Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.16
Printed on 14 February 2023 at 15:23:39

Project Information:

Assessed By: Harry Hinchcliffe (STRO034627)   **Building Type:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE   Total Floor Area: 99.55m²

Site Reference : 15592 - L1a Assessment   **Plot Reference:** 15592 - L1a Assessment

Address : New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

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
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	19.12 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.11 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	62.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	61.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Floor	0.18 (max. 0.25)	0.18 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.41 (max. 2.00)	1.60 (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	5.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:

Database: (rev 504, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % — OK

Secondary heating system: None

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder		

6 Controls

Space heating controls	TTZC by plumbing and electrical services		OK
Hot water controls:	No cylinder thermostat		
	No cylinder		
Boiler interlock:	Yes		OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	OK

Based on:

Overshading:	Average or unknown
Windows facing: South West	7.78m²
Windows facing: North East	18.86m²
Windows facing: South East	2.76m²
Windows facing: North West	0.69m²
Ventilation rate:	4.00

10 Key features

Roofs U-value	0.11 W/m²K

Predicted Energy Assessment

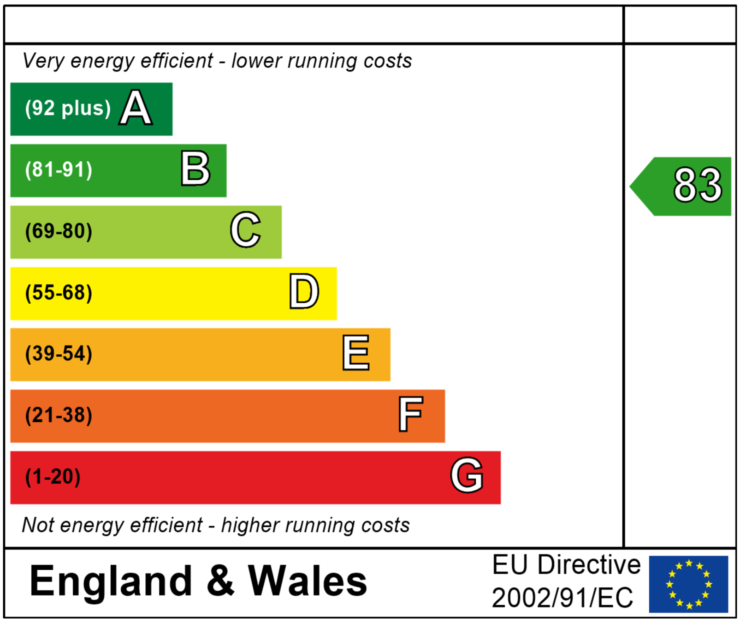
New Dwelling @
34 Summer House Way
Langley
WD5 0DY

Dwelling type:	Detached House
Date of assessment:	14 February 2023
Produced by:	Harry Hinchcliffe
Total floor area:	99.55 m²

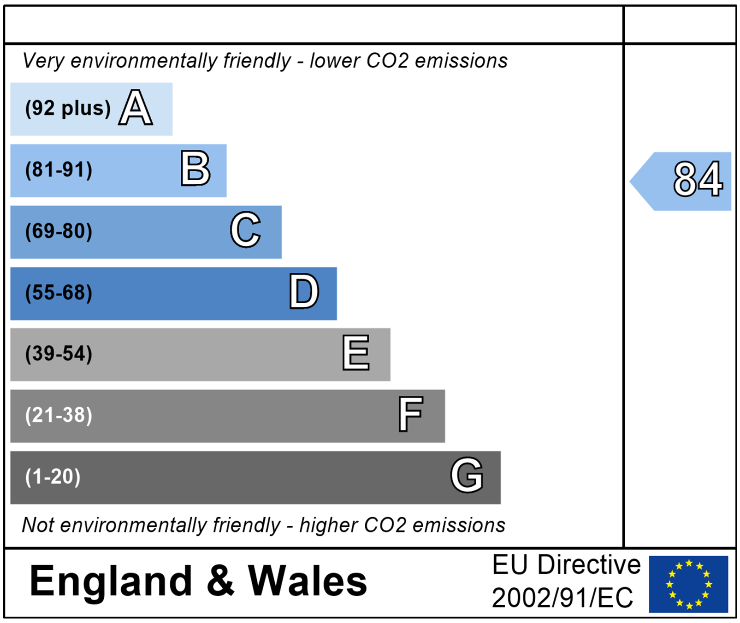
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



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

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

Developer Confirmation Report

Property Details: 15592 - L1a Assessment

Address:	New Dwelling @, 34 Summer House Way, Langley, WD5 0DY
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	14 February 2023
Date of certificate:	14 February 2023
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Thermal Mass Parameter:	Indicative Value Low

Comments:

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2023
Front of dwelling faces:	North

Comments:

Opening types:

Name:	Type:	Frame Factor:	g-value:	U-Value:	Area:
Front Door	Solid	0.7	0	1.6	2.1
Front Windows	Windows	0.7	0.63	1.4	7.78
Rear Windows	Windows	0.7	0.63	1.4	18.86
SE Windows	Windows	0.7	0.63	1.4	2.76
NW Window	Windows	0.7	0.63	1.4	0.69

Overshading: Average or unknown

Comments:

Opaque Elements:

Type:	U-Value:		Kappa:
External Elements			
External Walls	0.24	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A
Flat Roof	0.14	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A
Pitched Roof	0.11	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A

Developer Confirmation Report

Ground Floor	0.18	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A

Internal Elements (Area, Kappa)
Party Elements (Area, Kappa)

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0746

	Length	Psi-value		
[Approved]	18.94	0.3	E2	Other lintels (including other steel lintels)
[Approved]	18.94	0.04	E3	Sill
[Approved]	37.22	0.05	E4	Jamb
[Approved]	29.75	0.16	E5	Ground floor (normal)
[Approved]	31.3	0.07	E6	Intermediate floor within a dwelling
[Approved]	31.3	0.06	E10	Eaves (insulation at ceiling level)
	4.18	0	E14	Flat roof
[Approved]	31.8	0.09	E16	Corner (normal)
[Approved]	7.95	-0.09	E17	Corner (inverted internal area greater than external area)

Comments:

If specific construction details have been adopted then please provide the associated checklists; signed and dated.

Ventilation:

Pressure test: Yes (As designed)
Ventilation: Natural ventilation (extract fans)
Pressure test: 5
Comments:

Please provide the pressure test certificate, or certificates if the result is based on an average; signed and dated.

Main heating system:

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 504, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Design flow temperature<=35°C
Boiler interlock: Yes
Delayed start

Comments:

Developer Confirmation Report

Main heating Control:

Main heating Control: Time and temperature zone control by suitable arrangement of plumbing and electrical services

Comments:

Secondary heating system:

Secondary heating system: None

Comments:

Water heating:

Water heating: No hot water cylinder

Comments:

Solar panel: False

Others:

Electricity tariff:	Standard Tariff
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
Wind turbine:	No
Photovoltaics:	None

Comments:

Please provide the MCS certificate or data sheet equivalent confirming the size of the array on the roof. This should include any calculations to support a proportioned amount included in the assessment.

Declaration :

I confirm that the property has been built to the above specification.

Signed:

....

Date:

....

SAP Input

Property Details: 15592 - L1a Assessment

Address:	New Dwelling @, 34 Summer House Way, Langley, WD5 0DY
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	14 February 2023
Date of certificate:	14 February 2023
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Low
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2023

Floor Location:	Floor area:	Storey height:
Floor 0	52.34 m²	2.39 m
Floor 1	47.21 m²	2.65 m

Living area:	29.43 m² (fraction 0.296)
Front of dwelling faces:	North

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front Door	Manufacturer	Solid			PVC-U
Front Windows	Manufacturer	Windows	double-glazed	No	
Rear Windows	Manufacturer	Windows	double-glazed	No	
SE Windows	Manufacturer	Windows	double-glazed	No	
NW Window	Manufacturer	Windows	double-glazed	No	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Front Door	mm	0.7	0	1.6	2.1	1
Front Windows	16mm or more	0.7	0.63	1.4	7.78	1
Rear Windows	16mm or more	0.7	0.63	1.4	18.86	1
SE Windows	16mm or more	0.7	0.63	1.4	2.76	1
NW Window	16mm or more	0.7	0.63	1.4	0.69	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front Door		External Walls	South West	0	0
Front Windows		External Walls	South West	0	0
Rear Windows		External Walls	North East	0	0
SE Windows		External Walls	South East	0	0
NW Window		External Walls	North West	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
<u>External Elements</u>							
External Walls	154.05	32.19	121.86	0.24	0	False	N/A
Flat Roof	4.67	0	4.67	0.14	0		N/A
Pitched Roof	47.5	0	47.5	0.11	0		N/A

SAP Input

Ground Floor	52.34	0.18	N/A

Internal Elements
Party Elements

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0746

	Length	Psi-value		
[Approved]	18.94	0.3	E2	Other lintels (including other steel lintels)
[Approved]	18.94	0.04	E3	Sill
[Approved]	37.22	0.05	E4	Jamb
[Approved]	29.75	0.16	E5	Ground floor (normal)
[Approved]	31.3	0.07	E6	Intermediate floor within a dwelling
[Approved]	31.3	0.06	E10	Eaves (insulation at ceiling level)
	4.18	0	E14	Flat roof
[Approved]	31.8	0.09	E16	Corner (normal)
[Approved]	7.95	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	1
Pressure test:	5

Main heating system:

Main heating system:

Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 504, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Design flow temperature<=35°C
Boiler interlock: Yes
Delayed start

Main heating Control:

Main heating Control:

Time and temperature zone control by suitable arrangement of plumbing and electrical services
Control code: 2110

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:

From main heating system
Water code: 901
Fuel :mains gas
No hot water cylinder
Solar panel: False

Others:

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown

SAP Input

Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Harry Hinchcliffe	**Stroma Number:**	STRO034627
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.16

Property Address: 15592 - L1a Assessment

Address : New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.34	(1a) x	2.39	(2a) =	125.09	(3a)
First floor	47.21	(1b) x	2.65	(2b) =	125.11	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.55	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	250.2	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

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

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

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

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

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.23	(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

0.29	0.29	0.28	0.25	0.25	0.22	0.22	0.21	0.23	0.25	0.26	0.27

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=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54	(24d)

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

(25)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54	(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			2.1	x	1.6	=	3.36			(26)
Windows Type 1			7.78	x1/[1/(1.4)+ 0.04]		=	10.31			(27)
Windows Type 2			18.86	x1/[1/(1.4)+ 0.04]		=	25			(27)
Windows Type 3			2.76	x1/[1/(1.4)+ 0.04]		=	3.66			(27)
Windows Type 4			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Floor			52.34	x	0.18	=	9.421201			(28)
Walls	154.05	32.19	121.86	x	0.24	=	29.25			(29)
Roof Type1	4.67	0	4.67	x	0.14	=	0.65			(30)
Roof Type2	47.5	0	47.5	x	0.11	=	5.22			(30)
Total area of elements, m²			258.56							(31)

** 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) = 87.8 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13538.53 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Low 100 (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 19.28 (36)

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

Total fabric heat loss (33) + (36) = 107.07 (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=	44.87	44.73	44.6	43.95	43.83	43.28	43.28	43.17	43.49	43.83	44.08	44.33	(38)

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

(39)m=	151.95	151.81	151.67	151.03	150.91	150.35	150.35	150.25	150.57	150.91	151.15	151.41	

Average = $Sum(39)_{1...12}$ /12= 151.03 (39)

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

(40)m=	1.53	1.52	1.52	1.52	1.52	1.51	1.51	1.51	1.51	1.52	1.52	1.52	

Average = $Sum(40)_{1...12}$ /12= 1.52 (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 2.74 (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 99.16 (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=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08	

Total = $Sum(44)_{1...12}$ = 1189.97 (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=	161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66	

Total = $Sum(45)_{1...12}$ = 1560.23 (45)

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

(46)m=	24.26	21.22	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	21.64	23.5	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (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 (55)

SAP WorkSheet: New dwelling design stage

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

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

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

(61)m=	14.14	12.76	14.11	13.61	14.03	13.54	13.97	14.01	13.58	14.07	13.66	14.13	(61)

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

(62)m=	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79	(62)

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

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

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

Output from water heater

(64)m=	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79

Output from water heater (annual)$_{1...12}$ | 1725.84 | (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=	57.32	50.23	52.07	45.72	44.12	38.43	35.96	40.76	41.1	47.46	51.38	55.62	(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=	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	(66)

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

(67)m=	56.97	50.6	41.15	31.15	23.29	19.66	21.24	27.61	37.06	47.06	54.92	58.55	(67)

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

(68)m=	381.49	385.45	375.47	354.24	327.43	302.23	285.4	281.44	291.42	312.65	339.46	364.66	(68)

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

(69)m=	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	(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=	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	(71)

Water heating gains (Table 5)

(72)m=	77.05	74.75	69.99	63.5	59.29	53.37	48.34	54.79	57.08	63.79	71.36	74.76	(72)

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

(73)m=	627.36	622.65	598.46	560.75	521.86	487.11	466.83	475.7	497.42	535.36	577.6	609.82	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	18.86	x	11.28	x	0.63	x	0.7	=	65.03	(75)
Northeast 0.9x	0.77	x	18.86	x	22.97	x	0.63	x	0.7	=	132.38	(75)
Northeast 0.9x	0.77	x	18.86	x	41.38	x	0.63	x	0.7	=	238.5	(75)
Northeast 0.9x	0.77	x	18.86	x	67.96	x	0.63	x	0.7	=	391.69	(75)
Northeast 0.9x	0.77	x	18.86	x	91.35	x	0.63	x	0.7	=	526.51	(75)
Northeast 0.9x	0.77	x	18.86	x	97.38	x	0.63	x	0.7	=	561.31	(75)
Northeast 0.9x	0.77	x	18.86	x	91.1	x	0.63	x	0.7	=	525.09	(75)
Northeast 0.9x	0.77	x	18.86	x	72.63	x	0.63	x	0.7	=	418.61	(75)
Northeast 0.9x	0.77	x	18.86	x	50.42	x	0.63	x	0.7	=	290.62	(75)
Northeast 0.9x	0.77	x	18.86	x	28.07	x	0.63	x	0.7	=	161.78	(75)
Northeast 0.9x	0.77	x	18.86	x	14.2	x	0.63	x	0.7	=	81.83	(75)
Northeast 0.9x	0.77	x	18.86	x	9.21	x	0.63	x	0.7	=	53.11	(75)
Southeast 0.9x	0.77	x	2.76	x	36.79	x	0.63	x	0.7	=	31.04	(77)
Southeast 0.9x	0.77	x	2.76	x	62.67	x	0.63	x	0.7	=	52.86	(77)
Southeast 0.9x	0.77	x	2.76	x	85.75	x	0.63	x	0.7	=	72.33	(77)
Southeast 0.9x	0.77	x	2.76	x	106.25	x	0.63	x	0.7	=	89.62	(77)
Southeast 0.9x	0.77	x	2.76	x	119.01	x	0.63	x	0.7	=	100.38	(77)
Southeast 0.9x	0.77	x	2.76	x	118.15	x	0.63	x	0.7	=	99.66	(77)
Southeast 0.9x	0.77	x	2.76	x	113.91	x	0.63	x	0.7	=	96.08	(77)
Southeast 0.9x	0.77	x	2.76	x	104.39	x	0.63	x	0.7	=	88.05	(77)
Southeast 0.9x	0.77	x	2.76	x	92.85	x	0.63	x	0.7	=	78.32	(77)
Southeast 0.9x	0.77	x	2.76	x	69.27	x	0.63	x	0.7	=	58.43	(77)
Southeast 0.9x	0.77	x	2.76	x	44.07	x	0.63	x	0.7	=	37.17	(77)
Southeast 0.9x	0.77	x	2.76	x	31.49	x	0.63	x	0.7	=	26.56	(77)
Southwest 0.9x	0.77	x	7.78	x	36.79		0.63	x	0.7	=	87.48	(79)
Southwest 0.9x	0.77	x	7.78	x	62.67		0.63	x	0.7	=	149.02	(79)
Southwest 0.9x	0.77	x	7.78	x	85.75		0.63	x	0.7	=	203.89	(79)
Southwest 0.9x	0.77	x	7.78	x	106.25		0.63	x	0.7	=	252.63	(79)
Southwest 0.9x	0.77	x	7.78	x	119.01		0.63	x	0.7	=	282.97	(79)
Southwest 0.9x	0.77	x	7.78	x	118.15		0.63	x	0.7	=	280.92	(79)
Southwest 0.9x	0.77	x	7.78	x	113.91		0.63	x	0.7	=	270.84	(79)
Southwest 0.9x	0.77	x	7.78	x	104.39		0.63	x	0.7	=	248.21	(79)
Southwest 0.9x	0.77	x	7.78	x	92.85		0.63	x	0.7	=	220.77	(79)
Southwest 0.9x	0.77	x	7.78	x	69.27		0.63	x	0.7	=	164.7	(79)
Southwest 0.9x	0.77	x	7.78	x	44.07		0.63	x	0.7	=	104.79	(79)
Southwest 0.9x	0.77	x	7.78	x	31.49		0.63	x	0.7	=	74.87	(79)
Northwest 0.9x	0.77	x	0.69	x	11.28	x	0.63	x	0.7	=	2.38	(81)
Northwest 0.9x	0.77	x	0.69	x	22.97	x	0.63	x	0.7	=	4.84	(81)
Northwest 0.9x	0.77	x	0.69	x	41.38	x	0.63	x	0.7	=	8.73	(81)

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Northwest 0.9x	0.77	x	0.69	x	67.96	x	0.63	x	0.7	=	14.33	(81)
Northwest 0.9x	0.77	x	0.69	x	91.35	x	0.63	x	0.7	=	19.26	(81)
Northwest 0.9x	0.77	x	0.69	x	97.38	x	0.63	x	0.7	=	20.54	(81)
Northwest 0.9x	0.77	x	0.69	x	91.1	x	0.63	x	0.7	=	19.21	(81)
Northwest 0.9x	0.77	x	0.69	x	72.63	x	0.63	x	0.7	=	15.32	(81)
Northwest 0.9x	0.77	x	0.69	x	50.42	x	0.63	x	0.7	=	10.63	(81)
Northwest 0.9x	0.77	x	0.69	x	28.07	x	0.63	x	0.7	=	5.92	(81)
Northwest 0.9x	0.77	x	0.69	x	14.2	x	0.63	x	0.7	=	2.99	(81)
Northwest 0.9x	0.77	x	0.69	x	9.21	x	0.63	x	0.7	=	1.94	(81)

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

(83)m=	185.93	339.1	523.45	748.27	929.12	962.43	911.23	770.18	600.34	390.82	226.78	156.48	(83)

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

(84)m=	813.29	961.75	1121.91	1309.02	1450.98	1449.54	1378.06	1245.88	1097.76	926.17	804.38	766.3	(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=	0.94	0.92	0.88	0.79	0.68	0.54	0.43	0.48	0.67	0.84	0.92	0.95	(86)

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

(87)m=	18.19	18.52	19.07	19.75	20.33	20.72	20.88	20.84	20.52	19.75	18.84	18.11	(87)

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

(88)m=	19.67	19.67	19.67	19.67	19.68	19.68	19.68	19.68	19.68	19.68	19.67	19.67	(88)

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

(89)m=	0.93	0.91	0.86	0.76	0.62	0.46	0.32	0.36	0.59	0.81	0.91	0.94	(89)

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

(90)m=	16.01	16.49	17.26	18.2	18.98	19.45	19.61	19.59	19.24	18.23	16.95	15.9	(90)

fLA = Living area ÷ (4) = 0.3 (91)

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

(92)m=	16.65	17.09	17.79	18.66	19.38	19.82	19.99	19.96	19.62	18.68	17.51	16.56	(92)

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

(93)m=	16.5	16.94	17.64	18.51	19.23	19.67	19.84	19.81	19.47	18.53	17.36	16.41	(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=	0.9	0.87	0.81	0.72	0.6	0.46	0.33	0.38	0.58	0.77	0.87	0.91	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	734.02	835.77	914.08	948.08	873.52	663.73	454.8	468.05	636.23	715.38	701.8	698.64	(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=	1854.5	1827.33	1689.93	1451.35	1136.06	762.75	487.01	512.23	808.12	1196.82	1550.63	1847.97	(97)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(98)m=	833.64	666.33	577.23	362.35	195.33	0	0	0	0	358.19	611.16	855.1		
Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =													4459.33	(98)

Space heating requirement in kWh/m²/year	44.79	(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)	833.64	666.33	577.23	362.35	195.33	0	0	0	0	358.19	611.16	855.1		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	891.59	712.65	617.36	387.54	208.9	0	0	0	0	383.09	653.65	914.55		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													4769.33	(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)	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		
Efficiency of water heater													87.3	(216)
(217)m=	89.93	89.88	89.79	89.58	89.16	87.3	87.3	87.3	87.3	89.55	89.82	89.95		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	195.61	171.61	178.31	157.28	152.72	136.23	127.86	144.41	145.45	163.3	175.81	189.87		
Total = Sum(219a)$_{1...12}$ =													1938.47	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			4769.33	
Water heating fuel used			1938.47	
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			402.42	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			7185.22	(338)

10a. Fuel costs - individual heating systems:

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	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211)	x	3.48	x 0.01 =	165.97	(240)
Space heating - main system 2	(213)	x	0	x 0.01 =	0	(241)
Space heating - secondary	(215)	x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	67.46	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(249)

(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a

Energy for lighting	(232)		13.19	x 0.01 =	53.08	(250)
Additional standing charges (Table 12)					120	(251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)...(254) =	416.4	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.21	(257)
SAP rating (Section 12)		83.12	(258)

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	=	1030.18	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	418.71	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1448.88	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	208.86	(268)
Total CO2, kg/year			sum of (265)…(271) =		1696.67	(272)
CO2 emissions per m²			(272) ÷ (4) =		17.04	(273)
EI rating (section 14)					84	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	5818.59	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2364.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =				8183.52	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	230.25	(267)

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Electricity for lighting	(232) x	0	=	1235.43	(268)
'Total Primary Energy		sum of (265)…(271) =		9649.2	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		96.93	(273)

EPC Costs WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Harry Hinchcliffe	**Stroma Number:**	STRO034627
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.16

Property Address: 15592 - L1a Assessment

Address : New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.34	(1a) x	2.39	(2a) =	125.09	(3a)
First floor	47.21	(1b) x	2.65	(2b) =	125.11	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.55	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	250.2	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =		0	÷ (5) =	0	(8)

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

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

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

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

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

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.23	(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=	3.9	3.9	4	3.7	3.4	3.1	3.4	3	3.4	3.6	3.3	3.6

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	0.98	0.98	1	0.92	0.85	0.78	0.85	0.75	0.85	0.9	0.82	0.9

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

0.23	0.23	0.23	0.21	0.2	0.18	0.2	0.17	0.2	0.21	0.19	0.21

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=	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	(24d)

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

(25)m=	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	(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			2.1	x	1.6	=	3.36			(26)
Windows Type 1			7.78	x1/[1/(1.4)+ 0.04]		=	10.31			(27)
Windows Type 2			18.86	x1/[1/(1.4)+ 0.04]		=	25			(27)
Windows Type 3			2.76	x1/[1/(1.4)+ 0.04]		=	3.66			(27)
Windows Type 4			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Floor			52.34	x	0.18	=	9.421201			(28)
Walls	154.05	32.19	121.86	x	0.24	=	29.25			(29)
Roof Type1	4.67	0	4.67	x	0.14	=	0.65			(30)
Roof Type2	47.5	0	47.5	x	0.11	=	5.22			(30)
Total area of elements, m²			258.56							(31)

** 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) = 87.8 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13538.53 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Low 100 (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 19.28 (36)

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

Total fabric heat loss (33) + (36) = 107.07 (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=	43.38	43.38	43.49	43.17	42.88	42.61	42.88	42.52	42.88	43.07	42.79	43.07	(38)

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

(39)m=	150.46	150.46	150.57	150.25	149.95	149.68	149.95	149.6	149.95	150.15	149.86	150.15	

Average = Sum(39)$_{1…12}$ /12= 150.08 (39)

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

(40)m=	1.51	1.51	1.51	1.51	1.51	1.5	1.51	1.5	1.51	1.51	1.51	1.51	

Average = Sum(40)$_{1…12}$ /12= 1.51 (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 2.74 (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 99.16 (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=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08

Total = Sum(44)$_{1…12}$ = 1189.97 (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=	161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66

Total = Sum(45)$_{1…12}$ = 1560.23 (45)

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

(46)m=	24.26	21.22	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	21.64	23.5	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (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 (55)

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

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

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

(61)m=	14.14	12.76	14.11	13.61	14.03	13.54	13.97	14.01	13.58	14.07	13.66	14.13	(61)

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

(62)m=	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79	(62)

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

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

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

Output from water heater

(64)m=	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79

Output from water heater (annual)$_{1…12}$ 1725.84 (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=	57.32	50.23	52.07	45.72	44.12	38.43	35.96	40.76	41.1	47.46	51.38	55.62	(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=	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	164.12	(66)

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

(67)m=	56.97	50.6	41.15	31.15	23.29	19.66	21.24	27.61	37.06	47.06	54.92	58.55	(67)

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

(68)m=	381.49	385.45	375.47	354.24	327.43	302.23	285.4	281.44	291.42	312.65	339.46	364.66	(68)

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

(69)m=	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	54.15	(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=	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	(71)

Water heating gains (Table 5)

(72)m=	77.05	74.75	69.99	63.5	59.29	53.37	48.34	54.79	57.08	63.79	71.36	74.76	(72)

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

(73)m=	627.36	622.65	598.46	560.75	521.86	487.11	466.83	475.7	497.42	535.36	577.6	609.82	(73)

6. Solar gains:

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

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	18.86	x	12.93	x	0.63	x	0.7	=	74.52	(75)
Northeast	0.9x	0.77	x	18.86	x	24.22	x	0.63	x	0.7	=	139.61	(75)
Northeast	0.9x	0.77	x	18.86	x	43.36	x	0.63	x	0.7	=	249.91	(75)
Northeast	0.9x	0.77	x	18.86	x	72.26	x	0.63	x	0.7	=	416.52	(75)
Northeast	0.9x	0.77	x	18.86	x	94.65	x	0.63	x	0.7	=	545.55	(75)
Northeast	0.9x	0.77	x	18.86	x	108.13	x	0.63	x	0.7	=	623.24	(75)
Northeast	0.9x	0.77	x	18.86	x	99.28	x	0.63	x	0.7	=	572.24	(75)
Northeast	0.9x	0.77	x	18.86	x	80.36	x	0.63	x	0.7	=	463.16	(75)
Northeast	0.9x	0.77	x	18.86	x	56.56	x	0.63	x	0.7	=	326.01	(75)
Northeast	0.9x	0.77	x	18.86	x	31.11	x	0.63	x	0.7	=	179.29	(75)
Northeast	0.9x	0.77	x	18.86	x	16.69	x	0.63	x	0.7	=	96.21	(75)
Northeast	0.9x	0.77	x	18.86	x	10.44	x	0.63	x	0.7	=	60.16	(75)
Southeast	0.9x	0.77	x	2.76	x	40.57	x	0.63	x	0.7	=	34.22	(77)
Southeast	0.9x	0.77	x	2.76	x	63.28	x	0.63	x	0.7	=	53.37	(77)
Southeast	0.9x	0.77	x	2.76	x	85.85	x	0.63	x	0.7	=	72.41	(77)
Southeast	0.9x	0.77	x	2.76	x	108.59	x	0.63	x	0.7	=	91.59	(77)
Southeast	0.9x	0.77	x	2.76	x	119.53	x	0.63	x	0.7	=	100.82	(77)
Southeast	0.9x	0.77	x	2.76	x	127.75	x	0.63	x	0.7	=	107.75	(77)
Southeast	0.9x	0.77	x	2.76	x	120.63	x	0.63	x	0.7	=	101.75	(77)
Southeast	0.9x	0.77	x	2.76	x	111.38	x	0.63	x	0.7	=	93.95	(77)
Southeast	0.9x	0.77	x	2.76	x	99.66	x	0.63	x	0.7	=	84.06	(77)
Southeast	0.9x	0.77	x	2.76	x	73.37	x	0.63	x	0.7	=	61.89	(77)
Southeast	0.9x	0.77	x	2.76	x	49.78	x	0.63	x	0.7	=	41.99	(77)
Southeast	0.9x	0.77	x	2.76	x	34.39	x	0.63	x	0.7	=	29.01	(77)
Southwest	0.9x	0.77	x	7.78	x	40.57		0.63	x	0.7	=	96.47	(79)
Southwest	0.9x	0.77	x	7.78	x	63.28		0.63	x	0.7	=	150.45	(79)
Southwest	0.9x	0.77	x	7.78	x	85.85		0.63	x	0.7	=	204.12	(79)
Southwest	0.9x	0.77	x	7.78	x	108.59		0.63	x	0.7	=	258.18	(79)
Southwest	0.9x	0.77	x	7.78	x	119.53		0.63	x	0.7	=	284.21	(79)
Southwest	0.9x	0.77	x	7.78	x	127.75		0.63	x	0.7	=	303.74	(79)
Southwest	0.9x	0.77	x	7.78	x	120.63		0.63	x	0.7	=	286.83	(79)
Southwest	0.9x	0.77	x	7.78	x	111.38		0.63	x	0.7	=	264.83	(79)
Southwest	0.9x	0.77	x	7.78	x	99.66		0.63	x	0.7	=	236.97	(79)
Southwest	0.9x	0.77	x	7.78	x	73.37		0.63	x	0.7	=	174.46	(79)
Southwest	0.9x	0.77	x	7.78	x	49.78		0.63	x	0.7	=	118.35	(79)
Southwest	0.9x	0.77	x	7.78	x	34.39		0.63	x	0.7	=	81.78	(79)
Northwest	0.9x	0.77	x	0.69	x	12.93	x	0.63	x	0.7	=	2.73	(81)
Northwest	0.9x	0.77	x	0.69	x	24.22	x	0.63	x	0.7	=	5.11	(81)
Northwest	0.9x	0.77	x	0.69	x	43.36	x	0.63	x	0.7	=	9.14	(81)

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Northwest 0.9x	0.77	x	0.69	x	72.26	x	0.63	x	0.7	=	15.24	(81)
Northwest 0.9x	0.77	x	0.69	x	94.65	x	0.63	x	0.7	=	19.96	(81)
Northwest 0.9x	0.77	x	0.69	x	108.13	x	0.63	x	0.7	=	22.8	(81)
Northwest 0.9x	0.77	x	0.69	x	99.28	x	0.63	x	0.7	=	20.94	(81)
Northwest 0.9x	0.77	x	0.69	x	80.36	x	0.63	x	0.7	=	16.94	(81)
Northwest 0.9x	0.77	x	0.69	x	56.56	x	0.63	x	0.7	=	11.93	(81)
Northwest 0.9x	0.77	x	0.69	x	31.11	x	0.63	x	0.7	=	6.56	(81)
Northwest 0.9x	0.77	x	0.69	x	16.69	x	0.63	x	0.7	=	3.52	(81)
Northwest 0.9x	0.77	x	0.69	x	10.44	x	0.63	x	0.7	=	2.2	(81)

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

(83)m=	207.93	348.54	535.59	781.53	950.54	1057.53	981.75	838.89	658.97	422.19	260.07	173.15	(83)

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

(84)m=	835.29	971.19	1134.05	1342.28	1472.4	1544.64	1448.59	1314.58	1156.38	957.55	837.67	782.97	(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=	0.94	0.92	0.87	0.77	0.64	0.47	0.35	0.38	0.62	0.82	0.91	0.95	(86)

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

(87)m=	18.32	18.6	19.2	19.88	20.45	20.82	20.94	20.92	20.63	19.89	18.97	18.23	(87)

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

(88)m=	19.68	19.68	19.68	19.68	19.68	19.68	19.68	19.69	19.68	19.68	19.68	19.68	(88)

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

(89)m=	0.93	0.9	0.84	0.74	0.58	0.38	0.23	0.26	0.53	0.78	0.9	0.94	(89)

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

(90)m=	16.2	16.6	17.46	18.38	19.14	19.55	19.66	19.65	19.37	18.43	17.14	16.07	(90)

fLA = Living area ÷ (4) = | 0.3 | (91)

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

(92)m=	16.82	17.2	17.97	18.83	19.53	19.93	20.04	20.03	19.75	18.86	17.68	16.71	(92)

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

(93)m=	16.67	17.05	17.82	18.68	19.38	19.78	19.89	19.88	19.6	18.71	17.53	16.56	(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=	0.9	0.86	0.8	0.7	0.57	0.39	0.25	0.28	0.53	0.75	0.86	0.91	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	748.07	839.65	910.69	943.56	834.56	595.86	359.22	367.55	607.66	716.8	720.84	709.4	(95)
Monthly average external temperature from Table 8													
(96)m=	4.6	5.1	7	9.4	12.4	15.4	17.4	17.3	14.7	11.1	7.4	4.5	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1816.31	1797.26	1629.56	1393.59	1045.96	655.24	372.83	385.52	734.2	1142.41	1517.89	1810.57	(97)

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

(98)m=	794.77	643.51	534.84	324.02	157.28	0	0	0	0	316.65	573.88	819.27

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4164.22 (98)

Space heating requirement in kWh/m²/year 41.83 (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)	794.77	643.51	534.84	324.02	157.28	0	0	0	0	316.65	573.88	819.27		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	850.03	688.24	572.02	346.54	168.22	0	0	0	0	338.67	613.77	876.22		(211)
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													4453.72	(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)	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		
Efficiency of water heater													87.3	(216)
(217)m=	89.9	89.86	89.74	89.51	88.99	87.3	87.3	87.3	87.3	89.46	89.79	89.93		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	195.66	171.64	178.4	157.41	153.01	136.23	127.86	144.41	145.45	163.45	175.88	189.91		
Total = Sum(219a)$_{1...12}$ =													1939.32	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			4453.72	
Water heating fuel used			1939.32	
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			402.42	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			6870.46	(338)

10a. Fuel costs - individual heating systems:

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		Fuel kWh/year	Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1		(211) x	3.74	x 0.01 =	166.57	(240)
Space heating - main system 2		(213) x	0	x 0.01 =	0	(241)
Space heating - secondary		(215) x	20.43	x 0.01 =	0	(242)
Water heating cost (other fuel)		(219)	3.74	x 0.01 =	72.53	(247)
Pumps, fans and electric keep-hot		(231)	0	x 0.01 =	15.32	(249)

(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a

Energy for lighting		(232)	0	x 0.01 =	82.21	(250)
Additional standing charges (Table 12)					95	(251)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)...(254) =	431.64	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.18	(257)
SAP rating (Section 12)		83.57	(258)

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	=	962	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	418.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1380.9	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	208.86	(268)
Total CO2, kg/year		sum of (265)…(271) =		1628.68	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		16.36	(273)
EI rating (section 14)				85	(274)

13a. Primary Energy

	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	5433.53	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2365.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =			7799.51	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)

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Electricity for lighting	(232) x		0	=	1235.43	(268)
'Total Primary Energy		sum of (265)…(271) =			9265.19	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			93.07	(273)

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User Details:

Assessor Name:	Harry Hinchcliffe	**Stroma Number:**	STRO034627
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.16

Property Address: 15592 - L1a Assessment

Address : New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	52.34	(1a)	x	2.39	(2a)	=	125.09	(3a)
First floor	47.21	(1b)	x	2.65	(2b)	=	125.11	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.55	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	250.2	(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) =	0.12	(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		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(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

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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

0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.38	0.4

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	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

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

(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(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			2.1	x	1	=	2.1			(26)
Windows Type 1			5.89	x1/[1/(1.4)+ 0.04]		=	7.81			(27)
Windows Type 2			14.28	x1/[1/(1.4)+ 0.04]		=	18.93			(27)
Windows Type 3			2.09	x1/[1/(1.4)+ 0.04]		=	2.77			(27)
Windows Type 4			0.52	x1/[1/(1.4)+ 0.04]		=	0.69			(27)
Floor			52.34	x	0.13	=	6.8042			(28)
Walls	154.05	24.88	129.17	x	0.18	=	23.25			(29)
Roof Type1	4.67	0	4.67	x	0.13	=	0.61			(30)
Roof Type2	47.5	0	47.5	x	0.13	=	6.17			(30)
Total area of elements, m²			258.56							(31)

** 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) = 69.14 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13977.13 (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 12.87 (36)

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

Total fabric heat loss (33) + (36) = 82.01 (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=	49.14	48.83	48.54	47.13	46.87	45.64	45.64	45.42	46.12	46.87	47.4	47.96	(38)

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

(39)m=	131.15	130.85	130.55	129.14	128.88	127.66	127.66	127.43	128.13	128.88	129.41	129.97	

Average = Sum(39)$_{1…12}$ /12= 129.14 (39)

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

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

Average = Sum(40)$_{1…12}$ /12= 1.3 (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 2.74 (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 99.16 (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=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08

Total = Sum(44)$_{1…12}$ = 1189.97 (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=	161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66

Total = Sum(45)$_{1…12}$ = 1560.23 (45)

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

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

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

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

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (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 (55)

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

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	137.5	120.26	124.09	108.19	103.81	89.58	83.01	95.25	96.39	112.33	122.62	133.16	(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=	137.5	120.26	124.09	108.19	103.81	89.58	83.01	95.25	96.39	112.33	122.62	133.16

Output from water heater (annual)$_{1...12}$ — 1326.2 (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=	34.37	30.06	31.02	27.05	25.95	22.39	20.75	23.81	24.1	28.08	30.66	33.29	(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=	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	(66)

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

(67)m=	22.79	20.24	16.46	12.46	9.31	7.86	8.5	11.04	14.82	18.82	21.97	23.42	(67)

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

(68)m=	255.6	258.25	251.57	237.34	219.38	202.5	191.22	188.57	195.25	209.48	227.44	244.32	(68)

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

(69)m=	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

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

(71)m=	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	(71)

Water heating gains (Table 5)

(72)m=	46.2	44.74	41.7	37.57	34.88	31.1	27.89	32.01	33.47	37.75	42.58	44.74	(72)

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

(73)m=	388.62	387.26	373.75	351.39	327.6	305.49	291.64	295.65	307.57	330.08	356.02	376.52	(73)

6. Solar gains:

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

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Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	14.28	x	11.28	x	0.63	x	0.7	=	49.24	(75)
Northeast 0.9x	0.77	x	14.28	x	22.97	x	0.63	x	0.7	=	100.23	(75)
Northeast 0.9x	0.77	x	14.28	x	41.38	x	0.63	x	0.7	=	180.58	(75)
Northeast 0.9x	0.77	x	14.28	x	67.96	x	0.63	x	0.7	=	296.57	(75)
Northeast 0.9x	0.77	x	14.28	x	91.35	x	0.63	x	0.7	=	398.65	(75)
Northeast 0.9x	0.77	x	14.28	x	97.38	x	0.63	x	0.7	=	425	(75)
Northeast 0.9x	0.77	x	14.28	x	91.1	x	0.63	x	0.7	=	397.58	(75)
Northeast 0.9x	0.77	x	14.28	x	72.63	x	0.63	x	0.7	=	316.95	(75)
Northeast 0.9x	0.77	x	14.28	x	50.42	x	0.63	x	0.7	=	220.04	(75)
Northeast 0.9x	0.77	x	14.28	x	28.07	x	0.63	x	0.7	=	122.49	(75)
Northeast 0.9x	0.77	x	14.28	x	14.2	x	0.63	x	0.7	=	61.96	(75)
Northeast 0.9x	0.77	x	14.28	x	9.21	x	0.63	x	0.7	=	40.21	(75)
Southeast 0.9x	0.77	x	2.09	x	36.79	x	0.63	x	0.7	=	23.5	(77)
Southeast 0.9x	0.77	x	2.09	x	62.67	x	0.63	x	0.7	=	40.03	(77)
Southeast 0.9x	0.77	x	2.09	x	85.75	x	0.63	x	0.7	=	54.77	(77)
Southeast 0.9x	0.77	x	2.09	x	106.25	x	0.63	x	0.7	=	67.87	(77)
Southeast 0.9x	0.77	x	2.09	x	119.01	x	0.63	x	0.7	=	76.02	(77)
Southeast 0.9x	0.77	x	2.09	x	118.15	x	0.63	x	0.7	=	75.47	(77)
Southeast 0.9x	0.77	x	2.09	x	113.91	x	0.63	x	0.7	=	72.76	(77)
Southeast 0.9x	0.77	x	2.09	x	104.39	x	0.63	x	0.7	=	66.68	(77)
Southeast 0.9x	0.77	x	2.09	x	92.85	x	0.63	x	0.7	=	59.31	(77)
Southeast 0.9x	0.77	x	2.09	x	69.27	x	0.63	x	0.7	=	44.24	(77)
Southeast 0.9x	0.77	x	2.09	x	44.07	x	0.63	x	0.7	=	28.15	(77)
Southeast 0.9x	0.77	x	2.09	x	31.49	x	0.63	x	0.7	=	20.11	(77)
Southwest 0.9x	0.77	x	5.89	x	36.79		0.63	x	0.7	=	66.23	(79)
Southwest 0.9x	0.77	x	5.89	x	62.67		0.63	x	0.7	=	112.82	(79)
Southwest 0.9x	0.77	x	5.89	x	85.75		0.63	x	0.7	=	154.36	(79)
Southwest 0.9x	0.77	x	5.89	x	106.25		0.63	x	0.7	=	191.26	(79)
Southwest 0.9x	0.77	x	5.89	x	119.01		0.63	x	0.7	=	214.23	(79)
Southwest 0.9x	0.77	x	5.89	x	118.15		0.63	x	0.7	=	212.68	(79)
Southwest 0.9x	0.77	x	5.89	x	113.91		0.63	x	0.7	=	205.04	(79)
Southwest 0.9x	0.77	x	5.89	x	104.39		0.63	x	0.7	=	187.91	(79)
Southwest 0.9x	0.77	x	5.89	x	92.85		0.63	x	0.7	=	167.14	(79)
Southwest 0.9x	0.77	x	5.89	x	69.27		0.63	x	0.7	=	124.69	(79)
Southwest 0.9x	0.77	x	5.89	x	44.07		0.63	x	0.7	=	79.33	(79)
Southwest 0.9x	0.77	x	5.89	x	31.49		0.63	x	0.7	=	56.68	(79)
Northwest 0.9x	0.77	x	0.52	x	11.28	x	0.63	x	0.7	=	1.79	(81)
Northwest 0.9x	0.77	x	0.52	x	22.97	x	0.63	x	0.7	=	3.65	(81)
Northwest 0.9x	0.77	x	0.52	x	41.38	x	0.63	x	0.7	=	6.58	(81)

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Northwest	0.9x	0.77	x	0.52	x	67.96	x	0.63	x	0.7	=	10.8	(81)
Northwest	0.9x	0.77	x	0.52	x	91.35	x	0.63	x	0.7	=	14.52	(81)
Northwest	0.9x	0.77	x	0.52	x	97.38	x	0.63	x	0.7	=	15.48	(81)
Northwest	0.9x	0.77	x	0.52	x	91.1	x	0.63	x	0.7	=	14.48	(81)
Northwest	0.9x	0.77	x	0.52	x	72.63	x	0.63	x	0.7	=	11.54	(81)
Northwest	0.9x	0.77	x	0.52	x	50.42	x	0.63	x	0.7	=	8.01	(81)
Northwest	0.9x	0.77	x	0.52	x	28.07	x	0.63	x	0.7	=	4.46	(81)
Northwest	0.9x	0.77	x	0.52	x	14.2	x	0.63	x	0.7	=	2.26	(81)
Northwest	0.9x	0.77	x	0.52	x	9.21	x	0.63	x	0.7	=	1.46	(81)

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

(83)m=	140.77	256.73	396.29	566.49	703.41	728.62	689.86	583.08	454.5	295.88	171.69	118.47	(83)

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

(84)m=	529.38	643.99	770.05	917.89	1031.01	1034.11	981.5	878.73	762.08	625.96	527.71	494.98	(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	0.96	0.88	0.71	0.55	0.63	0.88	0.98	1	1	(86)

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

(87)m=	19.48	19.66	19.96	20.38	20.73	20.93	20.98	20.97	20.8	20.33	19.83	19.45	(87)

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

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

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

(89)m=	1	1	0.99	0.95	0.83	0.61	0.42	0.49	0.81	0.97	1	1	(89)

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

(90)m=	18.45	18.63	18.93	19.34	19.66	19.82	19.85	19.85	19.74	19.31	18.81	18.43	(90)

fLA = Living area ÷ (4) = 0.3 (91)

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

(92)m=	18.75	18.93	19.24	19.65	19.98	20.15	20.19	20.18	20.05	19.61	19.11	18.73	(92)

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

(93)m=	18.75	18.93	19.24	19.65	19.98	20.15	20.19	20.18	20.05	19.61	19.11	18.73	(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	0.94	0.83	0.64	0.46	0.53	0.82	0.97	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	528.18	640.31	757.22	865.68	860.34	664.06	450.31	467.58	626.19	608.35	525.18	494.15	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1895.38	1836.07	1662.85	1388.02	1067.04	708.36	457.66	481.61	762.74	1161.59	1554.44	1888.25	(97)

TFEE WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(98)m=	1017.2	803.55	673.78	376.09	153.79	0	0	0	0	411.61	741.07	1037.21		

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 5214.29 (98)

Space heating requirement in kWh/m²/year 52.38 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1199.97	944.66	968.47	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.86	0.92	0.88	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1028.1	864.52	851.68	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1313.48	1249.72	1131.44	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(104)m=	0	0	0	0	0	205.48	286.58	208.14	0	0	0	0

Total = Sum(104)$_{6...8}$ = 700.2 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104)$_{6...8}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(107)m=	0	0	0	0	0	51.37	71.65	52.04	0	0	0	0

Total = Sum(107)$_{6...8}$ = 175.05 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 1.76 (108)

8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency (99) + (108) = 54.14 (109)

Target Fabric Energy Efficiency (TFEE) 62.26 (109)

DFEE WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Harry Hinchcliffe	**Stroma Number:**	STRO034627
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.16

Property Address: 15592 - L1a Assessment

Address : New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	52.34	(1a)	x	2.39	(2a)	=	125.09	(3a)
First floor	47.21	(1b)	x	2.65	(2b)	=	125.11	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.55	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	250.2	(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) =	0.12	(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			1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.34	(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

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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

0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.38	0.4

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	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

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

(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(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			2.1	x	1.6	=	3.36			(26)
Windows Type 1			7.78	x1/[1/(1.4)+ 0.04]		=	10.31			(27)
Windows Type 2			18.86	x1/[1/(1.4)+ 0.04]		=	25			(27)
Windows Type 3			2.76	x1/[1/(1.4)+ 0.04]		=	3.66			(27)
Windows Type 4			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Floor			52.34	x	0.18	=	9.421201			(28)
Walls	154.05	32.19	121.86	x	0.24	=	29.25			(29)
Roof Type1	4.67	0	4.67	x	0.14	=	0.65			(30)
Roof Type2	47.5	0	47.5	x	0.11	=	5.22			(30)
Total area of elements, m²			258.56							(31)

** 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) = 87.8 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13538.53 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Low 100 (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 19.28 (36)

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

Total fabric heat loss (33) + (36) = 107.07 (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=	49.14	48.83	48.54	47.13	46.87	45.64	45.64	45.42	46.12	46.87	47.4	47.96	(38)

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

(39)m=	156.21	155.91	155.61	154.21	153.94	152.72	152.72	152.49	153.19	153.94	154.47	155.03	

Average = $Sum(39)_{1...12}$ /12= 154.2 (39)

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

(40)m=	1.57	1.57	1.56	1.55	1.55	1.53	1.53	1.53	1.54	1.55	1.55	1.56	

Average = $Sum(40)_{1...12}$ /12= 1.55 (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 2.74 (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 99.16 (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=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08

Total = $Sum(44)_{1...12}$ = 1189.97 (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=	161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66

Total = $Sum(45)_{1...12}$ = 1560.23 (45)

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

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

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

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

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (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 (55)

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

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	137.5	120.26	124.09	108.19	103.81	89.58	83.01	95.25	96.39	112.33	122.62	133.16	(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=	137.5	120.26	124.09	108.19	103.81	89.58	83.01	95.25	96.39	112.33	122.62	133.16

Output from water heater (annual)$_{1\ldots12}$ — 1326.2 (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=	34.37	30.06	31.02	27.05	25.95	22.39	20.75	23.81	24.1	28.08	30.66	33.29	(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=	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	(66)

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

(67)m=	22.79	20.24	16.46	12.46	9.31	7.86	8.5	11.04	14.82	18.82	21.97	23.42	(67)

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

(68)m=	255.6	258.25	251.57	237.34	219.38	202.5	191.22	188.57	195.25	209.48	227.44	244.32	(68)

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

(69)m=	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

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

(71)m=	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	(71)

Water heating gains (Table 5)

(72)m=	46.2	44.74	41.7	37.57	34.88	31.1	27.89	32.01	33.47	37.75	42.58	44.74	(72)

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

(73)m=	388.62	387.26	373.75	351.39	327.6	305.49	291.64	295.65	307.57	330.08	356.02	376.52	(73)

6. Solar gains:

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

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	18.86	x	11.28	x	0.63	x	0.7	=	65.03	(75)
Northeast	0.9x	0.77	x	18.86	x	22.97	x	0.63	x	0.7	=	132.38	(75)
Northeast	0.9x	0.77	x	18.86	x	41.38	x	0.63	x	0.7	=	238.5	(75)
Northeast	0.9x	0.77	x	18.86	x	67.96	x	0.63	x	0.7	=	391.69	(75)
Northeast	0.9x	0.77	x	18.86	x	91.35	x	0.63	x	0.7	=	526.51	(75)
Northeast	0.9x	0.77	x	18.86	x	97.38	x	0.63	x	0.7	=	561.31	(75)
Northeast	0.9x	0.77	x	18.86	x	91.1	x	0.63	x	0.7	=	525.09	(75)
Northeast	0.9x	0.77	x	18.86	x	72.63	x	0.63	x	0.7	=	418.61	(75)
Northeast	0.9x	0.77	x	18.86	x	50.42	x	0.63	x	0.7	=	290.62	(75)
Northeast	0.9x	0.77	x	18.86	x	28.07	x	0.63	x	0.7	=	161.78	(75)
Northeast	0.9x	0.77	x	18.86	x	14.2	x	0.63	x	0.7	=	81.83	(75)
Northeast	0.9x	0.77	x	18.86	x	9.21	x	0.63	x	0.7	=	53.11	(75)
Southeast	0.9x	0.77	x	2.76	x	36.79	x	0.63	x	0.7	=	31.04	(77)
Southeast	0.9x	0.77	x	2.76	x	62.67	x	0.63	x	0.7	=	52.86	(77)
Southeast	0.9x	0.77	x	2.76	x	85.75	x	0.63	x	0.7	=	72.33	(77)
Southeast	0.9x	0.77	x	2.76	x	106.25	x	0.63	x	0.7	=	89.62	(77)
Southeast	0.9x	0.77	x	2.76	x	119.01	x	0.63	x	0.7	=	100.38	(77)
Southeast	0.9x	0.77	x	2.76	x	118.15	x	0.63	x	0.7	=	99.66	(77)
Southeast	0.9x	0.77	x	2.76	x	113.91	x	0.63	x	0.7	=	96.08	(77)
Southeast	0.9x	0.77	x	2.76	x	104.39	x	0.63	x	0.7	=	88.05	(77)
Southeast	0.9x	0.77	x	2.76	x	92.85	x	0.63	x	0.7	=	78.32	(77)
Southeast	0.9x	0.77	x	2.76	x	69.27	x	0.63	x	0.7	=	58.43	(77)
Southeast	0.9x	0.77	x	2.76	x	44.07	x	0.63	x	0.7	=	37.17	(77)
Southeast	0.9x	0.77	x	2.76	x	31.49	x	0.63	x	0.7	=	26.56	(77)
Southwest	0.9x	0.77	x	7.78	x	36.79		0.63	x	0.7	=	87.48	(79)
Southwest	0.9x	0.77	x	7.78	x	62.67		0.63	x	0.7	=	149.02	(79)
Southwest	0.9x	0.77	x	7.78	x	85.75		0.63	x	0.7	=	203.89	(79)
Southwest	0.9x	0.77	x	7.78	x	106.25		0.63	x	0.7	=	252.63	(79)
Southwest	0.9x	0.77	x	7.78	x	119.01		0.63	x	0.7	=	282.97	(79)
Southwest	0.9x	0.77	x	7.78	x	118.15		0.63	x	0.7	=	280.92	(79)
Southwest	0.9x	0.77	x	7.78	x	113.91		0.63	x	0.7	=	270.84	(79)
Southwest	0.9x	0.77	x	7.78	x	104.39		0.63	x	0.7	=	248.21	(79)
Southwest	0.9x	0.77	x	7.78	x	92.85		0.63	x	0.7	=	220.77	(79)
Southwest	0.9x	0.77	x	7.78	x	69.27		0.63	x	0.7	=	164.7	(79)
Southwest	0.9x	0.77	x	7.78	x	44.07		0.63	x	0.7	=	104.79	(79)
Southwest	0.9x	0.77	x	7.78	x	31.49		0.63	x	0.7	=	74.87	(79)
Northwest	0.9x	0.77	x	0.69	x	11.28	x	0.63	x	0.7	=	2.38	(81)
Northwest	0.9x	0.77	x	0.69	x	22.97	x	0.63	x	0.7	=	4.84	(81)
Northwest	0.9x	0.77	x	0.69	x	41.38	x	0.63	x	0.7	=	8.73	(81)

Northwest	0.9x	0.77	x	0.69	x	67.96	x	0.63	x	0.7	=	14.33	(81)
Northwest	0.9x	0.77	x	0.69	x	91.35	x	0.63	x	0.7	=	19.26	(81)
Northwest	0.9x	0.77	x	0.69	x	97.38	x	0.63	x	0.7	=	20.54	(81)
Northwest	0.9x	0.77	x	0.69	x	91.1	x	0.63	x	0.7	=	19.21	(81)
Northwest	0.9x	0.77	x	0.69	x	72.63	x	0.63	x	0.7	=	15.32	(81)
Northwest	0.9x	0.77	x	0.69	x	50.42	x	0.63	x	0.7	=	10.63	(81)
Northwest	0.9x	0.77	x	0.69	x	28.07	x	0.63	x	0.7	=	5.92	(81)
Northwest	0.9x	0.77	x	0.69	x	14.2	x	0.63	x	0.7	=	2.99	(81)
Northwest	0.9x	0.77	x	0.69	x	9.21	x	0.63	x	0.7	=	1.94	(81)

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

(83)m=	185.93	339.1	523.45	748.27	929.12	962.43	911.23	770.18	600.34	390.82	226.78	156.48	(83)

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

(84)m=	574.55	726.36	897.2	1099.67	1256.72	1267.92	1202.86	1065.83	907.91	720.89	582.8	532.99	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.95	0.92	0.84	0.73	0.6	0.48	0.54	0.74	0.9	0.96	0.98	(86)

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

(87)m=	17.79	18.15	18.75	19.52	20.19	20.65	20.85	20.8	20.39	19.49	18.5	17.72	(87)

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

(88)m=	19.64	19.64	19.64	19.65	19.65	19.66	19.66	19.66	19.66	19.65	19.65	19.64	(88)

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

(89)m=	0.97	0.94	0.9	0.81	0.68	0.51	0.36	0.42	0.67	0.87	0.95	0.97	(89)

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

(90)m=	16.75	17.11	17.7	18.45	19.07	19.46	19.6	19.58	19.27	18.44	17.47	16.69	(90)

fLA = Living area ÷ (4) = 0.3 (91)

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

(92)m=	17.06	17.42	18.01	18.76	19.4	19.81	19.97	19.94	19.6	18.75	17.77	17	(92)

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

(93)m=	17.06	17.42	18.01	18.76	19.4	19.81	19.97	19.94	19.6	18.75	17.77	17	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.95	0.92	0.88	0.79	0.67	0.52	0.39	0.44	0.66	0.85	0.93	0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	546.85	671.23	785.98	868.07	838.07	659.15	466.33	472.81	600.77	611.64	542.84	510.72	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1992.87	1951.3	1790.76	1520.98	1185.09	795.86	514.74	539.53	842.37	1255.36	1648.37	1983.9	(97)

DFEE WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(98)m=	1075.84	860.21	747.56	470.1	258.19	0	0	0	0	478.92	795.98	1096.05		

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 5782.85 (98)

Space heating requirement in kWh/m²/year 58.09 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1435.56	1130.12	1158.95	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.72	0.78	0.74	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1036.33	881.97	856.57	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1586.76	1508.46	1350.13	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(104)m=	0	0	0	0	0	396.31	466.1	367.21	0	0	0	0

Total = Sum(104)$_{6...8}$ = 1229.63 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104)$_{6...8}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(107)m=	0	0	0	0	0	99.08	116.53	91.8	0	0	0	0

Total = Sum(107)$_{6...8}$ = 307.41 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 3.09 (108)

8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency (99) + (108) = 61.18 (109)

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Harry Hinchcliffe	**Stroma Number:**	STRO034627
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.16

Property Address: 15592 - L1a Assessment

Address : New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	52.34	(1a)	x	2.39	(2a)	=	125.09	(3a)
First floor	47.21	(1b)	x	2.65	(2b)	=	125.11	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.55	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	250.2	(5)

2. Ventilation rate:

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

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0	÷ (5) =	0	(8)

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

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

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

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

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

Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.23	(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

DER WorkSheet: New dwelling design stage

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

0.29	0.29	0.28	0.25	0.25	0.22	0.22	0.21	0.23	0.25	0.26	0.27

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=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54	(24d)

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

(25)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54	(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			2.1	x	1.6	=	3.36			(26)
Windows Type 1			7.78	x1/[1/(1.4)+ 0.04]		=	10.31			(27)
Windows Type 2			18.86	x1/[1/(1.4)+ 0.04]		=	25			(27)
Windows Type 3			2.76	x1/[1/(1.4)+ 0.04]		=	3.66			(27)
Windows Type 4			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Floor			52.34	x	0.18	=	9.421201			(28)
Walls	154.05	32.19	121.86	x	0.24	=	29.25			(29)
Roof Type1	4.67	0	4.67	x	0.14	=	0.65			(30)
Roof Type2	47.5	0	47.5	x	0.11	=	5.22			(30)
Total area of elements, m²			258.56							(31)

** 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) =	87.8	(33)
Heat capacity Cm = S(A x k)	((28)…(30) + (32) + (32a)…(32e) =	13538.53	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Indicative Value: Low	100	(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 19.28 (36)

DER WorkSheet: New dwelling design stage

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

Total fabric heat loss (33) + (36) = 107.07 (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=	44.87	44.73	44.6	43.95	43.83	43.28	43.28	43.17	43.49	43.83	44.08	44.33	(38)

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

(39)m=	151.95	151.81	151.67	151.03	150.91	150.35	150.35	150.25	150.57	150.91	151.15	151.41	

Average = $Sum(39)_{1...12}$ /12= 151.03 (39)

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

(40)m=	1.53	1.52	1.52	1.52	1.52	1.51	1.51	1.51	1.51	1.52	1.52	1.52	

Average = $Sum(40)_{1...12}$ /12= 1.52 (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 2.74 (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 99.16 (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=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08

Total = $Sum(44)_{1...12}$ = 1189.97 (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=	161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66

Total = $Sum(45)_{1...12}$ = 1560.23 (45)

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

(46)m=	24.26	21.22	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	21.64	23.5	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

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

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

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (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 (55)

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

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

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

(61)m=	14.14	12.76	14.11	13.61	14.03	13.54	13.97	14.01	13.58	14.07	13.66	14.13	(61)

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

(62)m=	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79	(62)

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

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

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

Output from water heater

(64)m=	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79

Output from water heater (annual)$_{1…12}$ | 1725.84 | (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=	57.32	50.23	52.07	45.72	44.12	38.43	35.96	40.76	41.1	47.46	51.38	55.62	(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=	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	(66)

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

(67)m=	22.79	20.24	16.46	12.46	9.31	7.86	8.5	11.04	14.82	18.82	21.97	23.42	(67)

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

(68)m=	255.6	258.25	251.57	237.34	219.38	202.5	191.22	188.57	195.25	209.48	227.44	244.32	(68)

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

(69)m=	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	(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=	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	(71)

Water heating gains (Table 5)

(72)m=	77.05	74.75	69.99	63.5	59.29	53.37	48.34	54.79	57.08	63.79	71.36	74.76	(72)

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

(73)m=	422.46	420.27	405.04	380.33	355.02	330.76	315.08	321.43	334.19	359.12	387.8	409.53	(73)

6. Solar gains:

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

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	18.86	x	11.28	x	0.63	x	0.7	=	65.03	(75)
Northeast	0.9x	0.77	x	18.86	x	22.97	x	0.63	x	0.7	=	132.38	(75)
Northeast	0.9x	0.77	x	18.86	x	41.38	x	0.63	x	0.7	=	238.5	(75)
Northeast	0.9x	0.77	x	18.86	x	67.96	x	0.63	x	0.7	=	391.69	(75)
Northeast	0.9x	0.77	x	18.86	x	91.35	x	0.63	x	0.7	=	526.51	(75)
Northeast	0.9x	0.77	x	18.86	x	97.38	x	0.63	x	0.7	=	561.31	(75)
Northeast	0.9x	0.77	x	18.86	x	91.1	x	0.63	x	0.7	=	525.09	(75)
Northeast	0.9x	0.77	x	18.86	x	72.63	x	0.63	x	0.7	=	418.61	(75)
Northeast	0.9x	0.77	x	18.86	x	50.42	x	0.63	x	0.7	=	290.62	(75)
Northeast	0.9x	0.77	x	18.86	x	28.07	x	0.63	x	0.7	=	161.78	(75)
Northeast	0.9x	0.77	x	18.86	x	14.2	x	0.63	x	0.7	=	81.83	(75)
Northeast	0.9x	0.77	x	18.86	x	9.21	x	0.63	x	0.7	=	53.11	(75)
Southeast	0.9x	0.77	x	2.76	x	36.79	x	0.63	x	0.7	=	31.04	(77)
Southeast	0.9x	0.77	x	2.76	x	62.67	x	0.63	x	0.7	=	52.86	(77)
Southeast	0.9x	0.77	x	2.76	x	85.75	x	0.63	x	0.7	=	72.33	(77)
Southeast	0.9x	0.77	x	2.76	x	106.25	x	0.63	x	0.7	=	89.62	(77)
Southeast	0.9x	0.77	x	2.76	x	119.01	x	0.63	x	0.7	=	100.38	(77)
Southeast	0.9x	0.77	x	2.76	x	118.15	x	0.63	x	0.7	=	99.66	(77)
Southeast	0.9x	0.77	x	2.76	x	113.91	x	0.63	x	0.7	=	96.08	(77)
Southeast	0.9x	0.77	x	2.76	x	104.39	x	0.63	x	0.7	=	88.05	(77)
Southeast	0.9x	0.77	x	2.76	x	92.85	x	0.63	x	0.7	=	78.32	(77)
Southeast	0.9x	0.77	x	2.76	x	69.27	x	0.63	x	0.7	=	58.43	(77)
Southeast	0.9x	0.77	x	2.76	x	44.07	x	0.63	x	0.7	=	37.17	(77)
Southeast	0.9x	0.77	x	2.76	x	31.49	x	0.63	x	0.7	=	26.56	(77)
Southwest	0.9x	0.77	x	7.78	x	36.79		0.63	x	0.7	=	87.48	(79)
Southwest	0.9x	0.77	x	7.78	x	62.67		0.63	x	0.7	=	149.02	(79)
Southwest	0.9x	0.77	x	7.78	x	85.75		0.63	x	0.7	=	203.89	(79)
Southwest	0.9x	0.77	x	7.78	x	106.25		0.63	x	0.7	=	252.63	(79)
Southwest	0.9x	0.77	x	7.78	x	119.01		0.63	x	0.7	=	282.97	(79)
Southwest	0.9x	0.77	x	7.78	x	118.15		0.63	x	0.7	=	280.92	(79)
Southwest	0.9x	0.77	x	7.78	x	113.91		0.63	x	0.7	=	270.84	(79)
Southwest	0.9x	0.77	x	7.78	x	104.39		0.63	x	0.7	=	248.21	(79)
Southwest	0.9x	0.77	x	7.78	x	92.85		0.63	x	0.7	=	220.77	(79)
Southwest	0.9x	0.77	x	7.78	x	69.27		0.63	x	0.7	=	164.7	(79)
Southwest	0.9x	0.77	x	7.78	x	44.07		0.63	x	0.7	=	104.79	(79)
Southwest	0.9x	0.77	x	7.78	x	31.49		0.63	x	0.7	=	74.87	(79)
Northwest	0.9x	0.77	x	0.69	x	11.28	x	0.63	x	0.7	=	2.38	(81)
Northwest	0.9x	0.77	x	0.69	x	22.97	x	0.63	x	0.7	=	4.84	(81)
Northwest	0.9x	0.77	x	0.69	x	41.38	x	0.63	x	0.7	=	8.73	(81)

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Northwest	0.9x	0.77	x	0.69	x	67.96	x	0.63	x	0.7	=	14.33	(81)
Northwest	0.9x	0.77	x	0.69	x	91.35	x	0.63	x	0.7	=	19.26	(81)
Northwest	0.9x	0.77	x	0.69	x	97.38	x	0.63	x	0.7	=	20.54	(81)
Northwest	0.9x	0.77	x	0.69	x	91.1	x	0.63	x	0.7	=	19.21	(81)
Northwest	0.9x	0.77	x	0.69	x	72.63	x	0.63	x	0.7	=	15.32	(81)
Northwest	0.9x	0.77	x	0.69	x	50.42	x	0.63	x	0.7	=	10.63	(81)
Northwest	0.9x	0.77	x	0.69	x	28.07	x	0.63	x	0.7	=	5.92	(81)
Northwest	0.9x	0.77	x	0.69	x	14.2	x	0.63	x	0.7	=	2.99	(81)
Northwest	0.9x	0.77	x	0.69	x	9.21	x	0.63	x	0.7	=	1.94	(81)

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

(83)m=	185.93	339.1	523.45	748.27	929.12	962.43	911.23	770.18	600.34	390.82	226.78	156.48	(83)

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

(84)m=	608.39	759.37	928.49	1128.6	1284.14	1293.19	1226.31	1091.61	934.53	749.94	614.58	566.01	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.97	0.95	0.91	0.83	0.72	0.58	0.47	0.52	0.73	0.89	0.95	0.97	(86)

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

(87)m=	17.91	18.26	18.85	19.59	20.24	20.67	20.86	20.81	20.42	19.56	18.59	17.83	(87)

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

(88)m=	19.67	19.67	19.67	19.67	19.68	19.68	19.68	19.68	19.68	19.68	19.67	19.67	(88)

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

(89)m=	0.96	0.94	0.89	0.8	0.67	0.5	0.35	0.41	0.65	0.86	0.94	0.97	(89)

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

(90)m=	15.6	16.12	16.95	18	18.87	19.4	19.6	19.56	19.14	17.99	16.6	15.5	(90)

fLA = Living area ÷ (4) = 0.3 (91)

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

(92)m=	16.28	16.75	17.51	18.47	19.27	19.78	19.97	19.93	19.52	18.45	17.19	16.19	(92)

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

(93)m=	16.13	16.6	17.36	18.32	19.12	19.63	19.82	19.78	19.37	18.3	17.04	16.04	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.94	0.91	0.85	0.76	0.64	0.5	0.36	0.42	0.63	0.82	0.91	0.95	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	570.66	688.52	793.39	863.12	823.52	640.43	445.33	454.14	590.5	617.08	561.64	535.19	(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=	1798.25	1776.02	1647.67	1422.3	1120.01	755.87	484.32	508.22	793.55	1162.65	1501.98	1792.04	(97)

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

(98)m=	913.32	730.8	635.58	402.61	220.59	0	0	0	0	405.9	677.04	935.1

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4920.94 (98)

Space heating requirement in kWh/m²/year 49.43 (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)	913.32	730.8	635.58	402.61	220.59	0	0	0	0	405.9	677.04	935.1		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	976.81	781.6	679.77	430.6	235.93	0	0	0	0	434.12	724.11	1000.1		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													5263.04	(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)	175.91	154.24	160.1	140.89	136.16	118.93	111.62	126.07	126.98	146.23	157.92	170.79		
Efficiency of water heater													87.3	(216)
(217)m=	89.97	89.93	89.84	89.65	89.25	87.3	87.3	87.3	87.3	89.63	89.88	89.99		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	195.52	171.52	178.21	157.16	152.56	136.23	127.86	144.41	145.45	163.15	175.71	189.79		
Total = Sum(219a)$_{1...12}$ =													1937.57	(219)

Annual totals		kWh/year	kWh/year	
Space heating fuel used, main system 1			5263.04	
Water heating fuel used			1937.57	
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			402.42	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			7678.03	(338)

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

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	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	1136.82	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	418.52	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1555.33	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	208.86	(268)
Total CO2, kg/year			sum of (265)…(271) =		1803.11	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4) =		18.11	(273)
EI rating (section 14)					83	(274)

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User Details:

Assessor Name:	Harry Hinchcliffe	**Stroma Number:**	STRO034627
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.16

Property Address: 15592 - L1a Assessment

Address : New Dwelling @, 34 Summer House Way, Langley, WD5 0DY

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	52.34	(1a)	x	2.39	(2a)	=	125.09	(3a)
First floor	47.21	(1b)	x	2.65	(2b)	=	125.11	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.55	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)		=	250.2	(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) =	0.12	(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		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(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

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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

0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.38	0.4

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	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

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

(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(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			2.1	x	1	=	2.1			(26)
Windows Type 1			5.89	x1/[1/(1.4)+ 0.04]		=	7.81			(27)
Windows Type 2			14.28	x1/[1/(1.4)+ 0.04]		=	18.93			(27)
Windows Type 3			2.09	x1/[1/(1.4)+ 0.04]		=	2.77			(27)
Windows Type 4			0.52	x1/[1/(1.4)+ 0.04]		=	0.69			(27)
Floor			52.34	x	0.13	=	6.8042			(28)
Walls	154.05	24.88	129.17	x	0.18	=	23.25			(29)
Roof Type1	4.67	0	4.67	x	0.13	=	0.61			(30)
Roof Type2	47.5	0	47.5	x	0.13	=	6.17			(30)
Total area of elements, m²			258.56							(31)

** 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) = 69.14 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13977.13 (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 12.87 (36)

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

Total fabric heat loss (33) + (36) = 82.01 (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=	49.14	48.83	48.54	47.13	46.87	45.64	45.64	45.42	46.12	46.87	47.4	47.96	(38)

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

(39)m=	131.15	130.85	130.55	129.14	128.88	127.66	127.66	127.43	128.13	128.88	129.41	129.97	

Average = Sum(39)$_{1…12}$ /12= 129.14 (39)

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

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

Average = Sum(40)$_{1…12}$ /12= 1.3 (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 2.74 (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 99.16 (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=	109.08	105.11	101.15	97.18	93.21	89.25	89.25	93.21	97.18	101.15	105.11	109.08	

Total = Sum(44)$_{1…12}$ = 1189.97 (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=	161.76	141.48	145.99	127.28	122.13	105.39	97.66	112.06	113.4	132.16	144.26	156.66	

Total = Sum(45)$_{1…12}$ = 1560.23 (45)

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

(46)m=	24.26	21.22	21.9	19.09	18.32	15.81	14.65	16.81	17.01	19.82	21.64	23.5	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

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

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

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (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 (55)

TER WorkSheet: New dwelling design stage

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

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

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

(61)m=	50.96	46.03	50.96	47.92	47.5	44.01	45.48	47.5	47.92	50.96	49.32	50.96	(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=	212.72	187.51	196.95	175.21	169.63	149.4	143.14	159.56	161.33	183.12	193.58	207.62	(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=	212.72	187.51	196.95	175.21	169.63	149.4	143.14	159.56	161.33	183.12	193.58	207.62

Output from water heater (annual)$_{1...12}$ — 2139.75 — (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=	66.53	58.55	61.28	54.3	52.48	46.04	43.84	49.14	49.69	56.68	60.3	64.83	(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=	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	136.77	(66)

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

(67)m=	22.79	20.24	16.46	12.46	9.31	7.86	8.5	11.04	14.82	18.82	21.97	23.42	(67)

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

(68)m=	255.6	258.25	251.57	237.34	219.38	202.5	191.22	188.57	195.25	209.48	227.44	244.32	(68)

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

(69)m=	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	36.68	(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=	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	-109.41	(71)

Water heating gains (Table 5)

(72)m=	89.42	87.13	82.37	75.42	70.54	63.95	58.93	66.04	69.01	76.19	83.74	87.14	(72)

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

(73)m=	434.83	432.65	417.43	392.25	366.26	341.34	325.67	332.68	346.11	371.52	400.18	421.91	(73)

6. Solar gains:

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

TER WorkSheet: New dwelling design stage

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast	0.9x	0.77	x	14.28	x	11.28	x	0.63	x	0.7	=	49.24	(75)
Northeast	0.9x	0.77	x	14.28	x	22.97	x	0.63	x	0.7	=	100.23	(75)
Northeast	0.9x	0.77	x	14.28	x	41.38	x	0.63	x	0.7	=	180.58	(75)
Northeast	0.9x	0.77	x	14.28	x	67.96	x	0.63	x	0.7	=	296.57	(75)
Northeast	0.9x	0.77	x	14.28	x	91.35	x	0.63	x	0.7	=	398.65	(75)
Northeast	0.9x	0.77	x	14.28	x	97.38	x	0.63	x	0.7	=	425	(75)
Northeast	0.9x	0.77	x	14.28	x	91.1	x	0.63	x	0.7	=	397.58	(75)
Northeast	0.9x	0.77	x	14.28	x	72.63	x	0.63	x	0.7	=	316.95	(75)
Northeast	0.9x	0.77	x	14.28	x	50.42	x	0.63	x	0.7	=	220.04	(75)
Northeast	0.9x	0.77	x	14.28	x	28.07	x	0.63	x	0.7	=	122.49	(75)
Northeast	0.9x	0.77	x	14.28	x	14.2	x	0.63	x	0.7	=	61.96	(75)
Northeast	0.9x	0.77	x	14.28	x	9.21	x	0.63	x	0.7	=	40.21	(75)
Southeast	0.9x	0.77	x	2.09	x	36.79	x	0.63	x	0.7	=	23.5	(77)
Southeast	0.9x	0.77	x	2.09	x	62.67	x	0.63	x	0.7	=	40.03	(77)
Southeast	0.9x	0.77	x	2.09	x	85.75	x	0.63	x	0.7	=	54.77	(77)
Southeast	0.9x	0.77	x	2.09	x	106.25	x	0.63	x	0.7	=	67.87	(77)
Southeast	0.9x	0.77	x	2.09	x	119.01	x	0.63	x	0.7	=	76.02	(77)
Southeast	0.9x	0.77	x	2.09	x	118.15	x	0.63	x	0.7	=	75.47	(77)
Southeast	0.9x	0.77	x	2.09	x	113.91	x	0.63	x	0.7	=	72.76	(77)
Southeast	0.9x	0.77	x	2.09	x	104.39	x	0.63	x	0.7	=	66.68	(77)
Southeast	0.9x	0.77	x	2.09	x	92.85	x	0.63	x	0.7	=	59.31	(77)
Southeast	0.9x	0.77	x	2.09	x	69.27	x	0.63	x	0.7	=	44.24	(77)
Southeast	0.9x	0.77	x	2.09	x	44.07	x	0.63	x	0.7	=	28.15	(77)
Southeast	0.9x	0.77	x	2.09	x	31.49	x	0.63	x	0.7	=	20.11	(77)
Southwest	0.9x	0.77	x	5.89	x	36.79		0.63	x	0.7	=	66.23	(79)
Southwest	0.9x	0.77	x	5.89	x	62.67		0.63	x	0.7	=	112.82	(79)
Southwest	0.9x	0.77	x	5.89	x	85.75		0.63	x	0.7	=	154.36	(79)
Southwest	0.9x	0.77	x	5.89	x	106.25		0.63	x	0.7	=	191.26	(79)
Southwest	0.9x	0.77	x	5.89	x	119.01		0.63	x	0.7	=	214.23	(79)
Southwest	0.9x	0.77	x	5.89	x	118.15		0.63	x	0.7	=	212.68	(79)
Southwest	0.9x	0.77	x	5.89	x	113.91		0.63	x	0.7	=	205.04	(79)
Southwest	0.9x	0.77	x	5.89	x	104.39		0.63	x	0.7	=	187.91	(79)
Southwest	0.9x	0.77	x	5.89	x	92.85		0.63	x	0.7	=	167.14	(79)
Southwest	0.9x	0.77	x	5.89	x	69.27		0.63	x	0.7	=	124.69	(79)
Southwest	0.9x	0.77	x	5.89	x	44.07		0.63	x	0.7	=	79.33	(79)
Southwest	0.9x	0.77	x	5.89	x	31.49		0.63	x	0.7	=	56.68	(79)
Northwest	0.9x	0.77	x	0.52	x	11.28	x	0.63	x	0.7	=	1.79	(81)
Northwest	0.9x	0.77	x	0.52	x	22.97	x	0.63	x	0.7	=	3.65	(81)
Northwest	0.9x	0.77	x	0.52	x	41.38	x	0.63	x	0.7	=	6.58	(81)

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Northwest	0.9x	0.77	x	0.52	x	67.96	x	0.63	x	0.7	=	10.8	(81)
Northwest	0.9x	0.77	x	0.52	x	91.35	x	0.63	x	0.7	=	14.52	(81)
Northwest	0.9x	0.77	x	0.52	x	97.38	x	0.63	x	0.7	=	15.48	(81)
Northwest	0.9x	0.77	x	0.52	x	91.1	x	0.63	x	0.7	=	14.48	(81)
Northwest	0.9x	0.77	x	0.52	x	72.63	x	0.63	x	0.7	=	11.54	(81)
Northwest	0.9x	0.77	x	0.52	x	50.42	x	0.63	x	0.7	=	8.01	(81)
Northwest	0.9x	0.77	x	0.52	x	28.07	x	0.63	x	0.7	=	4.46	(81)
Northwest	0.9x	0.77	x	0.52	x	14.2	x	0.63	x	0.7	=	2.26	(81)
Northwest	0.9x	0.77	x	0.52	x	9.21	x	0.63	x	0.7	=	1.46	(81)

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

(83)m=	140.77	256.73	396.29	566.49	703.41	728.62	689.86	583.08	454.5	295.88	171.69	118.47	(83)

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

(84)m=	575.6	689.37	813.72	958.74	1069.67	1069.96	1015.53	915.77	800.62	667.4	571.87	540.37	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	1	0.99	0.96	0.86	0.7	0.54	0.61	0.86	0.98	1	1	(86)

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

(87)m=	19.52	19.7	20	20.41	20.75	20.93	20.98	20.97	20.82	20.37	19.87	19.49	(87)

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

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

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

(89)m=	1	0.99	0.98	0.94	0.81	0.6	0.41	0.47	0.79	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=	17.87	18.13	18.57	19.15	19.6	19.81	19.85	19.85	19.71	19.11	18.39	17.83	(90)

fLA = Living area ÷ (4) = 0.3 (91)

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

(92)m=	18.36	18.59	18.99	19.52	19.94	20.14	20.18	20.18	20.03	19.48	18.83	18.32	(92)

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

(93)m=	18.36	18.59	18.99	19.52	19.94	20.14	20.18	20.18	20.03	19.48	18.83	18.32	(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	0.93	0.82	0.62	0.44	0.51	0.8	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	573.53	683.7	795.86	893.72	874.71	668.2	451.18	469.49	640.14	642.61	567.7	538.9	(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=	1843.42	1791.63	1630.87	1371.83	1062.1	707.73	457.63	481.56	760.43	1144.76	1517.58	1835.37	(97)

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

(98)m=	944.8	744.53	621.25	344.23	139.42	0	0	0	0	373.6	683.91	964.57

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4816.31 (98)

Space heating requirement in kWh/m²/year 48.38 (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 93.4 (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)	944.8	744.53	621.25	344.23	139.42	0	0	0	0	373.6	683.91	964.57	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	1011.56	797.14	665.15	368.56	149.27	0	0	0	0	400	732.24	1032.73	(211)

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 5156.65 (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)	212.72	187.51	196.95	175.21	169.63	149.4	143.14	159.56	161.33	183.12	193.58	207.62

Efficiency of water heater 80.3 (216)

(217)m=	88.36	88.17	87.74	86.72	84.56	80.3	80.3	80.3	80.3	86.81	87.96	88.43	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	240.75	212.67	224.46	202.03	200.6	186.05	178.25	198.71	200.9	210.94	220.08	234.78

Total = Sum(219a)$_{1...12}$ = 2510.23 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			5156.65	
Water heating fuel used			2510.23	
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			402.42	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			8144.3	(338)

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

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	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211)	x	0.216	=	1113.84	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	542.21	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1656.05	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	208.86	(268)
Total CO2, kg/year			sum of (265)…(271) =		1903.83	(272)

TER =	19.12	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 14 February 2023

Property Details: 15592 - L1a Assessment

Dwelling type:	Detached House
Located in:	England
Region:	Thames valley
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	North
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Low
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	4 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	330.26	**(P1)**
Transmission heat loss coefficient:	107.1	
Summer heat loss coefficient:	437.34	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South West (Front Windows)	0	1
North East (Rear Windows)	0	1
South East (SE Windows)	0	1
North West (NW Window)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South West (Front Windows)	1	0.9	1	0.9	**(P8)**
North East (Rear Windows)	1	0.9	1	0.9	**(P8)**
South East (SE Windows)	1	0.9	1	0.9	**(P8)**
North West (NW Window)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South West (Front Windows)	0.9 x	7.78	119.92	0.63	0.7	0.9	333.28	
North East (Rear Windows)	0.9 x	18.86	98.85	0.63	0.7	0.9	665.92	
South East (SE Windows)	0.9 x	2.76	119.92	0.63	0.7	0.9	118.23	
North West (NW Window)	0.9 x	0.69	98.85	0.63	0.7	0.9	24.36	
						Total	1141.79	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	484.11	463.83	472.7	
Total summer gains	1703.28	1605.62	1458.63	**(P5)**
Summer gain/loss ratio	3.89	3.67	3.34	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	1.3	1.3	1.3	
Threshold temperature	21.19	22.87	22.44	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Medium