) =	0.39	(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

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross 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			9.44	x1/[1/(1.4)+ 0.04]		=	12.52			(27)
Windows Type 2			3.93	x1/[1/(1.4)+ 0.04]		=	5.21			(27)
Walls Type1	40.04	13.37	26.67	x	0.18	=	4.8			(29)
Walls Type2	12.16	0	12.16	x	0.18	=	2.19			(29)
Total area of elements, m²			52.2							(31)
Party wall			27.88	x	0	=	0			(32)
Party floor			53.46							(32a)
Party ceiling			53.46							(32b)
Internal wall **			102.03							(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) = 24.71 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9848.67 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.09 (36)

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

Total fabric heat loss (33) + (36) = 30.81 (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=	29.19	28.96	28.74	27.7	27.51	26.6	26.6	26.44	26.95	27.51	27.9	28.31	(38)

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

(39)m=	60	59.77	59.55	58.51	58.31	57.41	57.41	57.24	57.76	58.31	58.71	59.12	

Average = Sum(39)$_{1…12}$ /12= 58.51 (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=	1.12	1.12	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.1	1.11	

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 — 1.79 (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)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m 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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	(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=	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	

Output from water heater (annual)$_{1…12}$ 1756.39 (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=	78.91	70.08	74.85	68.83	68.71	63.2	62.41	66.12	65.26	71.29	73.2	77.6	(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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	106.06	104.29	100.61	95.6	92.35	87.78	83.89	88.87	90.64	95.82	101.67	104.3	(72)
Total internal gains =						(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m							
(73)m=	329.08	327.37	317.29	301.15	285	269.22	258.82	263.74	271.91	288.23	306.98	320.81	(73)

6. Solar 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	9.44	x	36.79	0.63	x	0.7	=	106.15	(79)
Southwest 0.9x	0.77	x	9.44	x	62.67	0.63	x	0.7	=	180.81	(79)
Southwest 0.9x	0.77	x	9.44	x	85.75	0.63	x	0.7	=	247.4	(79)
Southwest 0.9x	0.77	x	9.44	x	106.25	0.63	x	0.7	=	306.53	(79)
Southwest 0.9x	0.77	x	9.44	x	119.01	0.63	x	0.7	=	343.34	(79)

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Southwest	0.9x	0.77	x	9.44	x	118.15		0.63	x	0.7	=	340.86	(79)
Southwest	0.9x	0.77	x	9.44	x	113.91		0.63	x	0.7	=	328.63	(79)
Southwest	0.9x	0.77	x	9.44	x	104.39		0.63	x	0.7	=	301.16	(79)
Southwest	0.9x	0.77	x	9.44	x	92.85		0.63	x	0.7	=	267.88	(79)
Southwest	0.9x	0.77	x	9.44	x	69.27		0.63	x	0.7	=	199.84	(79)
Southwest	0.9x	0.77	x	9.44	x	44.07		0.63	x	0.7	=	127.14	(79)
Southwest	0.9x	0.77	x	9.44	x	31.49		0.63	x	0.7	=	90.84	(79)
Northwest	0.9x	0.77	x	3.93	x	11.28	x	0.63	x	0.7	=	13.55	(81)
Northwest	0.9x	0.77	x	3.93	x	22.97	x	0.63	x	0.7	=	27.58	(81)
Northwest	0.9x	0.77	x	3.93	x	41.38	x	0.63	x	0.7	=	49.7	(81)
Northwest	0.9x	0.77	x	3.93	x	67.96	x	0.63	x	0.7	=	81.62	(81)
Northwest	0.9x	0.77	x	3.93	x	91.35	x	0.63	x	0.7	=	109.71	(81)
Northwest	0.9x	0.77	x	3.93	x	97.38	x	0.63	x	0.7	=	116.96	(81)
Northwest	0.9x	0.77	x	3.93	x	91.1	x	0.63	x	0.7	=	109.42	(81)
Northwest	0.9x	0.77	x	3.93	x	72.63	x	0.63	x	0.7	=	87.23	(81)
Northwest	0.9x	0.77	x	3.93	x	50.42	x	0.63	x	0.7	=	60.56	(81)
Northwest	0.9x	0.77	x	3.93	x	28.07	x	0.63	x	0.7	=	33.71	(81)
Northwest	0.9x	0.77	x	3.93	x	14.2	x	0.63	x	0.7	=	17.05	(81)
Northwest	0.9x	0.77	x	3.93	x	9.21	x	0.63	x	0.7	=	11.07	(81)

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

(83)m=	119.7	208.4	297.09	388.15	453.06	457.83	438.04	388.39	328.43	233.55	144.19	101.91	(83)

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

(84)m=	448.78	535.77	614.39	689.3	738.05	727.04	696.87	652.14	600.34	521.78	451.17	422.72	(84)

7. Mean internal temperature (heating season)

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

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	0.85	0.69	0.5	0.36	0.4	0.64	0.9	0.98	0.99	(86)

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

(87)m=	20.02	20.23	20.5	20.78	20.94	20.99	21	21	20.97	20.75	20.34	19.98	(87)

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

(88)m=	19.98	19.99	19.99	20.01	20.01	20.02	20.02	20.02	20.02	20.01	20	20	(88)

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

(89)m=	0.99	0.97	0.93	0.81	0.63	0.43	0.28	0.32	0.56	0.86	0.97	0.99	(89)

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

(90)m=	18.7	19	19.38	19.77	19.96	20.02	20.02	20.02	20	19.75	19.17	18.66	(90)

fLA = Living area ÷ (4) = 0.45 (91)

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

(92)m=	19.29	19.55	19.89	20.23	20.4	20.46	20.46	20.46	20.44	20.2	19.7	19.26	(92)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	19.29	19.55	19.89	20.23	20.4	20.46	20.46	20.46	20.44	20.2	19.7	19.26	(93)

8. Space 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	0.93	0.82	0.65	0.46	0.32	0.36	0.59	0.87	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	442.32	518.28	568.34	567.06	482.79	333.19	221.4	231.97	355.02	452.87	437.17	418.01	(95)
Monthly 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=	899.43	875.74	797.14	662.89	507.38	336.22	221.74	232.59	365.95	559.92	739.61	890.2	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	340.09	240.21	170.23	69	18.29	0	0	0	0	79.64	217.76	351.31	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1486.54 (98)

Space heating requirement in kWh/m²/year 27.81 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	340.09	240.21	170.23	69	18.29	0	0	0	0	79.64	217.76	351.31	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	363.74	256.91	182.06	73.8	19.56	0	0	0	0	85.18	232.89	375.73	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1589.89 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	171.82	151.6	159.61	143.62	141.13	126.67	122.19	133.34	132.88	148.9	156.76	167.86	
Efficiency of water heater												79.8	(216)
(217)m=	86.6	86.04	84.99	82.98	80.9	79.8	79.8	79.8	79.8	83.23	85.69	86.74	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	198.4	176.21	187.81	173.07	174.46	158.74	153.12	167.1	166.51	178.9	182.94	193.53	

Total = Sum(219a)$_{1...12}$ = 2110.78 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1589.89

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Water heating fuel used			2110.78	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			245.94	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4021.61	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	343.42	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	455.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =			799.34	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	127.64	(268)
Total CO2, kg/year		sum of (265)…(271) =		965.91	(272)

TER =	18.07	(273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	18.46 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.74 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							3	x 10 =	30	(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) =	30	÷ (5) =	0.16	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.41	(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) =	0.41	(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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.52	0.51	0.5	0.45	0.44	0.39	0.39	0.38	0.41	0.44	0.46	0.48

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	(24d)

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

(25)m=	0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	(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			(29)
Walls Type2	17.78	0	17.78	x 0.18	=	3.2			(29)
Total area of elements, m²			90.4						(31)
Party wall			30.32	x 0	=	0			(32)
Party floor			72.62						(32a)
Party ceiling			72.62						(32b)
Internal wall **			146.17						(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) = 34.8 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.11 (36)

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

Total fabric heat loss (33) + (36) = 41.91 (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=	40.26	39.93	39.6	38.08	37.8	36.47	36.47	36.23	36.98	37.8	38.37	38.98	(38)

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

(39)m=	82.16	81.83	81.51	79.99	79.71	78.38	78.38	78.14	78.89	79.71	80.28	80.88	

Average = Sum(39)$_{1…12}$ /12= 79.99 (39)

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

(40)m=	1.13	1.13	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11

Average = Sum(40)$_{1…12}$ /12= 1.1 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	(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=	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	

Output from water heater (annual)$_{1...12}$ 1949.18 (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=	85.56	75.9	80.85	74.06	73.73	67.53	66.42	70.72	69.92	76.72	79.13	84.03	(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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	115	112.94	108.67	102.87	99.1	93.79	89.28	95.06	97.11	103.12	109.9	112.95	(72)

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

(73)m=	397.08	395.1	382.51	362.21	341.65	321.75	308.78	314.47	324.85	345.36	368.93	386.56	(73)

6. Solar 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)

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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=	452.84	508.6	586.99	698.03	793.06	803.01	758.98	673.38	574.02	484.06	439.09	432.1	(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	1	0.99	0.94	0.81	0.6	0.45	0.52	0.82	0.97	1	1	(86)

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

(87)m=	19.81	19.95	20.22	20.59	20.87	20.98	21	20.99	20.9	20.53	20.11	19.79	(87)

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

(88)m=	19.98	19.98	19.98	20	20	20.02	20.02	20.02	20.01	20	20	19.99	(88)

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

(89)m=	1	0.99	0.98	0.92	0.75	0.52	0.35	0.42	0.74	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=	18.39	18.59	18.99	19.53	19.88	20	20.02	20.02	19.93	19.46	18.85	18.38	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	18.93	19.11	19.46	19.94	20.26	20.38	20.39	20.39	20.31	19.87	19.34	18.92	(92)

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

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(93)m=	18.93	19.11	19.46	19.94	20.26	20.38	20.39	20.39	20.31	19.87	19.34	18.92	(93)

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=	1	0.99	0.98	0.92	0.77	0.55	0.39	0.46	0.77	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	450.87	504.39	573.79	641.97	610.85	443.15	296.05	309.09	440.19	464.28	435.34	430.62	(95)
Monthly average external temperature from Table 8													
(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=	1202.21	1163.16	1056.33	883.13	682.47	452.97	297.33	311.94	489.65	739.07	982.47	1190.69	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	558.99	442.69	359.01	173.64	53.28	0	0	0	0	204.44	393.93	565.49	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2751.48 (98)

Space heating requirement in kWh/m²/year 37.89 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	558.99	442.69	359.01	173.64	53.28	0	0	0	0	204.44	393.93	565.49		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	597.85	473.47	383.97	185.71	56.99	0	0	0	0	218.66	421.32	604.8		
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2942.76	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

Output from water heater (calculated above)														
	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22		
Efficiency of water heater													79.8	(216)
(217)m=	87.5	87.27	86.65	85.04	82.27	79.8	79.8	79.8	79.8	85.38	86.92	87.58		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	219.2	193.76	205.01	187.37	189.88	175.06	168.24	184.45	184.07	193.51	200.86	213.77		
Total = Sum(219a)$_{1...12}$ =													2315.18	(219)

Annual totals	kWh/year	kWh/year
Space heating fuel used, main system 1		2942.76

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Water heating fuel used			2315.18	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			320.14	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5653.09	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	635.64	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	500.08	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1135.72	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.15	(268)
Total CO2, kg/year		sum of (265)…(271) =		1340.79	(272)

TER =	18.46	(273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	19.25 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.23 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(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) =	0.39	(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

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6	(24d)

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

(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6	(25)

3. Heat 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			(29)
Walls Type2	24.24	0	24.24	x	0.18	=	4.36			(29)
Total area of elements, m²			51.9							(31)
Party wall			31.67	x	0	=	0			(32)
Party floor			53.96							(32a)
Party ceiling			53.96							(32b)
Internal wall **			95.03							(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) = 23.17 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.04 (36)

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

Total fabric heat loss (33) + (36) = 29.21 (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=	29.42	29.2	28.98	27.93	27.74	26.83	26.83	26.66	27.18	27.74	28.13	28.55	(38)

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

(39)m=	58.63	58.41	58.18	57.14	56.95	56.04	56.04	55.87	56.39	56.95	57.34	57.75	

Average = Sum(39)$_{1…12}$ /12= 57.14 (39)

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

(40)m=	1.09	1.08	1.08	1.06	1.06	1.04	1.04	1.04	1.04	1.06	1.06	1.07

Average = Sum(40)$_{1...12}$ /12= 1.06 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	(62)

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

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

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

Output from water heater

(64)m=	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	

Output from water heater (annual)$_{1...12}$ 1761.89 (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=	79.1	70.25	75.02	68.98	68.85	63.32	62.53	66.25	65.39	71.45	73.37	77.78	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	14.04	12.47	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	157.5	159.14	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	(69)
Pumps and fans gains (Table 5a)													
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	(71)
Water heating gains (Table 5)													
(72)m=	106.32	104.54	100.84	95.81	92.55	87.95	84.04	89.05	90.83	96.03	101.91	104.55	(72)
Total internal gains =						(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m							
(73)m=	330.96	329.25	319.1	302.84	286.57	270.67	260.21	265.15	273.38	289.81	308.7	322.63	(73)

6. Solar gains:

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

Orientation:	Access Factor 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)

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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=	372.58	413.97	471.74	553.51	623.52	629.9	596.26	533.05	459.37	393.35	361.07	356.62	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.92	0.77	0.56	0.41	0.48	0.77	0.96	0.99	1	(86)

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

(87)m=	19.93	20.07	20.33	20.68	20.91	20.99	21	21	20.93	20.62	20.22	19.91	(87)

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

(88)m=	20.01	20.02	20.02	20.03	20.04	20.05	20.05	20.05	20.05	20.04	20.03	20.03	(88)

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

(89)m=	0.99	0.99	0.97	0.9	0.71	0.48	0.32	0.38	0.69	0.94	0.99	1	(89)

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

(90)m=	18.59	18.79	19.17	19.67	19.96	20.04	20.05	20.05	20	19.6	19.04	18.58	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.22	19.4	19.72	20.15	20.41	20.49	20.5	20.5	20.44	20.08	19.6	19.21	(92)

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

(93)m=	19.22	19.4	19.72	20.15	20.41	20.49	20.5	20.5	20.44	20.08	19.6	19.21	(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	0.9	0.73	0.52	0.37	0.43	0.72	0.94	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	370.17	409.06	457.35	497.41	457.34	325.31	217.85	227.64	332.1	371.03	356.45	354.76	(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=	874.98	846.6	769	642.6	495.76	330	218.42	228.93	357.48	540.07	716.56	866.86	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	375.57	294.03	231.87	104.53	28.59	0	0	0	0	125.77	259.28	381	

TER WorkSheet: New dwelling design stage

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1800.63	(98)
Space heating requirement in kWh/m²/year	33.37	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	375.57	294.03	231.87	104.53	28.59	0	0	0	0	125.77	259.28	381		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	401.68	314.47	247.99	111.8	30.57	0	0	0	0	134.51	277.3	407.49		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1925.81	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Output from water heater (calculated above)	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42		
Efficiency of water heater													79.8	(216)
(217)m=	86.84	86.54	85.8	83.97	81.42	79.8	79.8	79.8	79.8	84.36	86.14	86.93		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m=	198.52	175.75	186.62	171.56	173.88	159.2	153.55	167.59	167.01	177.06	182.58	193.74		
Total = Sum(219a)$_{1...12}$ =													2107.07	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1925.81	
Water heating fuel used			2107.07	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			247.96	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4355.84	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

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

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

TER = 19.25 (273)

Regulations Compliance Report

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

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.44m²

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

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	16.69 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.29 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.11	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(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) =	0.36	(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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.46	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59	(24d)

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

(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59	(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			(29)
Walls Type2	16.73	0	16.73	x	0.18	=	3.01			(29)
Total area of elements, m²			58.24							(31)
Party wall			40.43	x	0	=	0			(32)
Party floor			69.44							(32a)
Party ceiling			69.44							(32b)
Internal wall **			136.21							(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) = 24.11 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.83 (36)

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

Total fabric heat loss (33) + (36) = 30.94 (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=	36.71	36.47	36.22	35.09	34.88	33.89	33.89	33.7	34.27	34.88	35.31	35.76	(38)

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

(39)m=	67.65	67.4	67.16	66.03	65.82	64.83	64.83	64.64	65.21	65.82	66.25	66.69	

Average = Sum(39)$_{1…12}$ /12= 66.03 (39)

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

(40)m=	0.97	0.97	0.97	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96

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 2.23 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	(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=	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	

Output from water heater (annual)$_{1...12}$ 1920.94 (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=	84.58	75.04	79.97	73.3	72.99	66.89	65.84	70.05	69.24	75.93	78.26	83.09	(65)

include (57)m in 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	113.69	111.67	107.49	101.8	98.11	92.91	88.49	94.15	96.16	102.05	108.7	111.68	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	387.16	385.17	372.87	353.12	333.17	313.88	301.31	306.95	317.07	337.03	359.93	377.01	(73)

6. Solar gains:

Solar gains are calculated 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)
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=	450.92	504.05	562.83	634.22	689.78	686.28	652.7	599.2	538.15	475.78	438.18	430.36	(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=	1	0.99	0.98	0.93	0.8	0.59	0.44	0.49	0.77	0.96	0.99	1	(86)

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

(87)m=	20.05	20.18	20.41	20.71	20.91	20.99	21	21	20.95	20.68	20.32	20.03	(87)

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

(88)m=	20.1	20.11	20.11	20.12	20.13	20.14	20.14	20.14	20.13	20.13	20.12	20.12	(88)

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

(89)m=	1	0.99	0.98	0.91	0.75	0.52	0.35	0.4	0.7	0.94	0.99	1	(89)

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

(90)m=	18.84	19.03	19.36	19.79	20.05	20.13	20.14	20.14	20.1	19.76	19.24	18.82	(90)

fLA = Living area ÷ (4) = 0.34 (91)

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

(92)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24	(92)

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

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(93)m=	19.25	19.43	19.72	20.11	20.34	20.43	20.43	20.43	20.39	20.08	19.61	19.24	(93)

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	0.91	0.76	0.54	0.38	0.43	0.72	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	448.52	498.69	547.41	578.07	525.27	372.74	248.03	259.75	387.12	448.63	433.16	428.57	(95)
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=	1011.55	979.19	888.07	739.88	568.97	377.65	248.52	260.77	410.09	623.73	828.81	1002.75	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1986.58 (98)

Space heating requirement in kWh/m²/year 28.61 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	418.9	322.9	253.45	116.5	32.51	0	0	0	0	130.27	284.86	427.19	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	448.02	345.34	271.07	124.6	34.78	0	0	0	0	139.32	304.67	456.89	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2124.68 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	188.88	166.53	175.01	157.04	154.01	137.79	132.49	145.16	144.84	162.84	171.98	184.39	
Efficiency of water heater												79.8	(216)
(217)m=	86.88	86.55	85.8	84.03	81.48	79.8	79.8	79.8	79.8	84.23	86.15	86.98	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	217.4	192.4	203.97	186.89	189.02	172.67	166.03	181.91	181.5	193.33	199.62	211.98

Total = Sum(219a)$_{1...12}$ = 2296.71 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2124.68

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Water heating fuel used			2296.71	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			317.84	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4814.23	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	458.93	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	496.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				955.02	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	164.96	(268)
Total CO2, kg/year			sum of (265)…(271) =		1158.9	(272)

TER =	16.69	(273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	16.77 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.35 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.11	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(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) =	0.36	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 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

0.46	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(24d)

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

(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(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			(29)
Walls Type2	18.41	0	18.41	x	0.18	=	3.31			(29)
Total area of elements, m²			60							(31)
Party wall			38.68	x	0	=	0			(32)
Party floor			69.61							(32a)
Party ceiling			69.61							(32b)
Internal wall **			136.21							(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) = 24.42 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.83 (36)

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

Total fabric heat loss (33) + (36) = 31.26 (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=	36.79	36.55	36.3	35.17	34.96	33.97	33.97	33.78	34.35	34.96	35.39	35.84	(38)

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

(39)m=	68.05	67.8	67.56	66.42	66.21	65.22	65.22	65.04	65.6	66.21	66.64	67.09

Average = Sum(39)$_{1…12}$ /12= 66.42 (39)

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

(40)m=	0.98	0.97	0.97	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.96	0.96

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 2.24 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H													
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	(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=	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	

Output from water heater (annual)$_{1...12}$ 1922.5 (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=	84.64	75.09	80.02	73.34	73.03	66.93	65.87	70.09	69.28	75.97	78.31	83.14	(65)

include (57)m in 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	113.76	111.74	107.55	101.86	98.16	92.96	88.53	94.2	96.22	102.11	108.77	111.75	(72)

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

(73)m=	387.74	385.74	373.42	353.63	333.64	314.32	301.73	307.38	317.52	337.51	360.46	377.56	(73)

6. Solar 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)
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=	451.5	504.63	563.38	634.74	690.26	686.72	653.12	599.63	538.6	476.27	438.71	430.92	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.93	0.8	0.6	0.44	0.49	0.77	0.96	0.99	1	(86)

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

(87)m=	20.04	20.18	20.41	20.71	20.91	20.99	21	21	20.95	20.68	20.31	20.03	(87)

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

(88)m=	20.1	20.11	20.11	20.12	20.12	20.14	20.14	20.14	20.13	20.12	20.12	20.11	(88)

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

(89)m=	1	0.99	0.98	0.91	0.75	0.52	0.35	0.4	0.7	0.94	0.99	1	(89)

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

(90)m=	18.83	19.02	19.35	19.78	20.04	20.13	20.14	20.14	20.09	19.75	19.23	18.81	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27	(92)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	19.29	19.46	19.75	20.13	20.37	20.46	20.46	20.46	20.42	20.11	19.64	19.27	(93)

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	0.91	0.77	0.55	0.39	0.44	0.72	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	449.14	499.38	548.31	579.82	528.59	376.65	251.51	263.23	390.23	449.79	433.81	429.17	(95)
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=	1020.07	987.36	895.47	746.2	574.32	381.94	252.05	264.36	414.51	629.39	836	1011.25	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2021.06 (98)

Space heating requirement in kWh/m²/year 29.03 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	424.77	327.92	258.29	119.79	34.03	0	0	0	0	133.63	289.58	433.07	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	454.3	350.72	276.24	128.12	36.39	0	0	0	0	142.92	309.71	463.17	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2161.56 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	
Efficiency of water heater												79.8	(216)
(217)m=	86.91	86.59	85.85	84.1	81.54	79.8	79.8	79.8	79.8	84.29	86.19	87.01	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	217.51	192.48	204.02	186.88	189.02	172.8	166.15	182.05	181.64	193.34	199.7	212.08	

Total = Sum(219a)$_{1...12}$ = 2297.68 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2161.56

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Water heating fuel used			2297.68	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			318.62	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4852.86	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	466.9	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	496.3	(264)
Space and water heating	(261) + (262) + (263) + (264) =			963.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	165.36	(268)
Total CO2, kg/year		sum of (265)…(271) =		1167.48	(272)

TER =	16.77	(273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	19.64 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.45 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

0.51	0.5	0.49	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat 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			(29)
Walls Type2	22.92	0	22.92	x	0.18	=	4.13			(29)
Total area of elements, m²			54.32							(31)
Party wall			30.08	x	0	=	0			(32)
Party floor			50.62							(32a)
Party ceiling			50.62							(32b)
Internal wall **			83.2							(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) = 20.06 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 5.76 (36)

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

Total fabric heat loss (33) + (36) = 25.82 (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=	27.86	27.64	27.42	26.4	26.21	25.32	25.32	25.15	25.66	26.21	26.6	27	(38)

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

(39)m=	53.68	53.46	53.24	52.21	52.02	51.13	51.13	50.97	51.47	52.02	52.41	52.82	

Average = Sum(39)$_{1…12}$ /12= 52.21 (39)

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

(40)m=	1.06	1.06	1.05	1.03	1.03	1.01	1.01	1.01	1.02	1.03	1.04	1.04

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 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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72	(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=	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72	

Output from water heater (annual)$_{1...12}$ 1725.1 (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=	77.83	69.14	73.88	67.99	67.9	62.5	61.76	65.37	64.51	70.41	72.24	76.55	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	104.61	102.89	99.3	94.42	91.26	86.8	83.01	87.87	89.59	94.64	100.34	102.89	(72)

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

(73)m=	318.67	316.97	307.24	291.69	276.19	261.04	251.06	255.89	263.76	279.47	297.51	310.76	(73)

6. Solar 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=	349.6	379.93	420.67	477.98	526.6	528	500.8	454.98	401.98	356.42	336.43	336.02	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.94	0.81	0.6	0.45	0.51	0.79	0.96	0.99	1	(86)

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

(87)m=	19.97	20.09	20.32	20.65	20.89	20.98	21	20.99	20.93	20.62	20.25	19.95	(87)

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

(88)m=	20.03	20.04	20.04	20.06	20.06	20.07	20.07	20.08	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	0.99	0.98	0.92	0.76	0.52	0.35	0.41	0.72	0.95	0.99	1	(89)

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

(90)m=	18.66	18.84	19.18	19.66	19.96	20.06	20.07	20.08	20.01	19.63	19.09	18.66	(90)

fLA = Living area ÷ (4) = 0.49 (91)

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

(92)m=	19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.53	20.46	20.12	19.66	19.29	(92)

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

(93)m=	19.3	19.45	19.74	20.14	20.41	20.51	20.53	20.53	20.46	20.12	19.66	19.29	(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	0.78	0.56	0.4	0.46	0.75	0.95	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	347.34	375.78	409.84	438.96	408.92	296.5	200.02	208.76	301.18	337.88	332.19	334.24	(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=	805.22	777.89	704.94	587.07	453.33	302.4	200.76	210.27	327.5	495.13	658.33	797.1	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	340.66	270.21	219.55	106.64	33.04	0	0	0	0	116.99	234.82	344.37	

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Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1666.28	(98)
Space heating requirement in kWh/m²/year	32.92	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	340.66	270.21	219.55	106.64	33.04	0	0	0	0	116.99	234.82	344.37		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	364.34	289	234.82	114.05	35.33	0	0	0	0	125.13	251.14	368.31		
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													1782.12	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)

Water heating

Output from water heater (calculated above)	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72		
Efficiency of water heater													79.8	(216)
(217)m=	86.65	86.39	85.71	84.08	81.66	79.8	79.8	79.8	79.8	84.23	85.94	86.74		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	194.53	172.21	182.79	167.78	169.84	156.09	150.67	164.28	163.66	173.64	179.05	189.91		
Total = Sum(219a)$_{1...12}$ =													2064.45	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1782.12	
Water heating fuel used			2064.45	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			239.96	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4161.53	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

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

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

TER = 19.64 (273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	17.67 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.46 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(25)

3. Heat 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			8.34	x1/[1/(1.4)+ 0.04]		=	11.06			(27)
Windows Type 2			7.64	x1/[1/(1.4)+ 0.04]		=	10.13			(27)
Walls Type1	61.09	15.98	45.11	x	0.18	=	8.12			(29)
Walls Type2	3.86	0	3.86	x	0.18	=	0.69			(29)
Total area of elements, m²			64.95							(31)
Party wall			37.5	x	0	=	0			(32)
Party floor			63.92							(32a)
Party ceiling			63.92							(32b)
Internal wall **			113.47							(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) = 30 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10121.33 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.91 (36)

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

Total fabric heat loss (33) + (36) = 37.91 (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=	34.1	33.87	33.63	32.53	32.32	31.37	31.37	31.19	31.74	32.32	32.74	33.18	(38)

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

(39)m=	72.01	71.77	71.54	70.44	70.23	69.28	69.28	69.1	69.65	70.23	70.65	71.09	

Average = Sum(39)$_{1…12}$ /12= 70.44 (39)

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

(40)m=	1.13	1.12	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11

Average = Sum(40)$_{1…12}$ /12= 1.1 (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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = — 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = — 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 — 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	(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=	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	

Output from water heater (annual)$_{1...12}$ 1867.72 (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=	82.75	73.44	78.32	71.85	71.61	65.7	64.73	68.78	67.95	74.43	76.63	81.31	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	111.22	109.29	105.26	99.8	96.25	91.25	87	92.44	94.38	100.04	106.43	109.29	(72)

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

(73)m=	367.58	365.71	354.21	335.72	317.08	298.97	287.12	292.49	301.9	320.59	342.07	358.04	(73)

6. Solar 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	8.34	x	11.28	x	0.63	x	0.7	=	28.76	(75)
Northeast 0.9x	0.77	x	8.34	x	22.97	x	0.63	x	0.7	=	58.54	(75)
Northeast 0.9x	0.77	x	8.34	x	41.38	x	0.63	x	0.7	=	105.47	(75)
Northeast 0.9x	0.77	x	8.34	x	67.96	x	0.63	x	0.7	=	173.21	(75)
Northeast 0.9x	0.77	x	8.34	x	91.35	x	0.63	x	0.7	=	232.82	(75)

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Northeast	0.9x	0.77	x	8.34	x	97.38	x	0.63	x	0.7	=	248.21	(75)
Northeast	0.9x	0.77	x	8.34	x	91.1	x	0.63	x	0.7	=	232.2	(75)
Northeast	0.9x	0.77	x	8.34	x	72.63	x	0.63	x	0.7	=	185.11	(75)
Northeast	0.9x	0.77	x	8.34	x	50.42	x	0.63	x	0.7	=	128.51	(75)
Northeast	0.9x	0.77	x	8.34	x	28.07	x	0.63	x	0.7	=	71.54	(75)
Northeast	0.9x	0.77	x	8.34	x	14.2	x	0.63	x	0.7	=	36.19	(75)
Northeast	0.9x	0.77	x	8.34	x	9.21	x	0.63	x	0.7	=	23.49	(75)
Southeast	0.9x	0.77	x	7.64	x	36.79	x	0.63	x	0.7	=	85.91	(77)
Southeast	0.9x	0.77	x	7.64	x	62.67	x	0.63	x	0.7	=	146.34	(77)
Southeast	0.9x	0.77	x	7.64	x	85.75	x	0.63	x	0.7	=	200.22	(77)
Southeast	0.9x	0.77	x	7.64	x	106.25	x	0.63	x	0.7	=	248.09	(77)
Southeast	0.9x	0.77	x	7.64	x	119.01	x	0.63	x	0.7	=	277.88	(77)
Southeast	0.9x	0.77	x	7.64	x	118.15	x	0.63	x	0.7	=	275.87	(77)
Southeast	0.9x	0.77	x	7.64	x	113.91	x	0.63	x	0.7	=	265.96	(77)
Southeast	0.9x	0.77	x	7.64	x	104.39	x	0.63	x	0.7	=	243.74	(77)
Southeast	0.9x	0.77	x	7.64	x	92.85	x	0.63	x	0.7	=	216.8	(77)
Southeast	0.9x	0.77	x	7.64	x	69.27	x	0.63	x	0.7	=	161.73	(77)
Southeast	0.9x	0.77	x	7.64	x	44.07	x	0.63	x	0.7	=	102.9	(77)
Southeast	0.9x	0.77	x	7.64	x	31.49	x	0.63	x	0.7	=	73.52	(77)

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

(83)m=	114.67	204.87	305.69	421.29	510.7	524.08	498.16	428.85	345.31	233.27	139.08	97.01	(83)

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

(84)m=	482.24	570.59	659.9	757.01	827.78	823.06	785.28	721.34	647.21	553.86	481.15	455.04	(84)

7. Mean 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	0.96	0.88	0.73	0.53	0.39	0.44	0.7	0.93	0.99	1	(86)

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

(87)m=	19.93	20.12	20.41	20.73	20.92	20.99	21	21	20.95	20.68	20.25	19.9	(87)

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

(88)m=	19.98	19.98	19.99	20	20	20.01	20.01	20.02	20.01	20	20	19.99	(88)

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

(89)m=	0.99	0.98	0.95	0.85	0.67	0.45	0.3	0.35	0.61	0.9	0.98	0.99	(89)

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

(90)m=	18.57	18.85	19.25	19.7	19.93	20.01	20.01	20.02	19.98	19.65	19.05	18.54	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.09	19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06	(92)

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

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(93)m=	19.09	19.34	19.69	20.09	20.31	20.38	20.39	20.39	20.35	20.04	19.5	19.06	(93)

8. Space 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	0.95	0.86	0.69	0.48	0.33	0.38	0.64	0.9	0.98	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	477.6	558.2	624.35	647.45	567.74	395.74	261.85	274.51	415.81	500.89	471.24	451.67		(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=	1065.09	1036.14	943.75	788.38	604.7	400.4	262.39	275.56	435.18	663.3	876.26	1056.17		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	437.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
Total per year (kWh/year) = Sum(98)1...5,9...12 =													1987.06	(98)
Space heating requirement in kWh/m²/year													31.09	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	437.09	321.18	237.63	101.47	27.49	0	0	0	0	120.84	291.62	449.74		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	467.48	343.5	254.15	108.52	29.41	0	0	0	0	129.24	311.89	481.01		
Total (kWh/year) =Sum(211)1...5,10...12=													2125.2	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)1...5,10...12=													0	(215)

Water heating

Output from water heater (calculated above)														
	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04		
Efficiency of water heater													79.8	(216)
(217)m=	87.05	86.61	85.71	83.75	81.29	79.8	79.8	79.8	79.8	84.1	86.29	87.17		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	210.63	186.7	198.38	182.32	184.34	168.16	161.85	177.12	176.65	188.25	193.61	205.39		
Total = Sum(219a)1...12 =													2233.4	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2125.2

Water heating fuel used			2233.4	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			287.67	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4721.27	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	459.04	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	482.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =				941.46	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	149.3	(268)
Total CO2, kg/year			sum of (265)…(271) =		1129.68	(272)

TER = 17.67 (273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	18.05 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.55 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(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) =	0.38	(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

0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(25)

3. Heat losses and heat loss 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			(29)
Walls Type2	27.31	0	27.31	x 0.18	=	4.92			(29)
Total area of elements, m²			80.11						(31)
Party wall			16.88	x 0	=	0			(32)
Party floor			60.34						(32a)
Party ceiling			60.34						(32b)
Internal wall **			107.91						(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) = 30.13 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.3 (36)

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

Total fabric heat loss (33) + (36) = 37.43 (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=	32.42	32.18	31.95	30.87	30.67	29.73	29.73	29.56	30.1	30.67	31.08	31.51	(38)

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

(39)m=	69.85	69.61	69.38	68.31	68.1	67.16	67.16	66.99	67.53	68.1	68.51	68.94	

Average = $Sum(39)_{1...12}$ /12= 68.3 (39)

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

(40)m=	1.16	1.15	1.15	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.14	1.14	

Average = $Sum(40)_{1...12}$ /12= 1.13 (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	
(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	

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

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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34	(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=	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34

Output from water heater (annual)$_{1...12}$ | 1830.8 | (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=	81.48	72.33	77.17	70.85	70.65	64.87	63.96	67.9	67.06	73.39	75.49	80.08	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot 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=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	(71)

Water heating gains (Table 5)

(72)m=	109.51	107.63	103.72	98.41	94.96	90.1	85.97	91.26	93.14	98.64	104.85	107.64	(72)

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

(73)m=	354.68	352.87	341.84	324.13	306.33	289.01	277.64	282.86	291.85	309.75	330.31	345.57	(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)

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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=	486.08	580.03	661.54	735.15	780.29	765.52	734.56	691.91	643.03	563.21	488.31	457.62	(84)

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=	0.99	0.98	0.95	0.88	0.74	0.55	0.4	0.44	0.68	0.92	0.98	0.99	(86)

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

(87)m=	19.94	20.14	20.42	20.72	20.91	20.98	21	21	20.96	20.7	20.26	19.9	(87)

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

(88)m=	19.95	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.99	19.98	19.97	19.97	(88)

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

(89)m=	0.99	0.98	0.94	0.85	0.68	0.47	0.31	0.35	0.6	0.88	0.98	0.99	(89)

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

(90)m=	18.56	18.86	19.25	19.67	19.9	19.98	19.99	19.99	19.95	19.66	19.05	18.52	(90)

fLA = Living area ÷ (4) = 0.44 (91)

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

(92)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13	(92)

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

(93)m=	19.17	19.43	19.77	20.14	20.35	20.43	20.44	20.44	20.4	20.12	19.59	19.13	(93)

8. 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	0.85	0.7	0.5	0.35	0.39	0.63	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	480.21	564.23	620.58	627.23	547	385.18	256.89	269.11	406.58	500.6	475.73	453.36	(95)
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=	1038.68	1011.35	920.55	767.42	588.89	391.27	257.65	270.39	425.27	648.19	855.43	1029.57	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1883.14 (98)

Space heating requirement in kWh/m²/year 31.21 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	415.5	300.46	223.18	100.94	31.17	0	0	0	0	109.81	273.39	428.7	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	444.39	321.35	238.69	107.95	33.33	0	0	0	0	117.44	292.39	458.5	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2014.05 (211)

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Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34

Efficiency of water heater 79.8 (216)

(217)m=	86.98	86.5	85.59	83.79	81.49	79.8	79.8	79.8	79.8	83.91	86.17	87.11	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	206.4	183.07	194.6	178.65	180.35	165.04	158.96	173.79	173.29	184.96	189.9	201.28

Total = Sum(219a)$_{1...12}$ = 2190.29 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2014.05	
Water heating fuel used		2190.29	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75	(231)
Electricity for lighting		273.64	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4552.98	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	435.03	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	473.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =			908.14	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	142.02	(268)
Total CO2, kg/year		sum of (265)…(271) =		1089.08	(272)

TER = 18.05 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	15.34 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.08 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							4	x 10 =	40	(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) =	40	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.5	0.49	0.48	0.43	0.43	0.38	0.38	0.37	0.4	0.43	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross 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			(29)
Walls Type2	49.77	0	49.77	x 0.18	=	8.96			(29)
Total area of elements, m²			125.93						(31)
Party wall			12.14	x 0	=	0			(32)
Party floor			103.81						(32a)
Party ceiling			103.81						(32b)
Internal wall **			193.17						(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) =	49.39	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	15708.13	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Indicative Value: Medium	250	(35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 9.77 (36)

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

Total fabric heat loss (33) + (36) = 59.16 (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

TER WorkSheet: New dwelling design stage

(38)m=	56.93	56.48	56.04	53.98	53.59	51.8	51.8	51.46	52.49	53.59	54.37	55.19	(38)

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

(39)m=	116.08	115.63	115.2	113.13	112.75	110.95	110.95	110.62	111.64	112.75	113.53	114.34	

Average = Sum(39)$_{1...12}$ /12= 113.13 (39)

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

(40)m=	1.12	1.11	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.09	1.1

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 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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63	(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=	209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63

Output from water heater (annual)$_{1...12}$ | 2122.6 | (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=	91.54	81.12	86.25	78.77	78.24	71.42	70.03	74.87	74.11	81.61	84.46	89.82	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	123.03	120.72	115.92	109.4	105.16	99.2	94.13	100.63	102.93	109.69	117.31	120.73	(72)

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

(73)m=	476.34	474.14	458.6	433.37	407.47	382.69	366.7	373.08	386.13	411.59	440.88	463.12	(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)

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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=	702.63	864.87	1007.23	1136.66	1216.67	1195.48	1146.38	1072.31	988.1	847.21	712.88	656.15	(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

TER WorkSheet: New dwelling design stage

(86)m=	1	0.99	0.97	0.91	0.77	0.58	0.42	0.47	0.72	0.94	0.99	1	(86)

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

(87)m=	19.87	20.08	20.37	20.69	20.9	20.98	21	21	20.95	20.66	20.2	19.84	(87)

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

(88)m=	19.99	19.99	19.99	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=	1	0.99	0.96	0.88	0.71	0.5	0.33	0.37	0.64	0.92	0.99	1	(89)

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

(90)m=	18.49	18.8	19.21	19.66	19.92	20.02	20.03	20.03	19.98	19.63	18.99	18.46	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.02	19.29	19.65	20.06	20.3	20.39	20.4	20.4	20.35	20.03	19.45	18.99	(92)

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

(93)m=	19.02	19.29	19.65	20.06	20.3	20.39	20.4	20.4	20.35	20.03	19.45	18.99	(93)

8. 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	0.88	0.73	0.53	0.37	0.41	0.67	0.92	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	698.32	850.4	962.81	1000.89	890.81	631.06	420.16	440.06	661.6	778.46	702.57	653.23	(95)
Monthly 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=	1708.94	1664.31	1515.25	1262.35	969.29	642.09	421.45	442.35	698.14	1062.76	1402.55	1691.21	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	751.9	546.95	411.02	188.25	58.4	0	0	0	0	211.52	503.99	772.26	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3444.29 (98)

Space heating requirement in kWh/m²/year 33.18 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	751.9	546.95	411.02	188.25	58.4	0	0	0	0	211.52	503.99	772.26	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	804.18	584.98	439.59	201.34	62.45	0	0	0	0	226.23	539.02	825.95	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 3683.73 (211)

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Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
									Total (kWh/year) =Sum(215)$_{1...5,10...12}$=				0	(215)

Water heating

Output from water heater (calculated above)

	209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63		
Efficiency of water heater													79.8	(216)
(217)m=	87.93	87.54	86.77	85.03	82.29	79.8	79.8	79.8	79.8	85.25	87.29	88.03		(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	238.58	211.13	223.43	204.03	206.34	189.73	181.85	200.06	199.87	211.06	218.39	232.47		
									Total = Sum(219a)$_{1...12}$ =				2516.93	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3683.73	
Water heating fuel used		2516.93	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75	(231)
Electricity for lighting		412.99	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		6688.66	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	795.69	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	543.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1339.34	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	214.34	(268)
Total CO2, kg/year		sum of (265)…(271) =		1592.61	(272)

TER =	15.34	(273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	18.61 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.22 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	41.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(25)

3. Heat 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			12.29	x1/[1/(1.4)+ 0.04]		=	16.29			(27)
Windows Type 2			3.35	x1/[1/(1.4)+ 0.04]		=	4.44			(27)
Walls Type1	46.72	15.64	31.08	x	0.18	=	5.59			(29)
Walls Type2	13.75	0	13.75	x	0.18	=	2.48			(29)
Total area of elements, m²			60.47							(31)
Party wall			30.32	x	0	=	0			(32)
Party floor			62.56							(32a)
Party ceiling			62.56							(32b)
Internal wall **			100.8							(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) = 28.8 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9340.6 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.92 (36)

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

Total fabric heat loss (33) + (36) = 35.73 (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=	33.46	33.23	32.99	31.9	31.7	30.75	30.75	30.57	31.11	31.7	32.11	32.54	(38)

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

(39)m=	69.19	68.95	68.72	67.63	67.42	66.47	66.47	66.29	66.84	67.42	67.84	68.27	

Average = Sum(39)$_{1…12}$ /12= 67.63 (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=	1.11	1.1	1.1	1.08	1.08	1.06	1.06	1.06	1.07	1.08	1.08	1.09

Average = Sum(40)$_{1…12}$ /12= 1.08 (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)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m 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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	181.92	160.44	168.73	151.57	148.77	133.26	128.29	140.35	139.96	157.16	165.78	177.65	(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=	181.92	160.44	168.73	151.57	148.77	133.26	128.29	140.35	139.96	157.16	165.78	177.65	

Output from water heater (annual)$_{1...12}$ 1853.89 (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=	82.27	73.02	77.89	71.48	71.25	65.39	64.44	68.45	67.62	74.04	76.2	80.85	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	110.58	108.67	104.69	99.28	95.76	90.82	86.61	92	93.91	99.51	105.84	108.67	(72)

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

(73)m=	362.72	360.88	349.56	331.36	313.03	295.22	283.55	288.86	298.12	316.51	337.64	353.34	(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	12.29	x	11.28	x	0.63	x	0.7	=	42.38	(75)
Northeast 0.9x	0.77	x	12.29	x	22.97	x	0.63	x	0.7	=	86.26	(75)
Northeast 0.9x	0.77	x	12.29	x	41.38	x	0.63	x	0.7	=	155.42	(75)
Northeast 0.9x	0.77	x	12.29	x	67.96	x	0.63	x	0.7	=	255.24	(75)
Northeast 0.9x	0.77	x	12.29	x	91.35	x	0.63	x	0.7	=	343.09	(75)

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Northeast 0.9x	0.77	x	12.29	x	97.38	x	0.63	x	0.7	=	365.77	(75)
Northeast 0.9x	0.77	x	12.29	x	91.1	x	0.63	x	0.7	=	342.17	(75)
Northeast 0.9x	0.77	x	12.29	x	72.63	x	0.63	x	0.7	=	272.79	(75)
Northeast 0.9x	0.77	x	12.29	x	50.42	x	0.63	x	0.7	=	189.38	(75)
Northeast 0.9x	0.77	x	12.29	x	28.07	x	0.63	x	0.7	=	105.42	(75)
Northeast 0.9x	0.77	x	12.29	x	14.2	x	0.63	x	0.7	=	53.32	(75)
Northeast 0.9x	0.77	x	12.29	x	9.21	x	0.63	x	0.7	=	34.61	(75)
Northwest 0.9x	0.77	x	3.35	x	11.28	x	0.63	x	0.7	=	11.55	(81)
Northwest 0.9x	0.77	x	3.35	x	22.97	x	0.63	x	0.7	=	23.51	(81)
Northwest 0.9x	0.77	x	3.35	x	41.38	x	0.63	x	0.7	=	42.36	(81)
Northwest 0.9x	0.77	x	3.35	x	67.96	x	0.63	x	0.7	=	69.57	(81)
Northwest 0.9x	0.77	x	3.35	x	91.35	x	0.63	x	0.7	=	93.52	(81)
Northwest 0.9x	0.77	x	3.35	x	97.38	x	0.63	x	0.7	=	99.7	(81)
Northwest 0.9x	0.77	x	3.35	x	91.1	x	0.63	x	0.7	=	93.27	(81)
Northwest 0.9x	0.77	x	3.35	x	72.63	x	0.63	x	0.7	=	74.36	(81)
Northwest 0.9x	0.77	x	3.35	x	50.42	x	0.63	x	0.7	=	51.62	(81)
Northwest 0.9x	0.77	x	3.35	x	28.07	x	0.63	x	0.7	=	28.74	(81)
Northwest 0.9x	0.77	x	3.35	x	14.2	x	0.63	x	0.7	=	14.53	(81)
Northwest 0.9x	0.77	x	3.35	x	9.21	x	0.63	x	0.7	=	9.43	(81)

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

(83)m=	53.93	109.78	197.78	324.81	436.61	465.48	435.44	347.14	241	134.16	67.86	44.04	(83)

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

(84)m=	416.65	470.65	547.34	656.17	749.65	760.7	718.99	636	539.12	450.66	405.5	397.38	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.92	0.76	0.55	0.4	0.47	0.77	0.96	0.99	1	(86)

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

(87)m=	19.88	20.03	20.3	20.67	20.91	20.99	21	21	20.93	20.59	20.18	19.86	(87)

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

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

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

(89)m=	1	0.99	0.97	0.89	0.7	0.47	0.32	0.38	0.69	0.95	0.99	1	(89)

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

(90)m=	18.51	18.72	19.12	19.65	19.94	20.02	20.03	20.03	19.97	19.55	18.96	18.49	(90)

fLA = Living area ÷ (4) = 0.43 (91)

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

(92)m=	19.1	19.28	19.63	20.09	20.36	20.44	20.45	20.45	20.38	20	19.48	19.08	(92)

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

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(93)m=	19.1	19.28	19.63	20.09	20.36	20.44	20.45	20.45	20.38	20	19.48	19.08	(93)

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	0.89	0.72	0.5	0.35	0.42	0.72	0.95	0.99	1		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	414.31	465.48	530.71	586.73	540.34	382.81	255.04	266.73	389.19	426.44	400.93	395.61		(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=	1023.86	991.83	902.35	756.53	583.62	388.05	255.69	268.24	420.06	633.87	840.02	1015.78		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	453.5	353.71	276.5	122.25	32.2	0	0	0	0	154.32	316.14	461.4		
									Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =				2170.03	(98)
Space heating requirement in kWh/m²/year													34.69	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	453.5	353.71	276.5	122.25	32.2	0	0	0	0	154.32	316.14	461.4		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	485.03	378.29	295.72	130.75	34.44	0	0	0	0	165.05	338.12	493.48		
									Total (kWh/year) =Sum(211)$_{1...5,10....12}$=				2320.89	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
									Total (kWh/year) =Sum(215)$_{1...5,10....12}$=				0	(215)

Water heating

Output from water heater (calculated above)														
	181.92	160.44	168.73	151.57	148.77	133.26	128.29	140.35	139.96	157.16	165.78	177.65		
Efficiency of water heater													79.8	(216)
(217)m=	87.15	86.87	86.12	84.25	81.51	79.8	79.8	79.8	79.8	84.77	86.51	87.25		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	208.74	184.71	195.92	179.91	182.5	166.99	160.77	175.87	175.39	185.4	191.63	203.62		
									Total = Sum(219a)$_{1...12}$ =				2211.45	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2320.89

Water heating fuel used		2211.45	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75	(231)
Electricity for lighting		282.38	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4889.72	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	501.31	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	477.67	(264)
Space and water heating	(261) + (262) + (263) + (264) =				978.98	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	146.56	(268)
Total CO2, kg/year			sum of (265)…(271) =		1164.46	(272)

TER = 18.61 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	18.46 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.74 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							3	x 10 =	30	(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) =	30	÷ (5) =	0.16	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.41	(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) =	0.41	(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

0.52	0.51	0.5	0.45	0.44	0.39	0.39	0.38	0.41	0.44	0.46	0.48

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	(24d)

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

(25)m=	0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	(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			(29)
Walls Type2	17.78	0	17.78	x 0.18	=	3.2			(29)
Total area of elements, m²			90.4						(31)
Party wall			30.32	x 0	=	0			(32)
Party floor			72.62						(32a)
Party ceiling			72.62						(32b)
Internal wall **			146.17						(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) = 34.8 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.11 (36)

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

Total fabric heat loss (33) + (36) = 41.91 (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=	40.26	39.93	39.6	38.08	37.8	36.47	36.47	36.23	36.98	37.8	38.37	38.98	(38)

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

(39)m=	82.16	81.83	81.51	79.99	79.71	78.38	78.38	78.14	78.89	79.71	80.28	80.88	

Average = Sum(39)$_{1…12}$ /12= 79.99 (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=	1.13	1.13	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11		
Average = Sum(40)$_{1…12}$ /12=													1.1	(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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H													
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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)

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=	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	(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=	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	

Output from water heater (annual)$_{1...12}$ 1949.18 (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=	85.56	75.9	80.85	74.06	73.73	67.53	66.42	70.72	69.92	76.72	79.13	84.03	(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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	115	112.94	108.67	102.87	99.1	93.79	89.28	95.06	97.11	103.12	109.9	112.95	(72)

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

(73)m=	397.08	395.1	382.51	362.21	341.65	321.75	308.78	314.47	324.85	345.36	368.93	386.56	(73)

6. Solar 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)

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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=	452.84	508.6	586.99	698.03	793.06	803.01	758.98	673.38	574.02	484.06	439.09	432.1	(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	1	0.99	0.94	0.81	0.6	0.45	0.52	0.82	0.97	1	1	(86)

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

(87)m=	19.81	19.95	20.22	20.59	20.87	20.98	21	20.99	20.9	20.53	20.11	19.79	(87)

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

(88)m=	19.98	19.98	19.98	20	20	20.02	20.02	20.02	20.01	20	20	19.99	(88)

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

(89)m=	1	0.99	0.98	0.92	0.75	0.52	0.35	0.42	0.74	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=	18.39	18.59	18.99	19.53	19.88	20	20.02	20.02	19.93	19.46	18.85	18.38	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	18.93	19.11	19.46	19.94	20.26	20.38	20.39	20.39	20.31	19.87	19.34	18.92	(92)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(93)m=	18.93	19.11	19.46	19.94	20.26	20.38	20.39	20.39	20.31	19.87	19.34	18.92		(93)

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=	1	0.99	0.98	0.92	0.77	0.55	0.39	0.46	0.77	0.96	0.99	1		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	450.87	504.39	573.79	641.97	610.85	443.15	296.05	309.09	440.19	464.28	435.34	430.62		(95)
Monthly average external temperature from Table 8														
(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=	1202.21	1163.16	1056.33	883.13	682.47	452.97	297.33	311.94	489.65	739.07	982.47	1190.69		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	558.99	442.69	359.01	173.64	53.28	0	0	0	0	204.44	393.93	565.49		
Total per year (kWh/year) = Sum(98)1...5,9...12 =													2751.48	(98)
Space heating requirement in kWh/m²/year													37.89	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	558.99	442.69	359.01	173.64	53.28	0	0	0	0	204.44	393.93	565.49		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	597.85	473.47	383.97	185.71	56.99	0	0	0	0	218.66	421.32	604.8		
Total (kWh/year) =Sum(211)1...5,10...12=													2942.76	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)1...5,10...12=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)														
	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22		
Efficiency of water heater													79.8	(216)
(217)m=	87.5	87.27	86.65	85.04	82.27	79.8	79.8	79.8	79.8	85.38	86.92	87.58		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	219.2	193.76	205.01	187.37	189.88	175.06	168.24	184.45	184.07	193.51	200.86	213.77		
Total = Sum(219a)1...12 =													2315.18	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2942.76

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Water heating fuel used			2315.18	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			320.14	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5653.09	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	635.64	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	500.08	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1135.72	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.15	(268)
Total CO2, kg/year		sum of (265)…(271) =		1340.79	(272)

TER = 18.46 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	19.25 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.23 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(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) =	0.39	(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

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6	(24d)

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

(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6	(25)

3. Heat 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			(29)
Walls Type2	24.24	0	24.24	x	0.18	=	4.36			(29)
Total area of elements, m²			51.9							(31)
Party wall			31.67	x	0	=	0			(32)
Party floor			53.96							(32a)
Party ceiling			53.96							(32b)
Internal wall **			95.03							(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) = 23.17 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.04 (36)

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

Total fabric heat loss (33) + (36) = 29.21 (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=	29.42	29.2	28.98	27.93	27.74	26.83	26.83	26.66	27.18	27.74	28.13	28.55	(38)

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

(39)m=	58.63	58.41	58.18	57.14	56.95	56.04	56.04	55.87	56.39	56.95	57.34	57.75	

Average = Sum(39)$_{1…12}$ /12= 57.14 (39)

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

(40)m=	1.09	1.08	1.08	1.06	1.06	1.04	1.04	1.04	1.04	1.06	1.06	1.07

Average = Sum(40)$_{1…12}$ /12= 1.06 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	(62)

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

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

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

Output from water heater

(64)m=	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	

Output from water heater (annual)$_{1...12}$ 1761.89 (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=	79.1	70.25	75.02	68.98	68.85	63.32	62.53	66.25	65.39	71.45	73.37	77.78	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	(66)

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

(67)m=	14.04	12.47	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	(67)

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

(68)m=	157.5	159.14	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	(68)

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

(69)m=	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	(71)

Water heating gains (Table 5)

(72)m=	106.32	104.54	100.84	95.81	92.55	87.95	84.04	89.05	90.83	96.03	101.91	104.55	(72)

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

(73)m=	330.96	329.25	319.1	302.84	286.57	270.67	260.21	265.15	273.38	289.81	308.7	322.63	(73)

6. Solar gains:

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

Orientation:	Access Factor 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)

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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=	372.58	413.97	471.74	553.51	623.52	629.9	596.26	533.05	459.37	393.35	361.07	356.62	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.92	0.77	0.56	0.41	0.48	0.77	0.96	0.99	1	(86)

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

(87)m=	19.93	20.07	20.33	20.68	20.91	20.99	21	21	20.93	20.62	20.22	19.91	(87)

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

(88)m=	20.01	20.02	20.02	20.03	20.04	20.05	20.05	20.05	20.05	20.04	20.03	20.03	(88)

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

(89)m=	0.99	0.99	0.97	0.9	0.71	0.48	0.32	0.38	0.69	0.94	0.99	1	(89)

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

(90)m=	18.59	18.79	19.17	19.67	19.96	20.04	20.05	20.05	20	19.6	19.04	18.58	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.22	19.4	19.72	20.15	20.41	20.49	20.5	20.5	20.44	20.08	19.6	19.21	(92)

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

(93)m=	19.22	19.4	19.72	20.15	20.41	20.49	20.5	20.5	20.44	20.08	19.6	19.21	(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	0.9	0.73	0.52	0.37	0.43	0.72	0.94	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	370.17	409.06	457.35	497.41	457.34	325.31	217.85	227.64	332.1	371.03	356.45	354.76	(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=	874.98	846.6	769	642.6	495.76	330	218.42	228.93	357.48	540.07	716.56	866.86	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	375.57	294.03	231.87	104.53	28.59	0	0	0	0	125.77	259.28	381	

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Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	1800.63	(98)
Space heating requirement in kWh/m²/year	33.37	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	375.57	294.03	231.87	104.53	28.59	0	0	0	0	125.77	259.28	381		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	401.68	314.47	247.99	111.8	30.57	0	0	0	0	134.51	277.3	407.49		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													1925.81	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Output from water heater (calculated above)	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42		
Efficiency of water heater													79.8	(216)
(217)m=	86.84	86.54	85.8	83.97	81.42	79.8	79.8	79.8	79.8	84.36	86.14	86.93		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	198.52	175.75	186.62	171.56	173.88	159.2	153.55	167.59	167.01	177.06	182.58	193.74		
Total = Sum(219a)$_{1...12}$ =													2107.07	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1925.81	
Water heating fuel used			2107.07	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			247.96	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4355.84	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

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

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

TER = 19.25 (273)

Regulations Compliance Report

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

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 69.61m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 04 - E

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	18.52 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.10 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	41.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas		

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.11	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(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) =	0.36	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 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

0.46	0.45	0.44	0.39	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(24d)

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

(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(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			(29)
Walls Type2	18.41	0	18.41	x	0.18	=	3.31			(29)
Roof	69.61	0	69.61	x	0.13	=	9.05			(30)
Total area of elements, m²			129.61							(31)
Party wall			38.68	x	0	=	0			(32)
Party floor			69.61							(32a)
Internal wall **			136.21							(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) = 33.47 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.21 (36)

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

Total fabric heat loss (33) + (36) = 40.68 (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=	36.79	36.55	36.3	35.17	34.96	33.97	33.97	33.78	34.35	34.96	35.39	35.84	(38)

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

(39)m=	77.47	77.22	76.98	75.85	75.63	74.64	74.64	74.46	75.02	75.63	76.06	76.51	

Average = $Sum(39)_{1…12}$ /12= 75.85 (39)

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

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

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 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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	(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=	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	

Output from water heater (annual)$_{1...12}$ 1922.5 (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=	84.64	75.09	80.02	73.34	73.03	66.93	65.87	70.09	69.28	75.97	78.31	83.14	(65)

include (57)m in 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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	113.76	111.74	107.55	101.86	98.16	92.96	88.53	94.2	96.22	102.11	108.77	111.75	(72)

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

(73)m=	387.74	385.74	373.42	353.63	333.64	314.32	301.73	307.38	317.52	337.51	360.46	377.56	(73)

6. Solar 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=	451.5	504.63	563.38	634.74	690.26	686.72	653.12	599.63	538.6	476.27	438.71	430.92	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.99	0.95	0.85	0.66	0.5	0.56	0.82	0.97	0.99	1	(86)

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

(87)m=	19.85	19.99	20.24	20.57	20.84	20.97	20.99	20.99	20.9	20.56	20.15	19.84	(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	20.02	20.02	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=	1	0.99	0.98	0.93	0.8	0.57	0.39	0.45	0.75	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=	18.47	18.67	19.03	19.51	19.86	20	20.02	20.02	19.94	19.5	18.92	18.45	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19	19.17	19.49	19.91	20.23	20.37	20.39	20.39	20.31	19.9	19.39	18.98	(92)

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

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(93)m=	19	19.17	19.49	19.91	20.23	20.37	20.39	20.39	20.31	19.9	19.39	18.98	(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	0.93	0.81	0.61	0.43	0.49	0.77	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	449.19	499.78	550.46	590.78	559.57	416.56	281.18	293.54	416.95	454.64	434.23	429.17	(95)
Monthly 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=	1138.5	1102.3	999.86	835.35	645.26	430.75	283.07	297.14	465.54	703.6	934.61	1130.58	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	512.85	404.89	334.35	176.09	63.76	0	0	0	0	185.23	360.27	521.85	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2559.29 (98)

Space heating requirement in kWh/m²/year 36.77 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	512.85	404.89	334.35	176.09	63.76	0	0	0	0	185.23	360.27	521.85	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	548.5	433.04	357.6	188.34	68.19	0	0	0	0	198.11	385.32	558.12	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2737.2 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)													
	189.04	166.67	175.15	157.17	154.14	137.89	132.59	145.27	144.95	162.97	172.12	184.54	
Efficiency of water heater												79.8	(216)
(217)m=	87.35	87.09	86.51	85.12	82.66	79.8	79.8	79.8	79.8	85.16	86.74	87.44	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	216.42	191.36	202.46	184.65	186.47	172.8	166.15	182.05	181.64	191.38	198.44	211.06	

Total = Sum(219a)$_{1...12}$ = 2284.87 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2737.2

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Water heating fuel used			2284.87	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			318.62	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5415.69	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	591.24	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	493.53	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1084.77	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	165.36	(268)
Total CO2, kg/year		sum of (265)…(271) =		1289.06	(272)

TER = 18.52 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	21.42 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.26 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.51	0.5	0.49	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47

Calculate effective air change rate for the applicable case

If mechanical ventilation:	0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)	0	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0	(23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

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

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)

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]

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

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)
(24d)m=	0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)
(25)m=	0.63	0.62	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat 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			(29)
Walls Type2	22.92	0	22.92	x	0.18	=	4.13			(29)
Roof	50.62	0	50.62	x	0.13	=	6.58			(30)
Total area of elements, m²			104.94							(31)
Party wall			30.08	x	0	=	0			(32)
Party floor			50.62							(32a)
Internal wall **			83.2							(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) =	26.64	(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	Indicative Value: Medium	250	(35)

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

Thermal bridges : S (L x Y) calculated using Appendix K		6.08	(36)

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

Total fabric heat loss	(33) + (36) =	32.71	(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=	27.86	27.64	27.42	26.4	26.21	25.32	25.32	25.15	25.66	26.21	26.6	27	(38)

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

(39)m=	60.58	60.36	60.14	59.11	58.92	58.03	58.03	57.86	58.37	58.92	59.31	59.72	

Average = $Sum(39)_{1\ldots12}$ /12= 59.11 (39)

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

(40)m=	1.2	1.19	1.19	1.17	1.16	1.15	1.15	1.14	1.15	1.16	1.17	1.18

Average = Sum(40)$_{1…12}$ /12= 1.17 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33

(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72	(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=	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72	

Output from water heater (annual)$_{1...12}$ 1725.1 (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=	77.83	69.14	73.88	67.99	67.9	62.5	61.76	65.37	64.51	70.41	72.24	76.55	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	104.61	102.89	99.3	94.42	91.26	86.8	83.01	87.87	89.59	94.64	100.34	102.89	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	318.67	316.97	307.24	291.69	276.19	261.04	251.06	255.89	263.76	279.47	297.51	310.76	(73)

6. Solar 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=	349.6	379.93	420.67	477.98	526.6	528	500.8	454.98	401.98	356.42	336.43	336.02	(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	0.95	0.85	0.66	0.5	0.57	0.83	0.97	0.99	1	(86)

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

(87)m=	19.78	19.91	20.16	20.52	20.81	20.96	20.99	20.99	20.88	20.51	20.09	19.77	(87)

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

(88)m=	19.92	19.93	19.93	19.95	19.95	19.96	19.96	19.97	19.96	19.95	19.94	19.94	(88)

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

(89)m=	1	0.99	0.98	0.93	0.8	0.57	0.39	0.45	0.76	0.96	0.99	1	(89)

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

(90)m=	18.31	18.5	18.86	19.38	19.77	19.94	19.96	19.96	19.86	19.38	18.78	18.3	(90)

fLA = Living area ÷ (4) = 0.49 (91)

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

(92)m=	19.03	19.19	19.5	19.94	20.28	20.44	20.47	20.46	20.36	19.93	19.43	19.02	(92)

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

(93)m=	19.03	19.19	19.5	19.94	20.28	20.44	20.47	20.46	20.36	19.93	19.43	19.02	(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	0.93	0.82	0.62	0.44	0.51	0.79	0.96	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	347.37	376.01	411.07	445.68	429.35	324.89	222.15	230.96	318.12	340.75	332.49	334.25	(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=	892.33	862.32	781.6	652.6	505.61	338.83	224.33	235.08	365.22	549.84	731	884.93	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	405.45	326.8	275.67	148.98	56.74	0	0	0	0	155.56	286.92	409.71	(98)

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Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2065.84	(98)
Space heating requirement in kWh/m²/year	40.81	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	405.45	326.8	275.67	148.98	56.74	0	0	0	0	155.56	286.92	409.71		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	433.63	349.52	294.84	159.34	60.69	0	0	0	0	166.38	306.87	438.2		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													2209.45	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)
Water heating														
Output from water heater (calculated above)	168.57	148.77	156.68	141.07	138.69	124.56	120.23	131.1	130.6	146.25	153.87	164.72		
Efficiency of water heater													79.8	(216)
(217)m=	87.07	86.86	86.31	84.96	82.64	79.8	79.8	79.8	79.8	84.98	86.45	87.15		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	193.6	171.28	181.54	166.04	167.82	156.09	150.67	164.28	163.66	172.1	177.98	189.01		
Total = Sum(219a)$_{1...12}$ =													2054.07	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2209.45	
Water heating fuel used			2054.07	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			239.96	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4578.48	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

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

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

TER =	21.42	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 06 December 2021 at 11:03:12

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	19.33 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.12 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.47	0.46	0.45	0.4	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(25)

3. Heat 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			8.34	x1/[1/(1.4)+ 0.04]	=	11.06			(27)
Windows Type 2			7.64	x1/[1/(1.4)+ 0.04]	=	10.13			(27)
Walls Type1	61.09	15.98	45.11	x 0.18	=	8.12			(29)
Walls Type2	3.86	0	3.86	x 0.18	=	0.69			(29)
Roof	63.92	0	63.92	x 0.13	=	8.31			(30)
Total area of elements, m²			128.87						(31)
Party wall			37.5	x 0	=	0			(32)
Party floor			63.92						(32a)
Internal wall **			113.47						(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) = 38.31 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8779.01 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 8.3 (36)

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

Total fabric heat loss (33) + (36) = 46.61 (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=	34.1	33.87	33.63	32.53	32.32	31.37	31.37	31.19	31.74	32.32	32.74	33.18	(38)

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

(39)m=	80.71	80.47	80.24	79.14	78.93	77.97	77.97	77.79	78.34	78.93	79.35	79.78	

Average = Sum(39)$_{1…12}$ /12= 79.14 (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=	1.26	1.26	1.26	1.24	1.23	1.22	1.22	1.22	1.23	1.23	1.24	1.25	

Average = Sum(40)$_{1…12}$ /12= 1.24 (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)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m 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=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	(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=	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04	

Output from water heater (annual)$_{1...12}$ 1867.72 (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=	82.75	73.44	78.32	71.85	71.61	65.7	64.73	68.78	67.95	74.43	76.63	81.31	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	111.22	109.29	105.26	99.8	96.25	91.25	87	92.44	94.38	100.04	106.43	109.29	(72)

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

(73)m=	367.58	365.71	354.21	335.72	317.08	298.97	287.12	292.49	301.9	320.59	342.07	358.04	(73)

6. Solar 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	8.34	x	11.28	x	0.63	x	0.7	=	28.76	(75)
Northeast 0.9x	0.77	x	8.34	x	22.97	x	0.63	x	0.7	=	58.54	(75)
Northeast 0.9x	0.77	x	8.34	x	41.38	x	0.63	x	0.7	=	105.47	(75)
Northeast 0.9x	0.77	x	8.34	x	67.96	x	0.63	x	0.7	=	173.21	(75)
Northeast 0.9x	0.77	x	8.34	x	91.35	x	0.63	x	0.7	=	232.82	(75)

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Northeast	0.9x	0.77	x	8.34	x	97.38	x	0.63	x	0.7	=	248.21	(75)
Northeast	0.9x	0.77	x	8.34	x	91.1	x	0.63	x	0.7	=	232.2	(75)
Northeast	0.9x	0.77	x	8.34	x	72.63	x	0.63	x	0.7	=	185.11	(75)
Northeast	0.9x	0.77	x	8.34	x	50.42	x	0.63	x	0.7	=	128.51	(75)
Northeast	0.9x	0.77	x	8.34	x	28.07	x	0.63	x	0.7	=	71.54	(75)
Northeast	0.9x	0.77	x	8.34	x	14.2	x	0.63	x	0.7	=	36.19	(75)
Northeast	0.9x	0.77	x	8.34	x	9.21	x	0.63	x	0.7	=	23.49	(75)
Southeast	0.9x	0.77	x	7.64	x	36.79	x	0.63	x	0.7	=	85.91	(77)
Southeast	0.9x	0.77	x	7.64	x	62.67	x	0.63	x	0.7	=	146.34	(77)
Southeast	0.9x	0.77	x	7.64	x	85.75	x	0.63	x	0.7	=	200.22	(77)
Southeast	0.9x	0.77	x	7.64	x	106.25	x	0.63	x	0.7	=	248.09	(77)
Southeast	0.9x	0.77	x	7.64	x	119.01	x	0.63	x	0.7	=	277.88	(77)
Southeast	0.9x	0.77	x	7.64	x	118.15	x	0.63	x	0.7	=	275.87	(77)
Southeast	0.9x	0.77	x	7.64	x	113.91	x	0.63	x	0.7	=	265.96	(77)
Southeast	0.9x	0.77	x	7.64	x	104.39	x	0.63	x	0.7	=	243.74	(77)
Southeast	0.9x	0.77	x	7.64	x	92.85	x	0.63	x	0.7	=	216.8	(77)
Southeast	0.9x	0.77	x	7.64	x	69.27	x	0.63	x	0.7	=	161.73	(77)
Southeast	0.9x	0.77	x	7.64	x	44.07	x	0.63	x	0.7	=	102.9	(77)
Southeast	0.9x	0.77	x	7.64	x	31.49	x	0.63	x	0.7	=	73.52	(77)

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

(83)m=	114.67	204.87	305.69	421.29	510.7	524.08	498.16	428.85	345.31	233.27	139.08	97.01	(83)

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

(84)m=	482.24	570.59	659.9	757.01	827.78	823.06	785.28	721.34	647.21	553.86	481.15	455.04	(84)

7. Mean 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	0.91	0.77	0.58	0.43	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=	19.75	19.95	20.24	20.61	20.86	20.97	20.99	20.99	20.92	20.57	20.09	19.72	(87)

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

(88)m=	19.87	19.87	19.88	19.89	19.89	19.9	19.9	19.91	19.9	19.89	19.89	19.88	(88)

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

(89)m=	0.99	0.98	0.96	0.88	0.71	0.49	0.33	0.38	0.66	0.92	0.98	0.99	(89)

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

(90)m=	18.23	18.52	18.94	19.46	19.77	19.89	19.9	19.9	19.84	19.42	18.74	18.19	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	18.81	19.06	19.44	19.89	20.19	20.3	20.32	20.32	20.25	19.85	19.26	18.77	(92)

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

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(93)m=	18.81	19.06	19.44	19.89	20.19	20.3	20.32	20.32	20.25	19.85	19.26	18.77	(93)

8. Space 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	0.95	0.88	0.73	0.53	0.37	0.42	0.69	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	477.7	559.15	628.8	664.54	603.37	433.48	288.32	301.85	444.95	508.69	471.99	451.69	(95)
Monthly 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=	1170.91	1139.37	1038.14	869.97	669.77	444.44	289.86	304.67	481.63	730.48	964.51	1162.69	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	515.75	389.91	304.55	147.91	49.4	0	0	0	0	165.01	354.61	528.99	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2456.13 (98)

Space heating requirement in kWh/m²/year 38.43 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	515.75	389.91	304.55	147.91	49.4	0	0	0	0	165.01	354.61	528.99	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	551.61	417.01	325.72	158.19	52.84	0	0	0	0	176.48	379.27	565.76	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2626.88 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	183.36	161.7	170.03	152.7	149.85	134.19	129.16	141.34	140.97	158.33	167.06	179.04

Efficiency of water heater 79.8 (216)

(217)m=	87.43	87.08	86.35	84.73	82.21	79.8	79.8	79.8	79.8	84.92	86.77	87.53	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	209.73	185.7	196.9	180.22	182.28	168.16	161.85	177.12	176.65	186.44	192.52	204.54

Total = Sum(219a)$_{1...12}$ = 2222.1 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2626.88

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Water heating fuel used			2222.1	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			287.67	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5211.66	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	567.41	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	479.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1047.38	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	149.3	(268)
Total CO2, kg/year			sum of (265)…(271) =		1235.61	(272)

TER = 19.33 (273)

Regulations Compliance Report

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

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:** 04 - H

Address :

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	19.72 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.26 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.13	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(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) =	0.38	(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

0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(24d)

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

(25)m=	0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	(25)

3. Heat losses and heat loss 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			(29)
Walls Type2	27.31	0	27.31	x 0.18	=	4.92			(29)
Roof	60.34	0	60.34	x 0.13	=	7.84			(30)
Total area of elements, m²			140.45						(31)
Party wall			16.88	x 0	=	0			(32)
Party floor			60.34						(32a)
Internal wall **			107.91						(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) = 37.97 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.67 (36)

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

Total fabric heat loss (33) + (36) = 45.64 (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=	32.42	32.18	31.95	30.87	30.67	29.73	29.73	29.56	30.1	30.67	31.08	31.51	(38)

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

(39)m=	78.06	77.82	77.59	76.52	76.31	75.37	75.37	75.2	75.74	76.31	76.72	77.15	

Average = Sum(39)$_{1…12}$ /12= 76.52 (39)

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

(40)m=	1.29	1.29	1.29	1.27	1.26	1.25	1.25	1.25	1.26	1.26	1.27	1.28	

Average = Sum(40)$_{1…12}$ /12= 1.27 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	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 — 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): — 1.39 (48)

Temperature factor from Table 2b — 0.54 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0.75 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) — 0 (51)

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) — 0.75 (55)

Water storage loss calculated for each month — ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34	(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=	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34

Output from water heater (annual)$_{1...12}$ | 1830.8 | (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=	81.48	72.33	77.17	70.85	70.65	64.87	63.96	67.9	67.06	73.39	75.49	80.08	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot 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=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	-79.65	(71)
Water heating gains (Table 5)													
(72)m=	109.51	107.63	103.72	98.41	94.96	90.1	85.97	91.26	93.14	98.64	104.85	107.64	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	354.68	352.87	341.84	324.13	306.33	289.01	277.64	282.86	291.85	309.75	330.31	345.57	(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=	486.08	580.03	661.54	735.15	780.29	765.52	734.56	691.91	643.03	563.21	488.31	457.62	(84)

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

TER WorkSheet: New dwelling design stage

(86)m=	0.99	0.98	0.96	0.9	0.78	0.6	0.45	0.49	0.73	0.93	0.99	0.99	(86)

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

(87)m=	19.75	19.96	20.26	20.6	20.85	20.97	20.99	20.99	20.92	20.59	20.11	19.72	(87)

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

(88)m=	19.85	19.85	19.85	19.87	19.87	19.88	19.88	19.88	19.88	19.87	19.86	19.86	(88)

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

(89)m=	0.99	0.98	0.95	0.87	0.72	0.51	0.34	0.38	0.64	0.9	0.98	0.99	(89)

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

(90)m=	18.22	18.52	18.95	19.43	19.73	19.86	19.88	19.88	19.82	19.42	18.75	18.18	(90)

fLA = Living area ÷ (4) = 0.44 (91)

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

(92)m=	18.9	19.16	19.53	19.95	20.23	20.35	20.37	20.37	20.31	19.94	19.35	18.86	(92)

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

(93)m=	18.9	19.16	19.53	19.95	20.23	20.35	20.37	20.37	20.31	19.94	19.35	18.86	(93)

8. Space heating 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	0.95	0.88	0.74	0.55	0.38	0.43	0.68	0.9	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	480.4	565.56	625.69	643.42	578.54	420	282.35	295.4	435.04	509.67	476.79	453.44	(95)
Monthly average external 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=	1139.68	1110.01	1010.83	845.22	650.71	433.46	284.36	298.66	470.01	712.84	939.86	1131.2	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	490.51	365.87	286.54	145.3	53.7	0	0	0	0	151.16	333.41	504.26	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2330.74 (98)

Space heating requirement in kWh/m²/year 38.63 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	490.51	365.87	286.54	145.3	53.7	0	0	0	0	151.16	333.41	504.26	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	524.6	391.3	306.46	155.4	57.43	0	0	0	0	161.67	356.59	539.31	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2492.77 (211)

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Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Total (kWh/year) =Sum(215)$_{1...5,10...12}$=					0	(215)

Water heating

Output from water heater (calculated above)

	179.53	158.35	166.57	149.69	146.96	131.7	126.85	138.69	138.28	155.2	163.64	175.34		
Efficiency of water heater													79.8	(216)
(217)m=	87.36	86.98	86.25	84.73	82.41	79.8	79.8	79.8	79.8	84.74	86.67	87.47		(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	205.5	182.06	193.13	176.66	178.33	165.04	158.96	173.79	173.29	183.14	188.8	200.44		
								Total = Sum(219a)$_{1...12}$ =					2179.15	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2492.77	
Water heating fuel used			2179.15	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			273.64	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			5020.56	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	538.44	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	470.7	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1009.13	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	142.02	(268)
Total CO2, kg/year		sum of (265)…(271) =		1190.08	(272)

TER =	19.72	(273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	15.34 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.08 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							4	x 10 =	40	(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) =	40	÷ (5) =	0.15	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

0.5	0.49	0.48	0.43	0.43	0.38	0.38	0.37	0.4	0.43	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

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

(25)m=	0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross 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			(29)
Walls Type2	49.77	0	49.77	x	0.18	=	8.96			(29)
Total area of elements, m²			125.93							(31)
Party wall			12.14	x	0	=	0			(32)
Party floor			103.81							(32a)
Party ceiling			103.81							(32b)
Internal wall **			193.17							(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) = 49.39 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 15708.13 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 9.77 (36)

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

Total fabric heat loss (33) + (36) = 59.16 (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

TER WorkSheet: New dwelling design stage

(38)m=	56.93	56.48	56.04	53.98	53.59	51.8	51.8	51.46	52.49	53.59	54.37	55.19	(38)

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

(39)m=	116.08	115.63	115.2	113.13	112.75	110.95	110.95	110.62	111.64	112.75	113.53	114.34	

Average = $Sum(39)_{1...12}$ /12= 113.13 (39)

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

(40)m=	1.12	1.11	1.11	1.09	1.09	1.07	1.07	1.07	1.08	1.09	1.09	1.1

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 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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter ‘0’ in (47)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer’s declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63	(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=	209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63

Output from water heater (annual)$_{1...12}$ | 2122.6 | (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=	91.54	81.12	86.25	78.77	78.24	71.42	70.03	74.87	74.11	81.61	84.46	89.82	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	123.03	120.72	115.92	109.4	105.16	99.2	94.13	100.63	102.93	109.69	117.31	120.73	(72)

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

(73)m=	476.34	474.14	458.6	433.37	407.47	382.69	366.7	373.08	386.13	411.59	440.88	463.12	(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)

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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=	702.63	864.87	1007.23	1136.66	1216.67	1195.48	1146.38	1072.31	988.1	847.21	712.88	656.15	(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

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(86)m=	1	0.99	0.97	0.91	0.77	0.58	0.42	0.47	0.72	0.94	0.99	1	(86)

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

(87)m=	19.87	20.08	20.37	20.69	20.9	20.98	21	21	20.95	20.66	20.2	19.84	(87)

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

(88)m=	19.99	19.99	19.99	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=	1	0.99	0.96	0.88	0.71	0.5	0.33	0.37	0.64	0.92	0.99	1	(89)

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

(90)m=	18.49	18.8	19.21	19.66	19.92	20.02	20.03	20.03	19.98	19.63	18.99	18.46	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.02	19.29	19.65	20.06	20.3	20.39	20.4	20.4	20.35	20.03	19.45	18.99	(92)

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

(93)m=	19.02	19.29	19.65	20.06	20.3	20.39	20.4	20.4	20.35	20.03	19.45	18.99	(93)

8. 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	0.88	0.73	0.53	0.37	0.41	0.67	0.92	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	698.32	850.4	962.81	1000.89	890.81	631.06	420.16	440.06	661.6	778.46	702.57	653.23	(95)
Monthly 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=	1708.94	1664.31	1515.25	1262.35	969.29	642.09	421.45	442.35	698.14	1062.76	1402.55	1691.21	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	751.9	546.95	411.02	188.25	58.4	0	0	0	0	211.52	503.99	772.26	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3444.29 (98)

Space heating requirement in kWh/m²/year 33.18 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	751.9	546.95	411.02	188.25	58.4	0	0	0	0	211.52	503.99	772.26	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	804.18	584.98	439.59	201.34	62.45	0	0	0	0	226.23	539.02	825.95	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 3683.73 (211)

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Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63

Efficiency of water heater 79.8 (216)

(217)m=	87.93	87.54	86.77	85.03	82.29	79.8	79.8	79.8	79.8	85.25	87.29	88.03	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	238.58	211.13	223.43	204.03	206.34	189.73	181.85	200.06	199.87	211.06	218.39	232.47

Total = Sum(219a)$_{1...12}$ = 2516.93 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3683.73	
Water heating fuel used		2516.93	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75	(231)
Electricity for lighting		412.99	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		6688.66	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	795.69	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	543.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1339.34	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	214.34	(268)
Total CO2, kg/year		sum of (265)…(271) =		1592.61	(272)

TER = 15.34 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	18.61 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.22 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	41.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas		

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.12	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.37	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		0	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	1	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.37	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
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

0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(24d)

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

(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	(25)

3. Heat 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			12.29	x1/[1/(1.4)+ 0.04] =	16.29			(27)
Windows Type 2			3.35	x1/[1/(1.4)+ 0.04] =	4.44			(27)
Walls Type1	46.72	15.64	31.08	x 0.18 =	5.59			(29)
Walls Type2	13.75	0	13.75	x 0.18 =	2.48			(29)
Total area of elements, m²			60.47					(31)
Party wall			30.32	x 0 =	0			(32)
Party floor			62.56					(32a)
Party ceiling			62.56					(32b)
Internal wall **			100.8					(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) = 28.8 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9340.6 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.92 (36)

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

Total fabric heat loss (33) + (36) = 35.73 (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=	33.46	33.23	32.99	31.9	31.7	30.75	30.75	30.57	31.11	31.7	32.11	32.54	(38)

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

(39)m=	69.19	68.95	68.72	67.63	67.42	66.47	66.47	66.29	66.84	67.42	67.84	68.27	

Average = Sum(39)$_{1…12}$ /12= 67.63 (39)

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

(40)m=	1.11	1.1	1.1	1.08	1.08	1.06	1.06	1.06	1.07	1.08	1.08	1.09

Average = Sum(40)$_{1…12}$ /12= 1.08 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	181.92	160.44	168.73	151.57	148.77	133.26	128.29	140.35	139.96	157.16	165.78	177.65	(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=	181.92	160.44	168.73	151.57	148.77	133.26	128.29	140.35	139.96	157.16	165.78	177.65	

Output from water heater (annual)$_{1...12}$ 1853.89 (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=	82.27	73.02	77.89	71.48	71.25	65.39	64.44	68.45	67.62	74.04	76.2	80.85	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	110.58	108.67	104.69	99.28	95.76	90.82	86.61	92	93.91	99.51	105.84	108.67	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	362.72	360.88	349.56	331.36	313.03	295.22	283.55	288.86	298.12	316.51	337.64	353.34	(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	12.29	x	11.28	x	0.63	x	0.7	=	42.38	(75)
Northeast 0.9x	0.77	x	12.29	x	22.97	x	0.63	x	0.7	=	86.26	(75)
Northeast 0.9x	0.77	x	12.29	x	41.38	x	0.63	x	0.7	=	155.42	(75)
Northeast 0.9x	0.77	x	12.29	x	67.96	x	0.63	x	0.7	=	255.24	(75)
Northeast 0.9x	0.77	x	12.29	x	91.35	x	0.63	x	0.7	=	343.09	(75)

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Northeast 0.9x	0.77	x	12.29	x	97.38	x	0.63	x	0.7	=	365.77	(75)
Northeast 0.9x	0.77	x	12.29	x	91.1	x	0.63	x	0.7	=	342.17	(75)
Northeast 0.9x	0.77	x	12.29	x	72.63	x	0.63	x	0.7	=	272.79	(75)
Northeast 0.9x	0.77	x	12.29	x	50.42	x	0.63	x	0.7	=	189.38	(75)
Northeast 0.9x	0.77	x	12.29	x	28.07	x	0.63	x	0.7	=	105.42	(75)
Northeast 0.9x	0.77	x	12.29	x	14.2	x	0.63	x	0.7	=	53.32	(75)
Northeast 0.9x	0.77	x	12.29	x	9.21	x	0.63	x	0.7	=	34.61	(75)
Northwest 0.9x	0.77	x	3.35	x	11.28	x	0.63	x	0.7	=	11.55	(81)
Northwest 0.9x	0.77	x	3.35	x	22.97	x	0.63	x	0.7	=	23.51	(81)
Northwest 0.9x	0.77	x	3.35	x	41.38	x	0.63	x	0.7	=	42.36	(81)
Northwest 0.9x	0.77	x	3.35	x	67.96	x	0.63	x	0.7	=	69.57	(81)
Northwest 0.9x	0.77	x	3.35	x	91.35	x	0.63	x	0.7	=	93.52	(81)
Northwest 0.9x	0.77	x	3.35	x	97.38	x	0.63	x	0.7	=	99.7	(81)
Northwest 0.9x	0.77	x	3.35	x	91.1	x	0.63	x	0.7	=	93.27	(81)
Northwest 0.9x	0.77	x	3.35	x	72.63	x	0.63	x	0.7	=	74.36	(81)
Northwest 0.9x	0.77	x	3.35	x	50.42	x	0.63	x	0.7	=	51.62	(81)
Northwest 0.9x	0.77	x	3.35	x	28.07	x	0.63	x	0.7	=	28.74	(81)
Northwest 0.9x	0.77	x	3.35	x	14.2	x	0.63	x	0.7	=	14.53	(81)
Northwest 0.9x	0.77	x	3.35	x	9.21	x	0.63	x	0.7	=	9.43	(81)

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

(83)m=	53.93	109.78	197.78	324.81	436.61	465.48	435.44	347.14	241	134.16	67.86	44.04	(83)

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

(84)m=	416.65	470.65	547.34	656.17	749.65	760.7	718.99	636	539.12	450.66	405.5	397.38	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.92	0.76	0.55	0.4	0.47	0.77	0.96	0.99	1	(86)

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

(87)m=	19.88	20.03	20.3	20.67	20.91	20.99	21	21	20.93	20.59	20.18	19.86	(87)

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

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

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

(89)m=	1	0.99	0.97	0.89	0.7	0.47	0.32	0.38	0.69	0.95	0.99	1	(89)

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

(90)m=	18.51	18.72	19.12	19.65	19.94	20.02	20.03	20.03	19.97	19.55	18.96	18.49	(90)

fLA = Living area ÷ (4) = 0.43 (91)

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

(92)m=	19.1	19.28	19.63	20.09	20.36	20.44	20.45	20.45	20.38	20	19.48	19.08	(92)

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

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(93)m=	19.1	19.28	19.63	20.09	20.36	20.44	20.45	20.45	20.38	20	19.48	19.08	(93)

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	0.89	0.72	0.5	0.35	0.42	0.72	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	414.31	465.48	530.71	586.73	540.34	382.81	255.04	266.73	389.19	426.44	400.93	395.61	(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=	1023.86	991.83	902.35	756.53	583.62	388.05	255.69	268.24	420.06	633.87	840.02	1015.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	453.5	353.71	276.5	122.25	32.2	0	0	0	0	154.32	316.14	461.4	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2170.03 (98)

Space heating requirement in kWh/m²/year 34.69 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	453.5	353.71	276.5	122.25	32.2	0	0	0	0	154.32	316.14	461.4	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	485.03	378.29	295.72	130.75	34.44	0	0	0	0	165.05	338.12	493.48	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2320.89 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)

	181.92	160.44	168.73	151.57	148.77	133.26	128.29	140.35	139.96	157.16	165.78	177.65	
Efficiency of water heater												79.8	(216)
(217)m=	87.15	86.87	86.12	84.25	81.51	79.8	79.8	79.8	79.8	84.77	86.51	87.25	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.74	184.71	195.92	179.91	182.5	166.99	160.77	175.87	175.39	185.4	191.63	203.62

Total = Sum(219a)$_{1...12}$ = 2211.45 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2320.89

Water heating fuel used			2211.45	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			282.38	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4889.72	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	501.31	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	477.67	(264)
Space and water heating	(261) + (262) + (263) + (264) =			978.98	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	146.56	(268)
Total CO2, kg/year		sum of (265)…(271) =		1164.46	(272)

TER = 18.61 (273)

Regulations Compliance Report

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

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	18.46 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.74 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Party wall	0.00 (max. 0.20)	-	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**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 boilers – mains gas	

TER 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							3	x 10 =	30	(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) =	30	÷ (5) =	0.16	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)

if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.41	(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) =	0.41	(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

0.52	0.51	0.5	0.45	0.44	0.39	0.39	0.38	0.41	0.44	0.46	0.48

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	(24d)

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

(25)m=	0.63	0.63	0.62	0.6	0.6	0.57	0.57	0.57	0.58	0.6	0.6	0.61	(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			(29)
Walls Type2	17.78	0	17.78	x	0.18	=	3.2			(29)
Total area of elements, m²			90.4							(31)
Party wall			30.32	x	0	=	0			(32)
Party floor			72.62							(32a)
Party ceiling			72.62							(32b)
Internal wall **			146.17							(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) = 34.8 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 7.11 (36)

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

Total fabric heat loss (33) + (36) = 41.91 (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=	40.26	39.93	39.6	38.08	37.8	36.47	36.47	36.23	36.98	37.8	38.37	38.98	(38)

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

(39)m=	82.16	81.83	81.51	79.99	79.71	78.38	78.38	78.14	78.89	79.71	80.28	80.88	

Average = Sum(39)$_{1…12}$ /12= 79.99 (39)

TER WorkSheet: New dwelling design stage

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

(40)m=	1.13	1.13	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.11	1.11

Average = Sum(40)$_{1…12}$ /12= 1.1 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	(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=	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22	

Output from water heater (annual)$_{1...12}$ 1949.18 (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=	85.56	75.9	80.85	74.06	73.73	67.53	66.42	70.72	69.92	76.72	79.13	84.03	(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=	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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	115	112.94	108.67	102.87	99.1	93.79	89.28	95.06	97.11	103.12	109.9	112.95	(72)

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

(73)m=	397.08	395.1	382.51	362.21	341.65	321.75	308.78	314.47	324.85	345.36	368.93	386.56	(73)

6. Solar 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)

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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=	452.84	508.6	586.99	698.03	793.06	803.01	758.98	673.38	574.02	484.06	439.09	432.1	(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	1	0.99	0.94	0.81	0.6	0.45	0.52	0.82	0.97	1	1	(86)

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

(87)m=	19.81	19.95	20.22	20.59	20.87	20.98	21	20.99	20.9	20.53	20.11	19.79	(87)

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

(88)m=	19.98	19.98	19.98	20	20	20.02	20.02	20.02	20.01	20	20	19.99	(88)

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

(89)m=	1	0.99	0.98	0.92	0.75	0.52	0.35	0.42	0.74	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=	18.39	18.59	18.99	19.53	19.88	20	20.02	20.02	19.93	19.46	18.85	18.38	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	18.93	19.11	19.46	19.94	20.26	20.38	20.39	20.39	20.31	19.87	19.34	18.92	(92)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(93)m=	18.93	19.11	19.46	19.94	20.26	20.38	20.39	20.39	20.31	19.87	19.34	18.92		(93)

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=	1	0.99	0.98	0.92	0.77	0.55	0.39	0.46	0.77	0.96	0.99	1		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	450.87	504.39	573.79	641.97	610.85	443.15	296.05	309.09	440.19	464.28	435.34	430.62		(95)
Monthly average external temperature from Table 8														
(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=	1202.21	1163.16	1056.33	883.13	682.47	452.97	297.33	311.94	489.65	739.07	982.47	1190.69		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	558.99	442.69	359.01	173.64	53.28	0	0	0	0	204.44	393.93	565.49		
									Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =				2751.48	(98)
Space heating requirement in kWh/m²/year													37.89	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	558.99	442.69	359.01	173.64	53.28	0	0	0	0	204.44	393.93	565.49		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	597.85	473.47	383.97	185.71	56.99	0	0	0	0	218.66	421.32	604.8		
									Total (kWh/year) =Sum(211)$_{1...5,10...12}$=				2942.76	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
									Total (kWh/year) =Sum(215)$_{1...5,10...12}$=				0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)														
	191.8	169.09	177.65	159.35	156.22	139.69	134.26	147.19	146.89	165.23	174.59	187.22		
Efficiency of water heater													79.8	(216)
(217)m=	87.5	87.27	86.65	85.04	82.27	79.8	79.8	79.8	79.8	85.38	86.92	87.58		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	219.2	193.76	205.01	187.37	189.88	175.06	168.24	184.45	184.07	193.51	200.86	213.77		
									Total = Sum(219a)$_{1...12}$ =				2315.18	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2942.76

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Water heating fuel used		2315.18	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	75	(231)
Electricity for lighting		320.14	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		5653.09	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	635.64	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	500.08	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1135.72	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.15	(268)
Total CO2, kg/year		sum of (265)…(271) =		1340.79	(272)

TER = 18.46 (273)

Regulations Compliance Report

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

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: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	20.99 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.99 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							2	x 10 =	20	(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) =	20	÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(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) =	0.39	(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

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6	(24d)

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

(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.6	(25)

3. Heat 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			(29)
Walls Type2	24.24	0	24.24	x	0.18	=	4.36			(29)
Roof	53.96	0	53.96	x	0.13	=	7.01			(30)
Total area of elements, m²			105.86							(31)
Party wall			31.67	x	0	=	0			(32)
Party floor			53.96							(32a)
Internal wall **			95.03							(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) = 30.19 (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 Indicative Value: Medium 250 (35)

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

Thermal bridges : S (L x Y) calculated using Appendix K 6.35 (36)

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

Total fabric heat loss (33) + (36) = 36.54 (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=	29.42	29.2	28.98	27.93	27.74	26.83	26.83	26.66	27.18	27.74	28.13	28.55	(38)

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

(39)m=	65.96	65.74	65.51	64.47	64.28	63.37	63.37	63.2	63.72	64.28	64.67	65.08	

Average = Sum(39)$_{1…12}$ /12= 64.47 (39)

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

(40)m=	1.22	1.22	1.21	1.19	1.19	1.17	1.17	1.17	1.18	1.19	1.2	1.21

Average = Sum(40)$_{1…12}$ /12= 1.19 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(57)

Primary circuit loss (annual) from Table 3 0 (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder 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=	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	(62)

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

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

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

Output from water heater

(64)m=	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42	

Output from water heater (annual)$_{1...12}$ 1761.89 (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=	79.1	70.25	75.02	68.98	68.85	63.32	62.53	66.25	65.39	71.45	73.37	77.78	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	90.34	(66)

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

(67)m=	14.04	12.47	10.14	7.68	5.74	4.85	5.24	6.81	9.13	11.6	13.54	14.43	(67)

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

(68)m=	157.5	159.14	155.02	146.25	135.18	124.78	117.83	116.2	120.31	129.08	140.15	150.55	(68)

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

(69)m=	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	32.03	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	-72.27	(71)

Water heating gains (Table 5)

(72)m=	106.32	104.54	100.84	95.81	92.55	87.95	84.04	89.05	90.83	96.03	101.91	104.55	(72)

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

(73)m=	330.96	329.25	319.1	302.84	286.57	270.67	260.21	265.15	273.38	289.81	308.7	322.63	(73)

6. Solar gains:

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

Orientation:		Access Factor 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)

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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=	372.58	413.97	471.74	553.51	623.52	629.9	596.26	533.05	459.37	393.35	361.07	356.62	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.94	0.81	0.62	0.46	0.53	0.81	0.97	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.75	19.89	20.16	20.55	20.84	20.97	20.99	20.99	20.88	20.5	20.07	19.73	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.9	19.91	19.91	19.92	19.93	19.94	19.94	19.94	19.94	19.93	19.92	19.92	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.92	0.76	0.53	0.35	0.42	0.73	0.95	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.25	18.45	18.86	19.41	19.78	19.92	19.94	19.94	19.85	19.36	18.73	18.23	(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.95	19.13	19.47	19.95	20.28	20.42	20.44	20.43	20.34	19.9	19.36	18.94	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.95	19.13	19.47	19.95	20.28	20.42	20.44	20.43	20.34	19.9	19.36	18.94	(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	0.78	0.57	0.4	0.47	0.77	0.95	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	370.19	409.32	458.98	506.79	483.59	357.28	241.41	251.46	351.77	374.31	356.73	354.75	(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=	966.57	935.48	849.89	712.17	551.6	368.56	243.12	254.95	397.39	597.66	792.93	959.18	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	443.71	353.58	290.84	147.87	50.6	0	0	0	0	166.17	314.06	449.7	

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Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =	2216.54	(98)
Space heating requirement in kWh/m²/year	41.08	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)	443.71	353.58	290.84	147.87	50.6	0	0	0	0	166.17	314.06	449.7		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	474.56	378.16	311.06	158.15	54.12	0	0	0	0	177.72	335.89	480.96		(211)
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													2370.63	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Output from water heater (calculated above)	172.39	152.1	160.12	144.07	141.57	127.04	122.54	133.74	133.28	149.36	157.27	168.42		
Efficiency of water heater													79.8	(216)
(217)m=	87.23	86.99	86.39	84.88	82.36	79.8	79.8	79.8	79.8	85.1	86.62	87.31		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	197.63	174.85	185.35	169.72	171.88	159.2	153.55	167.59	167.01	175.52	181.56	192.89		
Total = Sum(219a)$_{1...12}$ =													2096.76	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			2370.63	
Water heating fuel used			2096.76	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		75	(231)
Electricity for lighting			247.96	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4790.35	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year

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Space heating (main system 1)	(211) x	0.216	=	512.06	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	452.9	(264)
Space and water heating	(261) + (262) + (263) + (264) =			964.96	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	128.69	(268)
Total CO2, kg/year		sum of (265)…(271) =		1132.57	(272)

TER =	20.99	(273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 06 December 2021 at 11:03:02

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: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	18.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.12 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							3	x 10 =	30	(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) =	30	÷ (5) =	0.13	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.38	(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) =	0.38	(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

0.49	0.48	0.47	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.43	0.45

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.62	0.61	0.61	0.59	0.58	0.57	0.57	0.56	0.57	0.58	0.59	0.6	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.62	0.61	0.61	0.59	0.58	0.57	0.57	0.56	0.57	0.58	0.59	0.6	(25)

3. Heat losses 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			12.45	x1/[1/(1.4)+ 0.04]	=	16.51			(27)
Windows Type 2			4.49	x1/[1/(1.4)+ 0.04]	=	5.95			(27)
Windows Type 3			4.75	x1/[1/(1.4)+ 0.04]	=	6.3			(27)
Walls Type1	62.71	21.69	41.02	x 0.18	=	7.38			(29)
Walls Type2	20.9	0	20.9	x 0.18	=	3.76			(29)
Roof	86.78	0	86.78	x 0.13	=	11.28			(30)
Total area of elements, m²			170.39						(31)
Party wall			26.3	x 0	=	0			(32)
Party floor			86.78						(32a)
Internal wall **			169.02						(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) = 51.18 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10672.1 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 8.51 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 59.69 (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

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(38)m=	46.87	46.53	46.19	44.59	44.29	42.9	42.9	42.64	43.44	44.29	44.9	45.53	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	106.57	106.22	105.88	104.28	103.98	102.59	102.59	102.34	103.13	103.98	104.59	105.22	

Average = $Sum(39)_{1...12}$ /12= 104.28 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.23	1.22	1.22	1.2	1.2	1.18	1.18	1.18	1.19	1.2	1.21	1.21	

Average = $Sum(40)_{1...12}$ /12= 1.2 (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)

	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=	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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	202.3	178.27	187.12	167.61	164.15	146.53	140.6	154.46	154.25	173.81	183.95	197.39	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar 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=	202.3	178.27	187.12	167.61	164.15	146.53	140.6	154.46	154.25	173.81	183.95	197.39

Output from water heater (annual)$_{1...12}$ | 2050.45 | (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=	89.05	78.95	84	76.81	76.36	69.8	68.53	73.14	72.37	79.57	82.24	87.42	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is 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=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	-103.16	(71)

Water heating gains (Table 5)

(72)m=	119.69	117.48	112.91	106.68	102.64	96.95	92.11	98.31	100.51	106.95	114.23	117.49	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	438.18	436.07	421.95	399.11	375.82	353.42	338.88	344.98	356.72	379.78	406.3	426.28	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the 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	12.45	x	11.28	x	0.63	x	0.7	=	42.93	(75)
Northeast 0.9x	0.77	x	12.45	x	22.97	x	0.63	x	0.7	=	87.39	(75)

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Northeast 0.9x	0.77	x	12.45	x	41.38	x	0.63	x	0.7	=	157.44	(75)
Northeast 0.9x	0.77	x	12.45	x	67.96	x	0.63	x	0.7	=	258.56	(75)
Northeast 0.9x	0.77	x	12.45	x	91.35	x	0.63	x	0.7	=	347.56	(75)
Northeast 0.9x	0.77	x	12.45	x	97.38	x	0.63	x	0.7	=	370.54	(75)
Northeast 0.9x	0.77	x	12.45	x	91.1	x	0.63	x	0.7	=	346.63	(75)
Northeast 0.9x	0.77	x	12.45	x	72.63	x	0.63	x	0.7	=	276.34	(75)
Northeast 0.9x	0.77	x	12.45	x	50.42	x	0.63	x	0.7	=	191.84	(75)
Northeast 0.9x	0.77	x	12.45	x	28.07	x	0.63	x	0.7	=	106.79	(75)
Northeast 0.9x	0.77	x	12.45	x	14.2	x	0.63	x	0.7	=	54.02	(75)
Northeast 0.9x	0.77	x	12.45	x	9.21	x	0.63	x	0.7	=	35.06	(75)
Southwest 0.9x	0.77	x	4.49	x	36.79		0.63	x	0.7	=	50.49	(79)
Southwest 0.9x	0.77	x	4.75	x	36.79		0.63	x	0.7	=	53.41	(79)
Southwest 0.9x	0.77	x	4.49	x	62.67		0.63	x	0.7	=	86	(79)
Southwest 0.9x	0.77	x	4.75	x	62.67		0.63	x	0.7	=	90.98	(79)
Southwest 0.9x	0.77	x	4.49	x	85.75		0.63	x	0.7	=	117.67	(79)
Southwest 0.9x	0.77	x	4.75	x	85.75		0.63	x	0.7	=	124.48	(79)
Southwest 0.9x	0.77	x	4.49	x	106.25		0.63	x	0.7	=	145.8	(79)
Southwest 0.9x	0.77	x	4.75	x	106.25		0.63	x	0.7	=	154.24	(79)
Southwest 0.9x	0.77	x	4.49	x	119.01		0.63	x	0.7	=	163.31	(79)
Southwest 0.9x	0.77	x	4.75	x	119.01		0.63	x	0.7	=	172.76	(79)
Southwest 0.9x	0.77	x	4.49	x	118.15		0.63	x	0.7	=	162.13	(79)
Southwest 0.9x	0.77	x	4.75	x	118.15		0.63	x	0.7	=	171.51	(79)
Southwest 0.9x	0.77	x	4.49	x	113.91		0.63	x	0.7	=	156.31	(79)
Southwest 0.9x	0.77	x	4.75	x	113.91		0.63	x	0.7	=	165.36	(79)
Southwest 0.9x	0.77	x	4.49	x	104.39		0.63	x	0.7	=	143.24	(79)
Southwest 0.9x	0.77	x	4.75	x	104.39		0.63	x	0.7	=	151.54	(79)
Southwest 0.9x	0.77	x	4.49	x	92.85		0.63	x	0.7	=	127.41	(79)
Southwest 0.9x	0.77	x	4.75	x	92.85		0.63	x	0.7	=	134.79	(79)
Southwest 0.9x	0.77	x	4.49	x	69.27		0.63	x	0.7	=	95.05	(79)
Southwest 0.9x	0.77	x	4.75	x	69.27		0.63	x	0.7	=	100.55	(79)
Southwest 0.9x	0.77	x	4.49	x	44.07		0.63	x	0.7	=	60.47	(79)
Southwest 0.9x	0.77	x	4.75	x	44.07		0.63	x	0.7	=	63.98	(79)
Southwest 0.9x	0.77	x	4.49	x	31.49		0.63	x	0.7	=	43.21	(79)
Southwest 0.9x	0.77	x	4.75	x	31.49		0.63	x	0.7	=	45.71	(79)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	146.83	264.37	399.6	558.6	683.63	704.18	668.29	571.12	454.05	302.39	178.47	123.98	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	585.01	700.43	821.54	957.71	1059.45	1057.59	1007.17	916.1	810.77	682.17	584.77	550.25	(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

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(86)m=	1	0.99	0.98	0.92	0.79	0.6	0.44	0.5	0.77	0.96	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.72	19.92	20.22	20.59	20.86	20.97	20.99	20.99	20.91	20.54	20.06	19.7	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.9	19.9	19.9	19.92	19.92	19.93	19.93	19.94	19.93	19.92	19.92	19.91	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.97	0.9	0.73	0.51	0.34	0.39	0.69	0.94	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.21	18.49	18.93	19.46	19.79	19.92	19.93	19.93	19.86	19.4	18.72	18.18	(90)

fLA = Living area ÷ (4) = 0.51 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.98	19.22	19.58	20.04	20.34	20.45	20.47	20.47	20.39	19.98	19.41	18.95	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.98	19.22	19.58	20.04	20.34	20.45	20.47	20.47	20.39	19.98	19.41	18.95	(93)

8. 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	0.9	0.75	0.55	0.39	0.45	0.73	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	581.64	691.06	792.85	860.32	799.4	584.01	394.9	411.95	589.47	641.14	577.69	547.85	(95)
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=	1564.46	1520.75	1385.32	1161.42	898.09	600.68	397.4	416.68	649.12	975.71	1286.96	1552.15	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	731.22	557.55	440.8	216.79	73.43	0	0	0	0	248.92	510.67	747.2	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3526.59 (98)

Space heating requirement in kWh/m²/year 40.64 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	731.22	557.55	440.8	216.79	73.43	0	0	0	0	248.92	510.67	747.2	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	782.06	596.32	471.44	231.87	78.53	0	0	0	0	266.22	546.18	799.15	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 3771.75 (211)

TER WorkSheet: New dwelling design stage

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Total (kWh/year) =Sum(215)$_{1...5,10...12}$=					0	(215)

Water heating

Output from water heater (calculated above)

	202.3	178.27	187.12	167.61	164.15	146.53	140.6	154.46	154.25	173.81	183.95	197.39	
Efficiency of water heater													79.8 (216)
(217)m=	87.94	87.65	87.02	85.5	82.83	79.8	79.8	79.8	79.8	85.77	87.4	88.03	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	230.03	203.38	215.03	196.03	198.19	183.63	176.19	193.56	193.29	202.64	210.48	224.22		
								Total = Sum(219a)$_{1...12}$ =					2426.68	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3771.75	
Water heating fuel used		2426.68	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year — sum of (230a)…(230g) =		75	(231)
Electricity for lighting		366.89	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		6640.31	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	814.7	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	524.16	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1338.86	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	190.41	(268)
Total CO2, kg/year		sum of (265)…(271) =		1568.2	(272)

TER = 18.07 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 06 December 2021 at 11:03:01

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 103.81m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 06 - A

Address :

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)		
Fuel factor: 1.00 (mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	17.03 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.76 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	44.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas	

TER 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							4	x 10 =	40	(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) =	40	÷ (5) =	0.15	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(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) =	0.4	(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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.5	0.49	0.48	0.43	0.43	0.38	0.38	0.37	0.4	0.43	0.44	0.46

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross 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			(29)
Walls Type2	49.77	0	49.77	x 0.18	=	8.96			(29)
Roof	103.81	0	103.81	x 0.13	=	13.5			(30)
Total area of elements, m²			229.74						(31)
Party wall			12.14	x 0	=	0			(32)
Party floor			103.81						(32a)
Internal wall **			193.17						(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) = 62.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13528.12 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.29 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 73.17 (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=	56.93	56.48	56.04	53.98	53.59	51.8	51.8	51.46	52.49	53.59	54.37	55.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	130.1	129.65	129.21	127.15	126.76	124.97	124.97	124.63	125.66	126.76	127.54	128.36	

Average = Sum(39)$_{1…12}$ /12= 127.15 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.25	1.25	1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.23	1.24

Average = Sum(40)$_{1…12}$ /12= 1.22 (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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63	(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=	209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63

Output from water heater (annual)$_{1...12}$ | 2122.6 | (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=	91.54	81.12	86.25	78.77	78.24	71.42	70.03	74.87	74.11	81.61	84.46	89.82	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	123.03	120.72	115.92	109.4	105.16	99.2	94.13	100.63	102.93	109.69	117.31	120.73	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	476.34	474.14	458.6	433.37	407.47	382.69	366.7	373.08	386.13	411.59	440.88	463.12	(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)

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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=	702.63	864.87	1007.23	1136.66	1216.67	1195.48	1146.38	1072.31	988.1	847.21	712.88	656.15	(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=	1	0.99	0.97	0.93	0.81	0.63	0.47	0.52	0.77	0.95	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.69	19.91	20.21	20.57	20.83	20.96	20.99	20.99	20.91	20.54	20.05	19.66	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.88	19.88	19.88	19.9	19.9	19.92	19.92	19.92	19.91	19.9	19.9	19.89	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.97	0.9	0.76	0.54	0.36	0.41	0.68	0.93	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.15	18.46	18.9	19.41	19.75	19.89	19.91	19.92	19.84	19.39	18.69	18.12	(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.74	19.02	19.4	19.85	20.16	20.3	20.33	20.33	20.25	19.84	19.21	18.71	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.74	19.02	19.4	19.85	20.16	20.3	20.33	20.33	20.25	19.84	19.21	18.71	(93)

8. 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	0.58	0.4	0.45	0.71	0.93	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	698.27	851.29	968.06	1022.14	938.7	688.13	462.38	483.48	705.18	788.47	703.15	653.13	(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=	1879.03	1830.43	1666.96	1392.75	1072.86	712.82	465.92	489.44	772.78	1170.7	1544.49	1862.51	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	878.49	657.98	519.98	266.84	99.81	0	0	0	0	284.38	605.77	899.78	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4213.03 (98)

Space heating requirement in kWh/m²/year 40.58 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	878.49	657.98	519.98	266.84	99.81	0	0	0	0	284.38	605.77	899.78	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	939.56	703.72	556.13	285.39	106.75	0	0	0	0	304.14	647.88	962.33	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 4505.91 (211)

TER WorkSheet: New dwelling design stage

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10...12}$=													0	(215)

Water heating

Output from water heater (calculated above)

	209.78	184.81	193.87	173.49	169.8	151.41	145.11	159.65	159.49	179.92	190.62	204.63		
Efficiency of water heater													79.8	(216)
(217)m=	88.22	87.92	87.32	85.96	83.45	79.8	79.8	79.8	79.8	86.03	87.69	88.31		(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	237.8	210.22	222.03	201.83	203.47	189.73	181.85	200.06	199.87	209.13	217.39	231.73		
Total = Sum(219a)$_{1...12}$ =													2505.1	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		4505.91	
Water heating fuel used		2505.1	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		75	(231)
Electricity for lighting		412.99	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		7499.01	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	973.28	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	541.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1514.38	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	214.34	(268)
Total CO2, kg/year		sum of (265)…(271) =		1767.65	(272)

TER = 17.03 (273)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 06 December 2021 at 11:03:01

Project Information:

Assessed By: Neil Ingham (STRO010943) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 133.02m²

Site Reference : Highgate Road - GREEN **Plot Reference:** 06 - B

Address :

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)
Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER)	17.24 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.11 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	No cylinder

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	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 boilers – mains gas		

TER 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							4	x 10 =	40	(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) =	40	÷ (5) =	0.11	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(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) =	0.36	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 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

TER WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.46	0.45	0.45	0.4	0.39	0.35	0.35	0.34	0.36	0.39	0.41	0.43

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	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=	0.61	0.6	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.58	0.59	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.61	0.6	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.58	0.59	(25)

3. Heat losses 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			24.03	x1/[1/(1.4)+ 0.04]		=	31.86			(27)
Windows Type 2			4.63	x1/[1/(1.4)+ 0.04]		=	6.14			(27)
Windows Type 3			4.6	x1/[1/(1.4)+ 0.04]		=	6.1			(27)
Walls Type1	95.16	33.26	61.9	x	0.18	=	11.14			(29)
Walls Type2	41.02	0	41.02	x	0.18	=	7.38			(29)
Roof	133.02	0	133.02	x	0.13	=	17.29			(30)
Total area of elements, m²			269.2							(31)
Party wall			12.16	x	0	=	0			(32)
Party floor			133.02							(32a)
Internal wall **			196.47							(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) = 79.91 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 15008.61 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 11.16 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 91.08 (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

TER WorkSheet: New dwelling design stage

(38)m=	70.65	70.17	69.69	67.46	67.04	65.1	65.1	64.74	65.85	67.04	67.89	68.77	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	161.73	161.25	160.77	158.54	158.12	156.18	156.18	155.82	156.93	158.12	158.97	159.85	

Average = $Sum(39)_{1...12}$ /12= 158.54 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.22	1.21	1.21	1.19	1.19	1.17	1.17	1.17	1.18	1.19	1.2	1.2

Average = $Sum(40)_{1...12}$ /12= 1.19 (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)

	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=	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 150 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)

b) If manufacturer's declared cylinder loss factor is not known:

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.75 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	(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=	214.83	189.23	198.43	177.47	173.61	154.7	148.16	163.14	163.03	184.04	195.13	209.52	(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=	214.83	189.23	198.43	177.47	173.61	154.7	148.16	163.14	163.03	184.04	195.13	209.52

Output from water heater (annual)$_{1...12}$ | 2171.29 | (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=	93.21	82.59	87.76	80.09	79.51	72.52	71.05	76.03	75.29	82.98	85.96	91.45	(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=	3	3	3	3	3	3	3	3	3	3	3	3	(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=	125.29	122.91	117.96	111.23	106.87	100.72	95.49	102.19	104.57	111.53	119.39	122.92	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	523.01	520.75	503.47	475.26	446.01	418.25	400.47	407.05	421.76	450.21	482.95	508.09	(73)

6. Solar gains:

Solar gains are calculated 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	24.03	x	11.28	x	0.63	x	0.7	=	82.86	(75)
Northeast 0.9x	0.77	x	24.03	x	22.97	x	0.63	x	0.7	=	168.67	(75)

Northeast	0.9x	0.77	x	24.03	x	41.38	x	0.63	x	0.7	=	303.88	(75)
Northeast	0.9x	0.77	x	24.03	x	67.96	x	0.63	x	0.7	=	499.06	(75)
Northeast	0.9x	0.77	x	24.03	x	91.35	x	0.63	x	0.7	=	670.83	(75)
Northeast	0.9x	0.77	x	24.03	x	97.38	x	0.63	x	0.7	=	715.18	(75)
Northeast	0.9x	0.77	x	24.03	x	91.1	x	0.63	x	0.7	=	669.04	(75)
Northeast	0.9x	0.77	x	24.03	x	72.63	x	0.63	x	0.7	=	533.36	(75)
Northeast	0.9x	0.77	x	24.03	x	50.42	x	0.63	x	0.7	=	370.28	(75)
Northeast	0.9x	0.77	x	24.03	x	28.07	x	0.63	x	0.7	=	206.12	(75)
Northeast	0.9x	0.77	x	24.03	x	14.2	x	0.63	x	0.7	=	104.26	(75)
Northeast	0.9x	0.77	x	24.03	x	9.21	x	0.63	x	0.7	=	67.67	(75)
Southeast	0.9x	0.77	x	4.63	x	36.79	x	0.63	x	0.7	=	52.06	(77)
Southeast	0.9x	0.77	x	4.63	x	62.67	x	0.63	x	0.7	=	88.68	(77)
Southeast	0.9x	0.77	x	4.63	x	85.75	x	0.63	x	0.7	=	121.34	(77)
Southeast	0.9x	0.77	x	4.63	x	106.25	x	0.63	x	0.7	=	150.34	(77)
Southeast	0.9x	0.77	x	4.63	x	119.01	x	0.63	x	0.7	=	168.4	(77)
Southeast	0.9x	0.77	x	4.63	x	118.15	x	0.63	x	0.7	=	167.18	(77)
Southeast	0.9x	0.77	x	4.63	x	113.91	x	0.63	x	0.7	=	161.18	(77)
Southeast	0.9x	0.77	x	4.63	x	104.39	x	0.63	x	0.7	=	147.71	(77)
Southeast	0.9x	0.77	x	4.63	x	92.85	x	0.63	x	0.7	=	131.38	(77)
Southeast	0.9x	0.77	x	4.63	x	69.27	x	0.63	x	0.7	=	98.01	(77)
Southeast	0.9x	0.77	x	4.63	x	44.07	x	0.63	x	0.7	=	62.36	(77)
Southeast	0.9x	0.77	x	4.63	x	31.49	x	0.63	x	0.7	=	44.55	(77)
Northwest	0.9x	0.77	x	4.6	x	11.28	x	0.63	x	0.7	=	15.86	(81)
Northwest	0.9x	0.77	x	4.6	x	22.97	x	0.63	x	0.7	=	32.29	(81)
Northwest	0.9x	0.77	x	4.6	x	41.38	x	0.63	x	0.7	=	58.17	(81)
Northwest	0.9x	0.77	x	4.6	x	67.96	x	0.63	x	0.7	=	95.53	(81)
Northwest	0.9x	0.77	x	4.6	x	91.35	x	0.63	x	0.7	=	128.42	(81)
Northwest	0.9x	0.77	x	4.6	x	97.38	x	0.63	x	0.7	=	136.9	(81)
Northwest	0.9x	0.77	x	4.6	x	91.1	x	0.63	x	0.7	=	128.07	(81)
Northwest	0.9x	0.77	x	4.6	x	72.63	x	0.63	x	0.7	=	102.1	(81)
Northwest	0.9x	0.77	x	4.6	x	50.42	x	0.63	x	0.7	=	70.88	(81)
Northwest	0.9x	0.77	x	4.6	x	28.07	x	0.63	x	0.7	=	39.46	(81)
Northwest	0.9x	0.77	x	4.6	x	14.2	x	0.63	x	0.7	=	19.96	(81)
Northwest	0.9x	0.77	x	4.6	x	9.21	x	0.63	x	0.7	=	12.95	(81)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	150.79	289.63	483.39	744.94	967.65	1019.27	958.29	783.17	572.55	343.59	186.58	125.18	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	673.8	810.39	986.86	1220.2	1413.66	1437.51	1358.76	1190.22	994.31	793.8	669.53	633.27	(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=	1	1	0.99	0.96	0.85	0.66	0.5	0.58	0.86	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.59	19.75	20.05	20.47	20.81	20.96	20.99	20.98	20.84	20.4	19.92	19.56	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.91	19.91	19.91	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.92	19.92	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.94	0.79	0.56	0.38	0.46	0.8	0.98	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.02	18.26	18.7	19.31	19.75	19.92	19.94	19.94	19.81	19.21	18.52	17.99	(90)

fLA = Living area ÷ (4) = 0.51 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.81	19.01	19.39	19.9	20.28	20.44	20.47	20.47	20.33	19.81	19.23	18.79	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.81	19.01	19.39	19.9	20.28	20.44	20.47	20.47	20.33	19.81	19.23	18.79	(93)

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=	1	1	0.99	0.94	0.81	0.61	0.44	0.52	0.82	0.98	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	672.61	806.78	972.3	1147.2	1149.25	874.78	598.3	620.07	819.49	774.74	667	632.44	(95)
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=	2346.57	2275.95	2071.78	1743.7	1357.08	912.57	604.47	633.42	977.81	1456.21	1927.74	2331.73	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1245.43	987.28	818.02	429.48	154.63	0	0	0	0	507.02	907.73	1264.27	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 6313.86 (98)

Space heating requirement in kWh/m²/year 47.47 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		93.5	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)													
	1245.43	987.28	818.02	429.48	154.63	0	0	0	0	507.02	907.73	1264.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1332.01	1055.92	874.88	459.34	165.38	0	0	0	0	542.26	970.83	1352.16	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 6752.79 (211)

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Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= | 0 | (215)

Water heating

Output from water heater (calculated above)

214.83	189.23	198.43	177.47	173.61	154.7	148.16	163.14	163.03	184.04	195.13	209.52

Efficiency of water heater | 79.8 | (216)

(217)m=	88.75	88.59	88.19	87.09	84.51	79.8	79.8	79.8	79.8	87.38	88.4	88.81	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	242.07	213.6	225	203.78	205.44	193.86	185.66	204.44	204.3	210.62	220.72	235.93

Total = Sum(219a)$_{1...12}$ = | 2545.43 | (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		6752.79	
Water heating fuel used		2545.43	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year — sum of (230a)…(230g) =		75	(231)
Electricity for lighting		474.41	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		9847.63	(338)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	1458.6	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	549.81	(264)
Space and water heating	(261) + (262) + (263) + (264) =				2008.41	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	246.22	(268)
Total CO2, kg/year			sum of (265)…(271) =		2293.56	(272)

TER = | 17.24 | (273)