

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.23
Printed on 26 February 2020 at 13:01:16

Project Information:

Assessed By: Mark Heptonstall (STRO004925)

Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 99.51m²

Site Reference : 10528

Plot Reference: V1 - 10528

Address : Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER)

30.7 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

25.81 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)

72.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE)

63.3 kWh/m²

OK

2 Fabric U-values

Element

Average

Highest

External wall

0.20 (max. 0.30)

0.20 (max. 0.70)

OK

Floor

0.13 (max. 0.25)

0.13 (max. 0.70)

OK

Roof

0.13 (max. 0.20)

0.13 (max. 0.35)

OK

Openings

1.40 (max. 2.00)

1.40 (max. 3.30)

OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

OK

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric

Air source heat pump in other cases

Secondary heating system:

None

5 Cylinder insulation

Hot water Storage:

Measured cylinder loss: 1.89 kWh/day

Permitted by DBSCG: 1.89 kWh/day

OK

Primary pipework insulated:

Yes

OK

6 Controls

Space heating controls

TTZC by plumbing and electrical services

OK

Hot water controls:

Cylinderstat

OK

Independent timer for DHW

OK

Regulations Compliance Report

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Slight	OK
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Based on:

Overshading:	Average or unknown
Windows facing: South East	0.62m ²
Windows facing: North East	4.07m ²
Windows facing: North West	3.78m ²
Windows facing: North West	5.66m ²
Roof windows facing: South West	4.1m ²
Roof windows facing: South West	1.17m ²
Roof windows facing: South West	3.1m ²
Roof windows facing: North West	2.34m ²
Ventilation rate:	4.00

10 Key features

None

Predicted Energy Assessment



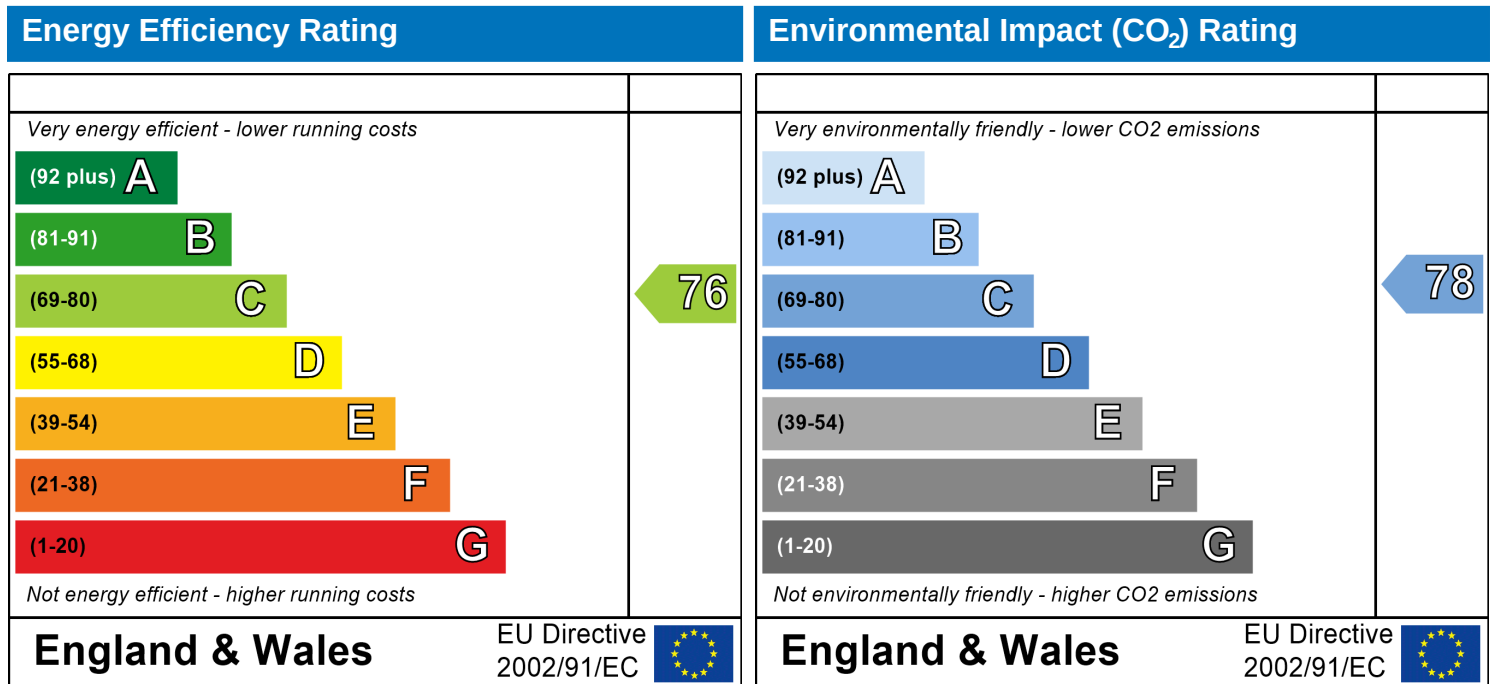
Reptune
Main Road
Yapton
ARUNDEL
BN18 0EA

Dwelling type:
Date of assessment:
Produced by:
Total floor area:

Detached House
26 February 2020
Mark Heptonstall
99.51 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.



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: V1 - 10528

Address: Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA
Located in: England
Region: South East England
UPRN: 123456789
Date of assessment: 26 February 2020
Date of certificate: 26 February 2020
Assessment type: New dwelling design stage
Transaction type: New dwelling
Thermal Mass Parameter: Indicative Value Medium
Comments:

Property description:

Dwelling type: House
Detachment: Detached
Year Completed: 2020
Front of dwelling faces: South East
Comments:

Opening types:

Name:	Type:	Frame Factor:	g-value:	U-Value:	Area:
Front	Solid	0.7	0	1.4	2.42
SE	Windows	0.7	0.63	1.4	0.62
NE	Windows	0.7	0.63	1.4	4.07
NW	Windows	0.7	0.63	1.4	3.78
NW	Windows	0.7	0.63	1.4	5.66
SW	Roof Windows	0.7	0.63	1.4	4.1
SW	Roof Windows	0.7	0.63	1.4	1.17
NW	Roof Windows	0.7	0.63	1.4	3.1
NW	Roof Windows	0.7	0.63	1.4	2.34

Overshading: Average or unknown
Comments:

Opaque Elements:

Type: U-Value: Kappa:

Developer Confirmation Report

External Elements

Exposed Brick	0.2	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A
Exposed Timber	0.19	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A

Materials Used:

Type:	Name:	Thickness:	Conductivity:	R-Value:
Exposed Brick	Internal Surface Resistance	0	0	0.13
Exposed Brick	Brickwork Inner Leaf - BRE (102.5 mm)	102.5	0.56	0.18
Exposed Brick	Kingspan K108	75	0.018	4.17
Exposed Brick	Unventilated Cavity - (Wall) (50 mm)	50	0	0.44
Exposed Brick	Brickwork Inner Leaf - BRE (102.5 mm)	102.5	0.56	0.18
Exposed Brick	External Surface Resistance	0	0	0.04
Exposed Timber	Internal Surface Resistance	0	0	0.13
Exposed Timber	Soft Wood/Plywood/Chipboard (Softwood) (15 mm)	15	0.13	0.12
Exposed Timber	Kooltherm K12 Framing Board (20 mm)	20	0.021	0.95
Exposed Timber	Kooltherm K12 Framing Board (100 mm)	100	0.02	5
Exposed Timber	Battens (35x50 mm)	35	0	0.44
Exposed Timber	Soft Wood/Plywood/Chipboard (Softwood) (9 mm)	9	0.13	0.07
Exposed Timber	External Surface Resistance	0	0	0.04

Comments:

Sloped	0.13	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A
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Materials Used:

Type:	Name:	Thickness:	Conductivity:	R-Value:
Sloped	Internal Surface Resistance	0	0	0.1
Sloped	Soft Wood/Plywood/Chipboard (Softwood) (15 mm)	15	0.13	0.12
Sloped	Kooltherm K7 Pitched Roof Board (40 mm)	40	0.021	1.9
Sloped	Kooltherm K7 Pitched Roof Board (150 mm)	150	0.02	7.5
Sloped	External Surface Resistance	0	0	0.04

Comments:

Ground	0.13	Please provide the U-Value calculation to justify the U-Value entered into the assessment.	N/A
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Materials Used:

Type:	Name:	Thickness:	Conductivity:	R-Value:
Ground	Internal Surface Resistance	0	0	0.17
Ground	Reinforced Concrete (1% Steel) (150 mm)	150	2.3	0.07
Ground	Kingspan Kooltherm K103	110	0.018	6.11
Ground	External Surface Resistance	0	0	0.04

Comments:

Developer Confirmation Report

Internal Elements (Area, Kappa)

Party Elements (Area, Kappa)

Thermal bridges:

Thermal bridges:	User-defined (individual PSI-values) Y-Value = 0.0491			
	Length	Psi-value		
	8.03	0.05	E2	Other lintels (including other steel lintels)
[Approved]	0.69	0.04	E3	Sill
[Approved]	19.46	0.05	E4	Jamb
[Approved]	42.7	0.16	E5	Ground floor (normal)
[Approved]	4.3	0.07	E6	Intermediate floor within a dwelling
[Approved]	29	0.04	E11	Eaves (insulation at rafter level)
[Approved]	24.47	0.04	E13	Gable (insulation at rafter level)
[Approved]	21.48	0.09	E16	Corner (normal)
[Approved]	9.11	-0.09	E17	Corner (inverted internal area greater than external area)
	7.7	0.08	R1	Head
	7.7	0.06	R2	Sill
	19.85	0.08	R3	Jamb
	11.27	0.08	R4	Ridge (vaulted ceiling)

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: Heat pumps with radiators or underfloor heating
 Electric heat pumps
 Fuel: Electricity
 Info Source: SAP Tables
 SAP Table: 224
 Air source heat pump in other cases
 Systems with radiators
 Central heating pump : 2013 or later
 Design flow temperature: Unknown
 Boiler interlock: Yes

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:

Hot water cylinder
Cylinder volume: 150 litres
Cylinder insulation: Measured loss, 1.89kWh/day
Primary pipework insulation: True
Cylinderstat: True
Cylinder in heated space: True

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.

Developer Confirmation Report

Signed:

.....

Date:

.....

SAP Input

Property Details: V1 - 10528

Address: Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA
Located in: England
Region: South East England
UPRN: 123456789
Date of assessment: 26 February 2020
Date of certificate: 26 February 2020
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 455

Property description:

Dwelling type: House
Detachment: Detached
Year Completed: 2020
Floor Location: Floor area: Storey height:
 Floor 0 84.35 m² 3.03758 m
 Floor 1 15.16 m² 1.9908 m
Living area: 51.9 m² (fraction 0.522)
Front of dwelling faces: South East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Front	Manufacturer	Solid			PVC-U
SE	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
NE	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
NW	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
NW	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
SW	Manufacturer	Roof Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
SW	Manufacturer	Roof Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
NW	Manufacturer	Roof Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
NW	Manufacturer	Roof Windows	low-E, En = 0.05, soft coat	Yes	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Front	mm	0.7	0	1.4	2.42	1
SE	16mm or more	0.7	0.63	1.4	0.62	1
NE	16mm or more	0.7	0.63	1.4	4.07	1
NW	16mm or more	0.7	0.63	1.4	3.78	1
NW	16mm or more	0.7	0.63	1.4	5.66	1
SW	16mm or more	0.7	0.63	1.4	4.1	1
SW	16mm or more	0.7	0.63	1.4	1.17	1
NW	16mm or more	0.7	0.63	1.4	3.1	1
NW	16mm or more	0.7	0.63	1.4	2.34	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Front		Exposed Timber	South East	0	0
SE		Exposed Timber	South East	0	0
NE		Exposed Timber	North East	0	0
NW		Exposed Timber	North West	0	0
NW		Exposed Brick	North West	0	0
SW		Sloped	South West	0.001	0

SAP Input

SW	Sloped	South West	0.001	0
NW	Sloped	South West	0.001	0
NW	Sloped	North West	0.001	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
<u>External Elements</u>							
Exposed Brick	93.34	5.66	87.68	0.2	0	False	N/A
Exposed Timber	44.67	10.89	33.78	0.19	0	False	N/A
Sloped	90.09	10.71	79.38	0.13	0		N/A
Ground	84.35			0.13			N/A

Internal Elements

Party Elements

Thermal bridges:

Thermal bridges:	User-defined (individual PSI-values) Y-Value = 0.0491			
	Length	Psi-value		
	8.03	0.05	E2	Other lintels (including other steel lintels)
[Approved]	0.69	0.04	E3	Sill
[Approved]	19.46	0.05	E4	Jamb
[Approved]	42.7	0.16	E5	Ground floor (normal)
[Approved]	4.3	0.07	E6	Intermediate floor within a dwelling
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[Approved]	24.47	0.04	E13	Gable (insulation at rafter level)
[Approved]	21.48	0.09	E16	Corner (normal)
[Approved]	9.11	-0.09	E17	Corner (inverted internal area greater than external area)
	7.7	0.08	R1	Head
	7.7	0.06	R2	Sill
	19.85	0.08	R3	Jamb
	11.27	0.08	R4	Ridge (vaulted ceiling)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	3
Number of passive stacks:	0
Number of sides sheltered:	0
Pressure test:	5

Main heating system:

Main heating system:	Heat pumps with radiators or underfloor heating
	Electric heat pumps
	Fuel: Electricity
	Info Source: SAP Tables
	SAP Table: 224
	Air source heat pump in other cases
	Systems with radiators
	Central heating pump : 2013 or later
	Design flow temperature: Unknown
	Boiler interlock: Yes

Main heating Control:

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

Control code: 2207

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system
Water code: 901
Fuel :Electricity
Hot water cylinder
Cylinder volume: 150 litres
Cylinder insulation: Measured loss, 1.89kWh/day
Primary pipework insulation: True
Cylinderstat: True
Cylinder in heated space: True
Solar panel: False

Others:

Electricity tariff: Standard Tariff
In Smoke Control Area: Unknown
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: Mark Heptonstall **Stroma Number:** STRO004925
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.4.23

Property Address: V1 - 10528

Address : Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	84.35 (1a)	x	3.04 (2a)	=	256.22 (3a)
First floor	15.16 (1b)	x	1.99 (2b)	=	30.18 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.51 (4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	286.4 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				3	30 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.1 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
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)
<i>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</i>			
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)			0.35 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35 (21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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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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SAP 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
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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

	0.45	0.44	0.43	0.39	0.38	0.34	0.34	0.33	0.35	0.38	0.4	0.42
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

(23a)

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

(23b)

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

(23c)

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

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

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
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(24d)

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

(25)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
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(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			2.42	x 1.4	= 3.388		(26)
Windows Type 1			0.62	x1/[1/(1.4)+0.04]	= 0.82		(27)
Windows Type 2			4.07	x1/[1/(1.4)+0.04]	= 5.4		(27)
Windows Type 3			3.78	x1/[1/(1.4)+0.04]	= 5.01		(27)
Windows Type 4			5.66	x1/[1/(1.4)+0.04]	= 7.5		(27)
Rooflights Type 1			4.1	x1/[1/(1.4)+0.04]	= 5.74		(27b)
Rooflights Type 2			1.17	x1/[1/(1.4)+0.04]	= 1.638		(27b)
Rooflights Type 3			3.1	x1/[1/(1.4)+0.04]	= 4.34		(27b)
Rooflights Type 4			2.34	x1/[1/(1.4)+0.04]	= 3.276		(27b)
Floor			84.35	x 0.13	= 10.9655		(28)
Walls Type1	93.34	5.66	87.68	x 0.2	= 17.54		(29)
Walls Type2	44.67	10.89	33.78	x 0.19	= 6.42		(29)
Roof	90.09	10.71	79.38	x 0.13	= 10.32		(30)
Total area of elements, m²			312.45				(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) = 81.56 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 0 (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

SAP WorkSheet: New dwelling design stage

can be used instead of a detailed calculation.

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

15.35 (36)

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

Total fabric heat loss

(33) + (36) =

96.91 (37)

Ventilation heat loss calculated monthly

(38)m = 0.33 x (25)m x (5)

(38)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
56.92	56.55	56.18	54.45	54.13	52.62	52.62	52.34	53.2	54.13	54.78	55.47

(38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=

153.84	153.46	153.09	151.37	151.04	149.54	149.54	149.26	150.12	151.04	151.7	152.38
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Average = Sum(39)_{1...12} /12=

151.36 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.55	1.54	1.54	1.52	1.52	1.5	1.5	1.5	1.51	1.52	1.52	1.53
------	------	------	------	------	-----	-----	-----	------	------	------	------

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

1.52 (40)

Number of days in month (Table 1a)

(41)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.73

(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

99.15

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 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=

109.07	105.1	101.14	97.17	93.21	89.24	89.24	93.21	97.17	101.14	105.1	109.07
--------	-------	--------	-------	-------	-------	-------	-------	-------	--------	-------	--------

Total = Sum(44)_{1...12} =

1189.86 (44)

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

(45)m=

161.75	141.47	145.98	127.27	122.12	105.38	97.65	112.05	113.39	132.15	144.25	156.64
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

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

1560.09 (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

150

(47)

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

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

Water storage loss:

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

1.89

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

(48) x (49) =

1.02

(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)

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Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0
1.02

(54)

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

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(56)

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

(57)m=	31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(57)

Primary circuit loss (annual) from Table 3

0

(58)

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

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

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

(59)

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

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

(61)

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

(62)m=	216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------

(62)

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

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

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

(63)

Output from water heater

(64)m=	216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------

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

2206.51

(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	97.7	86.71	92.46	84.82	84.52	77.54	76.39	81.18	80.21	87.86	90.47	96.01
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1

(66)

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

(67)m=	56.95	50.58	41.14	31.14	23.28	19.65	21.24	27.61	37.05	47.05	54.91	58.54
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(67)

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

(68)m=	381.39	385.35	375.38	354.15	327.34	302.15	285.33	281.37	291.34	312.57	339.38	364.56
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(68)

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

(69)m=	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(71)

Water heating gains (Table 5)

(72)m=	131.32	129.03	124.27	117.81	113.61	107.7	102.67	109.11	111.4	118.09	125.65	129.04
--------	--------	--------	--------	--------	--------	-------	--------	--------	-------	--------	--------	--------

(72)

Total internal gains =

$$(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$$

(73)m=	681.51	676.81	652.63	614.94	576.08	541.35	521.08	529.93	551.64	589.55	631.78	663.98
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(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 m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	4.07	x	11.28	x	0.63	x	0.7	=	14.03	(75)
Northeast 0.9x	0.77	x	4.07	x	22.97	x	0.63	x	0.7	=	28.57	(75)
Northeast 0.9x	0.77	x	4.07	x	41.38	x	0.63	x	0.7	=	51.47	(75)
Northeast 0.9x	0.77	x	4.07	x	67.96	x	0.63	x	0.7	=	84.53	(75)
Northeast 0.9x	0.77	x	4.07	x	91.35	x	0.63	x	0.7	=	113.62	(75)
Northeast 0.9x	0.77	x	4.07	x	97.38	x	0.63	x	0.7	=	121.13	(75)
Northeast 0.9x	0.77	x	4.07	x	91.1	x	0.63	x	0.7	=	113.32	(75)
Northeast 0.9x	0.77	x	4.07	x	72.63	x	0.63	x	0.7	=	90.34	(75)
Northeast 0.9x	0.77	x	4.07	x	50.42	x	0.63	x	0.7	=	62.72	(75)
Northeast 0.9x	0.77	x	4.07	x	28.07	x	0.63	x	0.7	=	34.91	(75)
Northeast 0.9x	0.77	x	4.07	x	14.2	x	0.63	x	0.7	=	17.66	(75)
Northeast 0.9x	0.77	x	4.07	x	9.21	x	0.63	x	0.7	=	11.46	(75)
Southeast 0.9x	0.77	x	0.62	x	36.79	x	0.63	x	0.7	=	6.97	(77)
Southeast 0.9x	0.77	x	0.62	x	62.67	x	0.63	x	0.7	=	11.88	(77)
Southeast 0.9x	0.77	x	0.62	x	85.75	x	0.63	x	0.7	=	16.25	(77)
Southeast 0.9x	0.77	x	0.62	x	106.25	x	0.63	x	0.7	=	20.13	(77)
Southeast 0.9x	0.77	x	0.62	x	119.01	x	0.63	x	0.7	=	22.55	(77)
Southeast 0.9x	0.77	x	0.62	x	118.15	x	0.63	x	0.7	=	22.39	(77)
Southeast 0.9x	0.77	x	0.62	x	113.91	x	0.63	x	0.7	=	21.58	(77)
Southeast 0.9x	0.77	x	0.62	x	104.39	x	0.63	x	0.7	=	19.78	(77)
Southeast 0.9x	0.77	x	0.62	x	92.85	x	0.63	x	0.7	=	17.59	(77)
Southeast 0.9x	0.77	x	0.62	x	69.27	x	0.63	x	0.7	=	13.12	(77)
Southeast 0.9x	0.77	x	0.62	x	44.07	x	0.63	x	0.7	=	8.35	(77)
Southeast 0.9x	0.77	x	0.62	x	31.49	x	0.63	x	0.7	=	5.97	(77)
Northwest 0.9x	0.77	x	3.78	x	11.28	x	0.63	x	0.7	=	13.03	(81)
Northwest 0.9x	0.77	x	5.66	x	11.28	x	0.63	x	0.7	=	19.52	(81)
Northwest 0.9x	0.77	x	3.78	x	22.97	x	0.63	x	0.7	=	26.53	(81)
Northwest 0.9x	0.77	x	5.66	x	22.97	x	0.63	x	0.7	=	39.73	(81)
Northwest 0.9x	0.77	x	3.78	x	41.38	x	0.63	x	0.7	=	47.8	(81)
Northwest 0.9x	0.77	x	5.66	x	41.38	x	0.63	x	0.7	=	71.58	(81)
Northwest 0.9x	0.77	x	3.78	x	67.96	x	0.63	x	0.7	=	78.5	(81)
Northwest 0.9x	0.77	x	5.66	x	67.96	x	0.63	x	0.7	=	117.55	(81)
Northwest 0.9x	0.77	x	3.78	x	91.35	x	0.63	x	0.7	=	105.52	(81)
Northwest 0.9x	0.77	x	5.66	x	91.35	x	0.63	x	0.7	=	158.01	(81)
Northwest 0.9x	0.77	x	3.78	x	97.38	x	0.63	x	0.7	=	112.5	(81)
Northwest 0.9x	0.77	x	5.66	x	97.38	x	0.63	x	0.7	=	168.45	(81)
Northwest 0.9x	0.77	x	3.78	x	91.1	x	0.63	x	0.7	=	105.24	(81)
Northwest 0.9x	0.77	x	5.66	x	91.1	x	0.63	x	0.7	=	157.58	(81)
Northwest 0.9x	0.77	x	3.78	x	72.63	x	0.63	x	0.7	=	83.9	(81)

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Northwest 0.9x	0.77	x	5.66	x	72.63	x	0.63	x	0.7	=	125.63	(81)
Northwest 0.9x	0.77	x	3.78	x	50.42	x	0.63	x	0.7	=	58.25	(81)
Northwest 0.9x	0.77	x	5.66	x	50.42	x	0.63	x	0.7	=	87.22	(81)
Northwest 0.9x	0.77	x	3.78	x	28.07	x	0.63	x	0.7	=	32.42	(81)
Northwest 0.9x	0.77	x	5.66	x	28.07	x	0.63	x	0.7	=	48.55	(81)
Northwest 0.9x	0.77	x	3.78	x	14.2	x	0.63	x	0.7	=	16.4	(81)
Northwest 0.9x	0.77	x	5.66	x	14.2	x	0.63	x	0.7	=	24.56	(81)
Northwest 0.9x	0.77	x	3.78	x	9.21	x	0.63	x	0.7	=	10.64	(81)
Northwest 0.9x	0.77	x	5.66	x	9.21	x	0.63	x	0.7	=	15.94	(81)
Rooflights 0.9x	1	x	4.1	x	36.49	x	0.63	x	0.7	=	59.38	(82)
Rooflights 0.9x	1	x	1.17	x	30.69	x	0.63	x	0.7	=	14.25	(82)
Rooflights 0.9x	1	x	3.1	x	36.49	x	0.63	x	0.7	=	44.9	(82)
Rooflights 0.9x	1	x	2.34	x	22.07	x	0.63	x	0.7	=	20.5	(82)
Rooflights 0.9x	1	x	4.1	x	69.59	x	0.63	x	0.7	=	113.24	(82)
Rooflights 0.9x	1	x	1.17	x	61.32	x	0.63	x	0.7	=	28.48	(82)
Rooflights 0.9x	1	x	3.1	x	69.59	x	0.63	x	0.7	=	85.62	(82)
Rooflights 0.9x	1	x	2.34	x	46.51	x	0.63	x	0.7	=	43.2	(82)
Rooflights 0.9x	1	x	4.1	x	111.44	x	0.63	x	0.7	=	181.35	(82)
Rooflights 0.9x	1	x	1.17	x	104.11	x	0.63	x	0.7	=	48.34	(82)
Rooflights 0.9x	1	x	3.1	x	111.44	x	0.63	x	0.7	=	137.12	(82)
Rooflights 0.9x	1	x	2.34	x	85.44	x	0.63	x	0.7	=	79.35	(82)
Rooflights 0.9x	1	x	4.1	x	159.56	x	0.63	x	0.7	=	259.65	(82)
Rooflights 0.9x	1	x	1.17	x	156.63	x	0.63	x	0.7	=	72.74	(82)
Rooflights 0.9x	1	x	3.1	x	159.56	x	0.63	x	0.7	=	196.32	(82)
Rooflights 0.9x	1	x	2.34	x	139.34	x	0.63	x	0.7	=	129.41	(82)
Rooflights 0.9x	1	x	4.1	x	194.18	x	0.63	x	0.7	=	315.99	(82)
Rooflights 0.9x	1	x	1.17	x	196.16	x	0.63	x	0.7	=	91.09	(82)
Rooflights 0.9x	1	x	3.1	x	194.18	x	0.63	x	0.7	=	238.92	(82)
Rooflights 0.9x	1	x	2.34	x	184.4	x	0.63	x	0.7	=	171.26	(82)
Rooflights 0.9x	1	x	4.1	x	198.47	x	0.63	x	0.7	=	322.97	(82)
Rooflights 0.9x	1	x	1.17	x	202.65	x	0.63	x	0.7	=	94.1	(82)
Rooflights 0.9x	1	x	3.1	x	198.47	x	0.63	x	0.7	=	244.2	(82)
Rooflights 0.9x	1	x	2.34	x	194.93	x	0.63	x	0.7	=	181.04	(82)
Rooflights 0.9x	1	x	4.1	x	189.06	x	0.63	x	0.7	=	307.66	(82)
Rooflights 0.9x	1	x	1.17	x	192.17	x	0.63	x	0.7	=	89.24	(82)
Rooflights 0.9x	1	x	3.1	x	189.06	x	0.63	x	0.7	=	232.62	(82)
Rooflights 0.9x	1	x	2.34	x	183.04	x	0.63	x	0.7	=	170	(82)
Rooflights 0.9x	1	x	4.1	x	163.09	x	0.63	x	0.7	=	265.4	(82)
Rooflights 0.9x	1	x	1.17	x	162.27	x	0.63	x	0.7	=	75.35	(82)
Rooflights 0.9x	1	x	3.1	x	163.09	x	0.63	x	0.7	=	200.67	(82)
Rooflights 0.9x	1	x	2.34	x	148	x	0.63	x	0.7	=	137.46	(82)

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Rooflights 0.9x	1	x	4.1	x	128.47	x	0.63	x	0.7	=	209.06	(82)
Rooflights 0.9x	1	x	1.17	x	122.65	x	0.63	x	0.7	=	56.96	(82)
Rooflights 0.9x	1	x	3.1	x	128.47	x	0.63	x	0.7	=	158.07	(82)
Rooflights 0.9x	1	x	2.34	x	104.09	x	0.63	x	0.7	=	96.67	(82)
Rooflights 0.9x	1	x	4.1	x	81.62	x	0.63	x	0.7	=	132.83	(82)
Rooflights 0.9x	1	x	1.17	x	73.59	x	0.63	x	0.7	=	34.17	(82)
Rooflights 0.9x	1	x	3.1	x	81.62	x	0.63	x	0.7	=	100.43	(82)
Rooflights 0.9x	1	x	2.34	x	57.46	x	0.63	x	0.7	=	53.37	(82)
Rooflights 0.9x	1	x	4.1	x	45.15	x	0.63	x	0.7	=	73.47	(82)
Rooflights 0.9x	1	x	1.17	x	38.5	x	0.63	x	0.7	=	17.88	(82)
Rooflights 0.9x	1	x	3.1	x	45.15	x	0.63	x	0.7	=	55.55	(82)
Rooflights 0.9x	1	x	2.34	x	28.1	x	0.63	x	0.7	=	26.1	(82)
Rooflights 0.9x	1	x	4.1	x	30.25	x	0.63	x	0.7	=	49.23	(82)
Rooflights 0.9x	1	x	1.17	x	25.09	x	0.63	x	0.7	=	11.65	(82)
Rooflights 0.9x	1	x	3.1	x	30.25	x	0.63	x	0.7	=	37.22	(82)
Rooflights 0.9x	1	x	2.34	x	17.78	x	0.63	x	0.7	=	16.51	(82)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	192.59	377.23	633.26	958.84	1216.97	1266.79	1197.24	998.53	746.53	449.81	239.96	158.63	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	874.09	1054.04	1285.9	1573.78	1793.04	1808.14	1718.32	1528.46	1298.17	1039.36	871.73	822.61	(84)
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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)

(86)m=	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(86)
	0.99	0.98	0.95	0.86	0.69	0.51	0.38	0.44	0.7	0.93	0.98	0.99	

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

(87)m=	19.5	19.73	20.12	20.57	20.86	20.97	20.99	20.99	20.89	20.46	19.89	19.46	(87)
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(88)m=	19.65	19.66	19.66	19.67	19.67	19.69	19.69	19.69	19.68	19.67	19.67	19.66	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	0.99	0.97	0.93	0.82	0.62	0.41	0.27	0.32	0.6	0.9	0.98	0.99	(89)
--------	------	------	------	------	------	------	------	------	-----	-----	------	------	------

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

(90)m=	17.72	18.06	18.61	19.22	19.56	19.67	19.68	19.68	19.61	19.1	18.3	17.67	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------	------	-------	------

fLA = Living area ÷ (4) =

0.52

(91)

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

(92)m=	18.65	18.93	19.4	19.93	20.24	20.35	20.37	20.36	20.28	19.81	19.13	18.61	(92)
--------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.65	18.93	19.4	19.93	20.24	20.35	20.37	20.36	20.28	19.81	19.13	18.61	(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
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Utilisation factor for gains, hm:

(94)m=	0.98	0.97	0.93	0.82	0.65	0.46	0.33	0.38	0.65	0.9	0.97	0.99	(94)
--------	------	------	------	------	------	------	------	------	------	-----	------	------	------

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

(95)m=	860.92	1022.31	1194.9	1297.72	1171.79	837.19	559.2	584	844.98	934.71	848.11	812.62	(95)
--------	--------	---------	--------	---------	---------	--------	-------	-----	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
--------	-----	-----	-----	-----	------	------	------	------	------	------	-----	-----	------

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

(97)m=	2207.51	2153.53	1974.3	1669.16	1289.21	859.36	563.2	591.56	927.35	1391.54	1825.38	2195.06	(97)
--------	---------	---------	--------	---------	---------	--------	-------	--------	--------	---------	---------	---------	------

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

(98)m=	1001.86	760.18	579.87	267.44	87.36	0	0	0	0	339.88	703.64	1028.54	(98)
--------	---------	--------	--------	--------	-------	---	---	---	---	--------	--------	---------	------

Total per year (kWh/year) = Sum(98)_{1...5,9...12} = 4768.77 (98)

Space heating requirement in kWh/m²/year

47.92 (99)

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

Space heating:

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

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

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

Efficiency of main space heating system 1 170 (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)

1001.86	760.18	579.87	267.44	87.36	0	0	0	0	339.88	703.64	1028.54
---------	--------	--------	--------	-------	---	---	---	---	--------	--------	---------

(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)

589.33	447.16	341.1	157.32	51.39	0	0	0	0	199.93	413.9	605.02
--------	--------	-------	--------	-------	---	---	---	---	--------	-------	--------

Total (kWh/year) =Sum(211)_{1...5,10...12} = 2805.16 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

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

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

Water heating

Output from water heater (calculated above)

216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	(217)
---------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-------

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	127.44	112.38	118.17	106.12	104.13	93.24	89.74	98.21	97.95	110.03	116.11	124.44	(219)
---------	--------	--------	--------	--------	--------	-------	-------	-------	-------	--------	--------	--------	-------

Total = Sum(219a)_{1...12} = 1297.95 (219)

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1 2805.16

Water heating fuel used 1297.95

Electricity for pumps, fans and electric keep-hot

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central heating pump:

30

(230c)

Total electricity for the above, kWh/year

sum of (230a)...(230g) =

30

(231)

Electricity for lighting

402.32

(232)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	13.19	x 0.01 = 370 (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)	13.19	x 0.01 = 171.2 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 = 3.96 (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 = 53.07 (250)
Additional standing charges (Table 12)			0 (251)
Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost	(245)...(247) + (250)...(254) =		598.22 (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] =	1.74 (257)
SAP rating (Section 12)		75.75 (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	0.519	= 1455.88 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating	(219) x	0.519	= 673.63 (264)
Space and water heating	(261) + (262) + (263) + (264) =		2129.51 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= 15.57 (267)
Electricity for lighting	(232) x	0.519	= 208.8 (268)
Total CO2, kg/year		sum of (265)...(271) =	2353.88 (272)
CO2 emissions per m²		(272) ÷ (4) =	23.65 (273)
El rating (section 14)			78 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	3.07	= 8611.84 (261)

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Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3984.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =			12596.53	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	92.1	(267)
Electricity for lighting	(232) x	0	=	1235.12	(268)
'Total Primary Energy	sum of (265)...(271) =			13923.75	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			139.92	(273)

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User Details:

Assessor Name:	Mark Heptonstall	Stroma Number:	STRO004925
Software Name:	Stroma FSAP 2012	Software Version:	Version: 1.0.4.23

Property Address: V1 - 10528

Address : Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	84.35	(1a) x	3.04	(2a) =	256.22
First floor	15.16	(1b) x	1.99	(2b) =	30.18
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.51	(4)			
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	286.4

2. Ventilation rate:

	main heating		secondary heating		other		total		m ³ per hour
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0
Number of open flues	0	+	0	+	0	=	0	x 20 =	0
Number of intermittent fans							3	x 10 =	30
Number of passive vents							0	x 10 =	0
Number of flueless gas fires							0	x 40 =	0

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.1
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0
Additional infiltration		[(9)-1]x0.1 =	0
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0
<i>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</i>			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0
If no draught lobby, enter 0.05, else enter 0			0
Percentage of windows and doors draught stripped			0
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.35
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0
Shelter factor	(20) = 1 - [0.075 x (19)] =		1
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35

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=	4.8	4.4	4.2	4	4.2	3.8	4	3.7	3.8	4.1	4.1	4.4
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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.2	1.1	1.05	1	1.05	0.95	1	0.92	0.95	1.02	1.02	1.1
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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

	0.43	0.39	0.37	0.35	0.37	0.34	0.35	0.33	0.34	0.36	0.36	0.39
--	------	------	------	------	------	------	------	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

(23a)

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

(23b)

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

(23c)

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

(24a)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=	0.59	0.58	0.57	0.56	0.57	0.56	0.56	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=	0.59	0.58	0.57	0.56	0.57	0.56	0.56	0.55	0.56	0.57	0.57	0.58
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(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			2.42	x 1.4	= 3.388		(26)
Windows Type 1			0.62	x1/[1/(1.4)+0.04]	= 0.82		(27)
Windows Type 2			4.07	x1/[1/(1.4)+0.04]	= 5.4		(27)
Windows Type 3			3.78	x1/[1/(1.4)+0.04]	= 5.01		(27)
Windows Type 4			5.66	x1/[1/(1.4)+0.04]	= 7.5		(27)
Rooflights Type 1			4.1	x1/[1/(1.4)+0.04]	= 5.74		(27b)
Rooflights Type 2			1.17	x1/[1/(1.4)+0.04]	= 1.638		(27b)
Rooflights Type 3			3.1	x1/[1/(1.4)+0.04]	= 4.34		(27b)
Rooflights Type 4			2.34	x1/[1/(1.4)+0.04]	= 3.276		(27b)
Floor			84.35	x 0.13	= 10.9655		(28)
Walls Type1	93.34	5.66	87.68	x 0.2	= 17.54		(29)
Walls Type2	44.67	10.89	33.78	x 0.19	= 6.42		(29)
Roof	90.09	10.71	79.38	x 0.13	= 10.32		(30)
Total area of elements, m²			312.45				(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) = 81.56 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 0 (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

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can be used instead of a detailed calculation.

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

15.35 (36)

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

Total fabric heat loss

(33) + (36) =

96.91 (37)

Ventilation heat loss calculated monthly

(38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m=	55.82	54.45	53.81	53.2	53.81	52.62	53.2	52.34	52.62	53.5	53.5	54.45

(38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=	152.73	151.37	150.73	150.12	150.73	149.54	150.12	149.26	149.54	150.42	150.42	151.37
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

150.53 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=	1.53	1.52	1.51	1.51	1.51	1.5	1.51	1.5	1.5	1.51	1.51	1.52
--------	------	------	------	------	------	-----	------	-----	-----	------	------	------

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

2.73

(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

99.15

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	109.07	105.1	101.14	97.17	93.21	89.24	89.24	93.21	97.17	101.14	105.1	109.07
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------	-------	--------

Total = Sum(44)_{1...12} =

1189.86 (44)

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

(45)m=	161.75	141.47	145.98	127.27	122.12	105.38	97.65	112.05	113.39	132.15	144.25	156.64
--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

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

1560.09 (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

150

(47)

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

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

Water storage loss:

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

1.89

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

(48) x (49) =

1.02

(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)

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

0
1.02

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

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

(56)m=

31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=

31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(57)

Primary circuit loss (annual) from Table 3

0

(58)

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

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

(59)m=

23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(59)

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

(61)m=

0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---

(61)

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

(62)m=

216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------

(62)

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

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

(63)m=

0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---

(63)

Output from water heater

(64)m=

216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------

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

2206.51

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=

97.7	86.71	92.46	84.82	84.52	77.54	76.39	81.18	80.21	87.86	90.47	96.01
------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1	164.1

(66)

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

(67)m=

56.95	50.58	41.14	31.14	23.28	19.65	21.24	27.61	37.05	47.05	54.91	58.54
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(67)

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

(68)m=

381.39	385.35	375.38	354.15	327.34	302.15	285.33	281.37	291.34	312.57	339.38	364.56
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(68)

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

(69)m=

54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=

-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(71)

Water heating gains (Table 5)

(72)m=

131.32	129.03	124.27	117.81	113.61	107.7	102.67	109.11	111.4	118.09	125.65	129.04
--------	--------	--------	--------	--------	-------	--------	--------	-------	--------	--------	--------

(72)

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

(73)m=

681.51	676.81	652.63	614.94	576.08	541.35	521.08	529.93	551.64	589.55	631.78	663.98
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(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 m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	4.07	x	15.47	x	0.63	x	0.7	=	19.25	(75)
Northeast 0.9x	0.77	x	4.07	x	26.77	x	0.63	x	0.7	=	33.3	(75)
Northeast 0.9x	0.77	x	4.07	x	48.27	x	0.63	x	0.7	=	60.04	(75)
Northeast 0.9x	0.77	x	4.07	x	81.76	x	0.63	x	0.7	=	101.7	(75)
Northeast 0.9x	0.77	x	4.07	x	105.68	x	0.63	x	0.7	=	131.44	(75)
Northeast 0.9x	0.77	x	4.07	x	120.91	x	0.63	x	0.7	=	150.39	(75)
Northeast 0.9x	0.77	x	4.07	x	112.4	x	0.63	x	0.7	=	139.81	(75)
Northeast 0.9x	0.77	x	4.07	x	90.57	x	0.63	x	0.7	=	112.65	(75)
Northeast 0.9x	0.77	x	4.07	x	62.98	x	0.63	x	0.7	=	78.33	(75)
Northeast 0.9x	0.77	x	4.07	x	35.41	x	0.63	x	0.7	=	44.05	(75)
Northeast 0.9x	0.77	x	4.07	x	18.8	x	0.63	x	0.7	=	23.38	(75)
Northeast 0.9x	0.77	x	4.07	x	12.14	x	0.63	x	0.7	=	15.09	(75)
Southeast 0.9x	0.77	x	0.62	x	47.72	x	0.63	x	0.7	=	9.04	(77)
Southeast 0.9x	0.77	x	0.62	x	68.58	x	0.63	x	0.7	=	12.99	(77)
Southeast 0.9x	0.77	x	0.62	x	93.66	x	0.63	x	0.7	=	17.75	(77)
Southeast 0.9x	0.77	x	0.62	x	120.77	x	0.63	x	0.7	=	22.88	(77)
Southeast 0.9x	0.77	x	0.62	x	131.7	x	0.63	x	0.7	=	24.95	(77)
Southeast 0.9x	0.77	x	0.62	x	141.25	x	0.63	x	0.7	=	26.76	(77)
Southeast 0.9x	0.77	x	0.62	x	134.94	x	0.63	x	0.7	=	25.57	(77)
Southeast 0.9x	0.77	x	0.62	x	123.59	x	0.63	x	0.7	=	23.42	(77)
Southeast 0.9x	0.77	x	0.62	x	108.84	x	0.63	x	0.7	=	20.62	(77)
Southeast 0.9x	0.77	x	0.62	x	81.86	x	0.63	x	0.7	=	15.51	(77)
Southeast 0.9x	0.77	x	0.62	x	55.04	x	0.63	x	0.7	=	10.43	(77)
Southeast 0.9x	0.77	x	0.62	x	39.33	x	0.63	x	0.7	=	7.45	(77)
Northwest 0.9x	0.77	x	3.78	x	15.47	x	0.63	x	0.7	=	17.87	(81)
Northwest 0.9x	0.77	x	5.66	x	15.47	x	0.63	x	0.7	=	26.76	(81)
Northwest 0.9x	0.77	x	3.78	x	26.77	x	0.63	x	0.7	=	30.93	(81)
Northwest 0.9x	0.77	x	5.66	x	26.77	x	0.63	x	0.7	=	46.31	(81)
Northwest 0.9x	0.77	x	3.78	x	48.27	x	0.63	x	0.7	=	55.76	(81)
Northwest 0.9x	0.77	x	5.66	x	48.27	x	0.63	x	0.7	=	83.49	(81)
Northwest 0.9x	0.77	x	3.78	x	81.76	x	0.63	x	0.7	=	94.45	(81)
Northwest 0.9x	0.77	x	5.66	x	81.76	x	0.63	x	0.7	=	141.43	(81)
Northwest 0.9x	0.77	x	3.78	x	105.68	x	0.63	x	0.7	=	122.08	(81)
Northwest 0.9x	0.77	x	5.66	x	105.68	x	0.63	x	0.7	=	182.79	(81)
Northwest 0.9x	0.77	x	3.78	x	120.91	x	0.63	x	0.7	=	139.67	(81)
Northwest 0.9x	0.77	x	5.66	x	120.91	x	0.63	x	0.7	=	209.14	(81)
Northwest 0.9x	0.77	x	3.78	x	112.4	x	0.63	x	0.7	=	129.85	(81)
Northwest 0.9x	0.77	x	5.66	x	112.4	x	0.63	x	0.7	=	194.43	(81)
Northwest 0.9x	0.77	x	3.78	x	90.57	x	0.63	x	0.7	=	104.62	(81)

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Northwest 0.9x	0.77	x	5.66	x	90.57	x	0.63	x	0.7	=	156.66	(81)
Northwest 0.9x	0.77	x	3.78	x	62.98	x	0.63	x	0.7	=	72.75	(81)
Northwest 0.9x	0.77	x	5.66	x	62.98	x	0.63	x	0.7	=	108.94	(81)
Northwest 0.9x	0.77	x	3.78	x	35.41	x	0.63	x	0.7	=	40.91	(81)
Northwest 0.9x	0.77	x	5.66	x	35.41	x	0.63	x	0.7	=	61.25	(81)
Northwest 0.9x	0.77	x	3.78	x	18.8	x	0.63	x	0.7	=	21.71	(81)
Northwest 0.9x	0.77	x	5.66	x	18.8	x	0.63	x	0.7	=	32.51	(81)
Northwest 0.9x	0.77	x	3.78	x	12.14	x	0.63	x	0.7	=	14.02	(81)
Northwest 0.9x	0.77	x	5.66	x	12.14	x	0.63	x	0.7	=	20.99	(81)
Rooflights 0.9x	1	x	4.1	x	49.09	x	0.63	x	0.7	=	79.88	(82)
Rooflights 0.9x	1	x	1.17	x	41.94	x	0.63	x	0.7	=	19.47	(82)
Rooflights 0.9x	1	x	3.1	x	49.09	x	0.63	x	0.7	=	60.4	(82)
Rooflights 0.9x	1	x	2.34	x	30.67	x	0.63	x	0.7	=	28.49	(82)
Rooflights 0.9x	1	x	4.1	x	79.07	x	0.63	x	0.7	=	128.68	(82)
Rooflights 0.9x	1	x	1.17	x	70.71	x	0.63	x	0.7	=	32.83	(82)
Rooflights 0.9x	1	x	3.1	x	79.07	x	0.63	x	0.7	=	97.29	(82)
Rooflights 0.9x	1	x	2.34	x	54.62	x	0.63	x	0.7	=	50.73	(82)
Rooflights 0.9x	1	x	4.1	x	126.09	x	0.63	x	0.7	=	205.18	(82)
Rooflights 0.9x	1	x	1.17	x	119.24	x	0.63	x	0.7	=	55.37	(82)
Rooflights 0.9x	1	x	3.1	x	126.09	x	0.63	x	0.7	=	155.14	(82)
Rooflights 0.9x	1	x	2.34	x	99.7	x	0.63	x	0.7	=	92.6	(82)
Rooflights 0.9x	1	x	4.1	x	186.32	x	0.63	x	0.7	=	303.19	(82)
Rooflights 0.9x	1	x	1.17	x	184.58	x	0.63	x	0.7	=	85.71	(82)
Rooflights 0.9x	1	x	3.1	x	186.32	x	0.63	x	0.7	=	229.24	(82)
Rooflights 0.9x	1	x	2.34	x	166.99	x	0.63	x	0.7	=	155.09	(82)
Rooflights 0.9x	1	x	4.1	x	218.88	x	0.63	x	0.7	=	356.18	(82)
Rooflights 0.9x	1	x	1.17	x	222.59	x	0.63	x	0.7	=	103.36	(82)
Rooflights 0.9x	1	x	3.1	x	218.88	x	0.63	x	0.7	=	269.31	(82)
Rooflights 0.9x	1	x	2.34	x	212.24	x	0.63	x	0.7	=	197.12	(82)
Rooflights 0.9x	1	x	4.1	x	240.72	x	0.63	x	0.7	=	391.72	(82)
Rooflights 0.9x	1	x	1.17	x	247.16	x	0.63	x	0.7	=	114.77	(82)
Rooflights 0.9x	1	x	3.1	x	240.72	x	0.63	x	0.7	=	296.18	(82)
Rooflights 0.9x	1	x	2.34	x	240.79	x	0.63	x	0.7	=	223.63	(82)
Rooflights 0.9x	1	x	4.1	x	227.61	x	0.63	x	0.7	=	370.38	(82)
Rooflights 0.9x	1	x	1.17	x	232.76	x	0.63	x	0.7	=	108.09	(82)
Rooflights 0.9x	1	x	3.1	x	227.61	x	0.63	x	0.7	=	280.04	(82)
Rooflights 0.9x	1	x	2.34	x	224.69	x	0.63	x	0.7	=	208.68	(82)
Rooflights 0.9x	1	x	4.1	x	197.66	x	0.63	x	0.7	=	321.64	(82)
Rooflights 0.9x	1	x	1.17	x	198.25	x	0.63	x	0.7	=	92.06	(82)
Rooflights 0.9x	1	x	3.1	x	197.66	x	0.63	x	0.7	=	243.19	(82)
Rooflights 0.9x	1	x	2.34	x	183.7	x	0.63	x	0.7	=	170.61	(82)

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Rooflights 0.9x	1	x	4.1	x	155.57	x	0.63	x	0.7	=	253.16	(82)
Rooflights 0.9x	1	x	1.17	x	150.18	x	0.63	x	0.7	=	69.74	(82)
Rooflights 0.9x	1	x	3.1	x	155.57	x	0.63	x	0.7	=	191.41	(82)
Rooflights 0.9x	1	x	2.34	x	129.78	x	0.63	x	0.7	=	120.53	(82)
Rooflights 0.9x	1	x	4.1	x	100.14	x	0.63	x	0.7	=	162.95	(82)
Rooflights 0.9x	1	x	1.17	x	91.54	x	0.63	x	0.7	=	42.51	(82)
Rooflights 0.9x	1	x	3.1	x	100.14	x	0.63	x	0.7	=	123.21	(82)
Rooflights 0.9x	1	x	2.34	x	72.83	x	0.63	x	0.7	=	67.64	(82)
Rooflights 0.9x	1	x	4.1	x	58.52	x	0.63	x	0.7	=	95.23	(82)
Rooflights 0.9x	1	x	1.17	x	50.68	x	0.63	x	0.7	=	23.53	(82)
Rooflights 0.9x	1	x	3.1	x	58.52	x	0.63	x	0.7	=	72	(82)
Rooflights 0.9x	1	x	2.34	x	37.65	x	0.63	x	0.7	=	34.96	(82)
Rooflights 0.9x	1	x	4.1	x	39.17	x	0.63	x	0.7	=	63.73	(82)
Rooflights 0.9x	1	x	1.17	x	33	x	0.63	x	0.7	=	15.33	(82)
Rooflights 0.9x	1	x	3.1	x	39.17	x	0.63	x	0.7	=	48.19	(82)
Rooflights 0.9x	1	x	2.34	x	23.78	x	0.63	x	0.7	=	22.08	(82)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	261.16	433.06	725.32	1133.7	1387.24	1552.27	1456.85	1224.86	915.49	558.02	313.77	206.89	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	942.67	1109.87	1377.95	1748.64	1963.32	2093.62	1977.93	1754.79	1467.12	1147.58	945.54	870.87	(84)
--------	--------	---------	---------	---------	---------	---------	---------	---------	---------	---------	--------	--------	------

7. Mean internal temperature (heating season)

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

21 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.97	0.93	0.79	0.6	0.39	0.28	0.3	0.57	0.86	0.97	0.99	(86)

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

(87)m=	19.72	19.91	20.3	20.72	20.93	20.99	21	21	20.96	20.68	20.15	19.7	(87)
--------	-------	-------	------	-------	-------	-------	----	----	-------	-------	-------	------	------

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

(88)m=	19.66	19.67	19.68	19.68	19.68	19.69	19.68	19.69	19.69	19.68	19.68	19.67	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	0.98	0.96	0.9	0.74	0.51	0.3	0.18	0.19	0.46	0.81	0.96	0.98	(89)
--------	------	------	-----	------	------	-----	------	------	------	------	------	------	------

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

(90)m=	18.04	18.32	18.87	19.41	19.62	19.68	19.68	19.69	19.66	19.38	18.67	18.02	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.52 (91)

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

(92)m=	18.92	19.15	19.62	20.09	20.3	20.36	20.37	20.37	20.34	20.06	19.44	18.9	(92)
--------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	------	------

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

(93)m=	18.92	19.15	19.62	20.09	20.3	20.36	20.37	20.37	20.34	20.06	19.44	18.9	(93)
--------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	------	------

8. Space heating requirement

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

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

EPC Costs WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.98	0.96	0.9	0.75	0.55	0.34	0.23	0.24	0.51	0.82	0.95	0.98	(94)
--------	------	------	-----	------	------	------	------	------	------	------	------	------	------

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

(95)m=	920.24	1064.28	1241.78	1319.34	1088.61	720.96	459.58	427.45	753.94	945.27	900.46	853.93	(95)
--------	--------	---------	---------	---------	---------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

(96)m=	5.4	5.7	7.3	9.7	12.7	15.5	17.3	17.5	15.1	12	8.5	5.6	(96)
--------	-----	-----	-----	-----	------	------	------	------	------	----	-----	-----	------

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

(97)m=	2064.29	2035.39	1856.47	1560.16	1146.14	727.34	460.52	428.47	783.36	1211.84	1645.52	2012.84	(97)
--------	---------	---------	---------	---------	---------	--------	--------	--------	--------	---------	---------	---------	------

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

(98)m=	851.17	652.59	457.33	173.39	42.8	0	0	0	0	198.32	536.44	862.23	(98)
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Total per year (kWh/year) = Sum(98)_{1...5,9...12} =

3774.27

Space heating requirement in kWh/m²/year

37.93

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

Space heating:

Fraction of space heat from secondary/supplementary system

0

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

1

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

1

Efficiency of main space heating system 1

170

Efficiency of secondary/supplementary heating system, %

0

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----------

Space heating requirement (calculated above)

851.17	652.59	457.33	173.39	42.8	0	0	0	0	198.32	536.44	862.23
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(211)m = {[(98)m x (204)] } x 100 ÷ (206)

500.69	383.88	269.02	101.99	25.18	0	0	0	0	116.66	315.55	507.19
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

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

2220.16

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

0

Water heating

Output from water heater (calculated above)

216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
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Efficiency of water heater

170

(217)m=

170	170	170	170	170	170	170	170	170	170	170	170
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	127.44	112.38	118.17	106.12	104.13	93.24	89.74	98.21	97.95	110.03	116.11	124.44	(219)
---------	--------	--------	--------	--------	--------	-------	-------	-------	-------	--------	--------	--------	-------

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

1297.95

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1

2220.16

Water heating fuel used

1297.95

Electricity for pumps, fans and electric keep-hot

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central heating pump:

30

(230c)

Total electricity for the above, kWh/year

sum of (230a)...(230g) =

30

(231)

Electricity for lighting

402.32

(232)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	18.27	x 0.01 = 405.62 (240)
Space heating - main system 2	(213) x	0	x 0.01 = 0 (241)
Space heating - secondary	(215) x	18.27	x 0.01 = 0 (242)
Water heating cost (other fuel)	(219)	18.27	x 0.01 = 237.13 (247)
Pumps, fans and electric keep-hot	(231)	0	x 0.01 = 5.48 (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 = 73.5 (250)
Additional standing charges (Table 12)			0 (251)
Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost	(245)...(247) + (250)...(254) =		721.74 (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] =	1.51 (257)
SAP rating (Section 12)		78.87 (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	0.519	= 1152.26 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating	(219) x	0.519	= 673.63 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1825.9 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= 15.57 (267)
Electricity for lighting	(232) x	0.519	= 208.8 (268)
Total CO2, kg/year		sum of (265)...(271) =	2050.27 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	20.6 (273)
El rating (section 14)			81 (274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	3.07	= 6815.89 (261)

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Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3984.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =			10800.58	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	92.1	(267)
Electricity for lighting	(232) x	0	=	1235.12	(268)
'Total Primary Energy	sum of (265)...(271) =			12127.8	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			121.88	(273)

TFEE WorkSheet: New dwelling design stage

User Details:

Assessor Name: Mark Heptonstall **Stroma Number:** STRO004925
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.4.23

Property Address: V1 - 10528

Address : Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	84.35 (1a)	x	3.04 (2a)	=	256.22 (3a)
First floor	15.16 (1b)	x	1.99 (2b)	=	30.18 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.51 (4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	286.4 (5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m ³ 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) =	0.1 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
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)
<i>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</i>			
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)			0.35 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35 (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

	0.45	0.44	0.43	0.39	0.38	0.34	0.34	0.33	0.35	0.38	0.4	0.42
--	------	------	------	------	------	------	------	------	------	------	-----	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

(23a)

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

(23b)

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

(23c)

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

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

(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0
---------	---	---	---	---	---	---	---	---	---	---	---	---

(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0
---------	---	---	---	---	---	---	---	---	---	---	---	---

(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
---------	-----	-----	------	------	------	------	------	------	------	------	------	------

(24d)

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

(25)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
--------	-----	-----	------	------	------	------	------	------	------	------	------	------

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Doors			2.42	x 1	= 2.42		(26)
Windows Type 1			0.56	x1/[1/(1.4)+0.04]	= 0.74		(27)
Windows Type 2			3.68	x1/[1/(1.4)+0.04]	= 4.88		(27)
Windows Type 3			3.42	x1/[1/(1.4)+0.04]	= 4.53		(27)
Windows Type 4			5.12	x1/[1/(1.4)+0.04]	= 6.79		(27)
Rooflights Type 1			3.706753	x1/[1/(1.7)+0.04]	= 6.30148		(27b)
Rooflights Type 2			1.057781	x1/[1/(1.7)+0.04]	= 1.798227		(27b)
Rooflights Type 3			2.802667	x1/[1/(1.7)+0.04]	= 4.764534		(27b)
Rooflights Type 4			2.115561	x1/[1/(1.7)+0.04]	= 3.596455		(27b)
Floor			84.35	x 0.13	= 10.9655		(28)
Walls Type1	93.34	5.12	88.22	x 0.18	= 15.88		(29)
Walls Type2	44.67	10.08	34.59	x 0.18	= 6.23		(29)
Roof	90.09	9.68	80.41	x 0.13	= 10.45		(30)
Total area of elements, m²			312.45				(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) = 78.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 0 (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

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can be used instead of a detailed calculation.

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

16.04 (36)

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

Total fabric heat loss

(33) + (36) =

94.34 (37)

Ventilation heat loss calculated monthly

(38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m=	56.92	56.55	56.18	54.45	54.13	52.62	52.62	52.34	53.2	54.13	54.78	55.47

(38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=	151.26	150.89	150.52	148.79	148.47	146.96	146.96	146.68	147.54	148.47	149.12	149.81
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

148.79 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=	1.52	1.52	1.51	1.5	1.49	1.48	1.48	1.47	1.48	1.49	1.5	1.51
--------	------	------	------	-----	------	------	------	------	------	------	-----	------

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

1.5 (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

2.73

(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

99.15

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 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=	109.07	105.1	101.14	97.17	93.21	89.24	89.24	93.21	97.17	101.14	105.1	109.07
--------	--------	-------	--------	-------	-------	-------	-------	-------	-------	--------	-------	--------

Total = Sum(44)_{1...12} =

1189.86 (44)

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

(45)m=	161.75	141.47	145.98	127.27	122.12	105.38	97.65	112.05	113.39	132.15	144.25	156.64
--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

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

1560.09 (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

150

(47)

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

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

Water storage loss:

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

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)

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

0
0

(54)
 Enter (50) or (54) in (55) (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 × [(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=

137.49	120.25	124.08	108.18	103.8	89.57	83	95.25	96.38	112.32	122.61	133.15
--------	--------	--------	--------	-------	-------	----	-------	-------	--------	--------	--------

(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=

137.49	120.25	124.08	108.18	103.8	89.57	83	95.25	96.38	112.32	122.61	133.15
--------	--------	--------	--------	-------	-------	----	-------	-------	--------	--------	--------

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

1326.08

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=

34.37	30.06	31.02	27.04	25.95	22.39	20.75	23.81	24.1	28.08	30.65	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

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75

(66)

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

(67)m=

22.78	20.23	16.46	12.46	9.31	7.86	8.49	11.04	14.82	18.82	21.96	23.41
-------	-------	-------	-------	------	------	------	-------	-------	-------	-------	-------

(67)

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

(68)m=

255.53	258.18	251.5	237.28	219.32	202.44	191.17	188.52	195.2	209.42	227.38	244.26
--------	--------	-------	--------	--------	--------	--------	--------	-------	--------	--------	--------

(68)

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

(69)m=

36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=

-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(71)

Water heating gains (Table 5)

(72)m=

46.2	44.73	41.69	37.56	34.88	31.1	27.89	32	33.47	37.74	42.57	44.74
------	-------	-------	-------	-------	------	-------	----	-------	-------	-------	-------

(72)

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

(73)m=

388.54	387.18	373.68	351.32	327.54	305.43	291.58	295.59	307.51	330.01	355.94	376.44
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(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 m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	3.68	x	11.28	x	0.63	x	0.7	=	12.69	(75)
Northeast 0.9x	0.77	x	3.68	x	22.97	x	0.63	x	0.7	=	25.83	(75)
Northeast 0.9x	0.77	x	3.68	x	41.38	x	0.63	x	0.7	=	46.54	(75)
Northeast 0.9x	0.77	x	3.68	x	67.96	x	0.63	x	0.7	=	76.43	(75)
Northeast 0.9x	0.77	x	3.68	x	91.35	x	0.63	x	0.7	=	102.73	(75)
Northeast 0.9x	0.77	x	3.68	x	97.38	x	0.63	x	0.7	=	109.52	(75)
Northeast 0.9x	0.77	x	3.68	x	91.1	x	0.63	x	0.7	=	102.46	(75)
Northeast 0.9x	0.77	x	3.68	x	72.63	x	0.63	x	0.7	=	81.68	(75)
Northeast 0.9x	0.77	x	3.68	x	50.42	x	0.63	x	0.7	=	56.71	(75)
Northeast 0.9x	0.77	x	3.68	x	28.07	x	0.63	x	0.7	=	31.57	(75)
Northeast 0.9x	0.77	x	3.68	x	14.2	x	0.63	x	0.7	=	15.97	(75)
Northeast 0.9x	0.77	x	3.68	x	9.21	x	0.63	x	0.7	=	10.36	(75)
Southeast 0.9x	0.77	x	0.56	x	36.79	x	0.63	x	0.7	=	6.3	(77)
Southeast 0.9x	0.77	x	0.56	x	62.67	x	0.63	x	0.7	=	10.73	(77)
Southeast 0.9x	0.77	x	0.56	x	85.75	x	0.63	x	0.7	=	14.68	(77)
Southeast 0.9x	0.77	x	0.56	x	106.25	x	0.63	x	0.7	=	18.18	(77)
Southeast 0.9x	0.77	x	0.56	x	119.01	x	0.63	x	0.7	=	20.37	(77)
Southeast 0.9x	0.77	x	0.56	x	118.15	x	0.63	x	0.7	=	20.22	(77)
Southeast 0.9x	0.77	x	0.56	x	113.91	x	0.63	x	0.7	=	19.49	(77)
Southeast 0.9x	0.77	x	0.56	x	104.39	x	0.63	x	0.7	=	17.87	(77)
Southeast 0.9x	0.77	x	0.56	x	92.85	x	0.63	x	0.7	=	15.89	(77)
Southeast 0.9x	0.77	x	0.56	x	69.27	x	0.63	x	0.7	=	11.85	(77)
Southeast 0.9x	0.77	x	0.56	x	44.07	x	0.63	x	0.7	=	7.54	(77)
Southeast 0.9x	0.77	x	0.56	x	31.49	x	0.63	x	0.7	=	5.39	(77)
Northwest 0.9x	0.77	x	3.42	x	11.28	x	0.63	x	0.7	=	11.79	(81)
Northwest 0.9x	0.77	x	5.12	x	11.28	x	0.63	x	0.7	=	17.65	(81)
Northwest 0.9x	0.77	x	3.42	x	22.97	x	0.63	x	0.7	=	24	(81)
Northwest 0.9x	0.77	x	5.12	x	22.97	x	0.63	x	0.7	=	35.94	(81)
Northwest 0.9x	0.77	x	3.42	x	41.38	x	0.63	x	0.7	=	43.25	(81)
Northwest 0.9x	0.77	x	5.12	x	41.38	x	0.63	x	0.7	=	64.75	(81)
Northwest 0.9x	0.77	x	3.42	x	67.96	x	0.63	x	0.7	=	71.03	(81)
Northwest 0.9x	0.77	x	5.12	x	67.96	x	0.63	x	0.7	=	106.33	(81)
Northwest 0.9x	0.77	x	3.42	x	91.35	x	0.63	x	0.7	=	95.47	(81)
Northwest 0.9x	0.77	x	5.12	x	91.35	x	0.63	x	0.7	=	142.93	(81)
Northwest 0.9x	0.77	x	3.42	x	97.38	x	0.63	x	0.7	=	101.79	(81)
Northwest 0.9x	0.77	x	5.12	x	97.38	x	0.63	x	0.7	=	152.38	(81)
Northwest 0.9x	0.77	x	3.42	x	91.1	x	0.63	x	0.7	=	95.22	(81)
Northwest 0.9x	0.77	x	5.12	x	91.1	x	0.63	x	0.7	=	142.55	(81)
Northwest 0.9x	0.77	x	3.42	x	72.63	x	0.63	x	0.7	=	75.91	(81)

TFEE WorkSheet: New dwelling design stage

Northwest 0.9x	0.77	x	5.12	x	72.63	x	0.63	x	0.7	=	113.64	(81)
Northwest 0.9x	0.77	x	3.42	x	50.42	x	0.63	x	0.7	=	52.7	(81)
Northwest 0.9x	0.77	x	5.12	x	50.42	x	0.63	x	0.7	=	78.9	(81)
Northwest 0.9x	0.77	x	3.42	x	28.07	x	0.63	x	0.7	=	29.34	(81)
Northwest 0.9x	0.77	x	5.12	x	28.07	x	0.63	x	0.7	=	43.92	(81)
Northwest 0.9x	0.77	x	3.42	x	14.2	x	0.63	x	0.7	=	14.84	(81)
Northwest 0.9x	0.77	x	5.12	x	14.2	x	0.63	x	0.7	=	22.21	(81)
Northwest 0.9x	0.77	x	3.42	x	9.21	x	0.63	x	0.7	=	9.63	(81)
Northwest 0.9x	0.77	x	5.12	x	9.21	x	0.63	x	0.7	=	14.42	(81)
Rooflights 0.9x	1	x	3.71	x	36.49	x	0.63	x	0.7	=	53.69	(82)
Rooflights 0.9x	1	x	1.06	x	30.69	x	0.63	x	0.7	=	12.89	(82)
Rooflights 0.9x	1	x	2.8	x	36.49	x	0.63	x	0.7	=	40.59	(82)
Rooflights 0.9x	1	x	2.12	x	22.07	x	0.63	x	0.7	=	18.53	(82)
Rooflights 0.9x	1	x	3.71	x	69.59	x	0.63	x	0.7	=	102.38	(82)
Rooflights 0.9x	1	x	1.06	x	61.32	x	0.63	x	0.7	=	25.74	(82)
Rooflights 0.9x	1	x	2.8	x	69.59	x	0.63	x	0.7	=	77.41	(82)
Rooflights 0.9x	1	x	2.12	x	46.51	x	0.63	x	0.7	=	39.05	(82)
Rooflights 0.9x	1	x	3.71	x	111.44	x	0.63	x	0.7	=	163.96	(82)
Rooflights 0.9x	1	x	1.06	x	104.11	x	0.63	x	0.7	=	43.71	(82)
Rooflights 0.9x	1	x	2.8	x	111.44	x	0.63	x	0.7	=	123.97	(82)
Rooflights 0.9x	1	x	2.12	x	85.44	x	0.63	x	0.7	=	71.74	(82)
Rooflights 0.9x	1	x	3.71	x	159.56	x	0.63	x	0.7	=	234.75	(82)
Rooflights 0.9x	1	x	1.06	x	156.63	x	0.63	x	0.7	=	65.76	(82)
Rooflights 0.9x	1	x	2.8	x	159.56	x	0.63	x	0.7	=	177.49	(82)
Rooflights 0.9x	1	x	2.12	x	139.34	x	0.63	x	0.7	=	117	(82)
Rooflights 0.9x	1	x	3.71	x	194.18	x	0.63	x	0.7	=	285.68	(82)
Rooflights 0.9x	1	x	1.06	x	196.16	x	0.63	x	0.7	=	82.35	(82)
Rooflights 0.9x	1	x	2.8	x	194.18	x	0.63	x	0.7	=	216	(82)
Rooflights 0.9x	1	x	2.12	x	184.4	x	0.63	x	0.7	=	154.84	(82)
Rooflights 0.9x	1	x	3.71	x	198.47	x	0.63	x	0.7	=	291.99	(82)
Rooflights 0.9x	1	x	1.06	x	202.65	x	0.63	x	0.7	=	85.08	(82)
Rooflights 0.9x	1	x	2.8	x	198.47	x	0.63	x	0.7	=	220.78	(82)
Rooflights 0.9x	1	x	2.12	x	194.93	x	0.63	x	0.7	=	163.68	(82)
Rooflights 0.9x	1	x	3.71	x	189.06	x	0.63	x	0.7	=	278.15	(82)
Rooflights 0.9x	1	x	1.06	x	192.17	x	0.63	x	0.7	=	80.68	(82)
Rooflights 0.9x	1	x	2.8	x	189.06	x	0.63	x	0.7	=	210.31	(82)
Rooflights 0.9x	1	x	2.12	x	183.04	x	0.63	x	0.7	=	153.69	(82)
Rooflights 0.9x	1	x	3.71	x	163.09	x	0.63	x	0.7	=	239.95	(82)
Rooflights 0.9x	1	x	1.06	x	162.27	x	0.63	x	0.7	=	68.13	(82)
Rooflights 0.9x	1	x	2.8	x	163.09	x	0.63	x	0.7	=	181.42	(82)
Rooflights 0.9x	1	x	2.12	x	148	x	0.63	x	0.7	=	124.27	(82)

TFEE WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	3.71	x	128.47	x	0.63	x	0.7	=	189.01	(82)
Rooflights 0.9x	1	x	1.06	x	122.65	x	0.63	x	0.7	=	51.49	(82)
Rooflights 0.9x	1	x	2.8	x	128.47	x	0.63	x	0.7	=	142.91	(82)
Rooflights 0.9x	1	x	2.12	x	104.09	x	0.63	x	0.7	=	87.4	(82)
Rooflights 0.9x	1	x	3.71	x	81.62	x	0.63	x	0.7	=	120.09	(82)
Rooflights 0.9x	1	x	1.06	x	73.59	x	0.63	x	0.7	=	30.9	(82)
Rooflights 0.9x	1	x	2.8	x	81.62	x	0.63	x	0.7	=	90.8	(82)
Rooflights 0.9x	1	x	2.12	x	57.46	x	0.63	x	0.7	=	48.25	(82)
Rooflights 0.9x	1	x	3.71	x	45.15	x	0.63	x	0.7	=	66.42	(82)
Rooflights 0.9x	1	x	1.06	x	38.5	x	0.63	x	0.7	=	16.16	(82)
Rooflights 0.9x	1	x	2.8	x	45.15	x	0.63	x	0.7	=	50.22	(82)
Rooflights 0.9x	1	x	2.12	x	28.1	x	0.63	x	0.7	=	23.6	(82)
Rooflights 0.9x	1	x	3.71	x	30.25	x	0.63	x	0.7	=	44.51	(82)
Rooflights 0.9x	1	x	1.06	x	25.09	x	0.63	x	0.7	=	10.53	(82)
Rooflights 0.9x	1	x	2.8	x	30.25	x	0.63	x	0.7	=	33.65	(82)
Rooflights 0.9x	1	x	2.12	x	17.78	x	0.63	x	0.7	=	14.93	(82)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	174.13	341.08	572.58	866.97	1100.38	1145.44	1082.55	902.87	675	406.7	216.96	143.42	(83)
--------	--------	--------	--------	--------	---------	---------	---------	--------	-----	-------	--------	--------	------

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

(84)m=	562.66	728.26	946.26	1218.3	1427.92	1450.87	1374.13	1198.45	982.51	736.71	572.9	519.86	(84)
--------	--------	--------	--------	--------	---------	---------	---------	---------	--------	--------	-------	--------	------

7. Mean internal temperature (heating season)

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

21

(85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.92	0.79	0.61	0.46	0.54	0.82	0.97	1	1	(86)

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

(87)m=	19.26	19.49	19.89	20.4	20.78	20.94	20.99	20.97	20.81	20.27	19.67	19.23	(87)
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Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.67	19.68	19.68	19.69	19.69	19.7	19.7	19.71	19.7	19.69	19.69	19.68	(88)
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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.97	0.9	0.72	0.5	0.33	0.4	0.73	0.96	0.99	1	(89)
--------	---	------	------	-----	------	-----	------	-----	------	------	------	---	------

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

(90)m=	18.11	18.34	18.74	19.24	19.56	19.68	19.7	19.7	19.6	19.12	18.53	18.09	(90)
--------	-------	-------	-------	-------	-------	-------	------	------	------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.52

(91)

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

(92)m=	18.71	18.94	19.34	19.84	20.19	20.34	20.37	20.37	20.23	19.72	19.12	18.68	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.71	18.94	19.34	19.84	20.19	20.34	20.37	20.37	20.23	19.72	19.12	18.68	(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
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TFEE WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	1	0.99	0.97	0.9	0.75	0.55	0.4	0.47	0.77	0.96	0.99	1	(94)
--------	---	------	------	-----	------	------	-----	------	------	------	------	---	------

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

(95)m=	560.92	721.93	918.94	1097.2	1072.52	803.73	546.49	566.24	756.82	707.76	569.22	518.69	(95)
--------	--------	--------	--------	--------	---------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
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Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	2180.11	2118.74	1932.41	1628.31	1260.9	843.74	554.31	581.61	904.82	1353.87	1792.78	2169.64	(97)
--------	---------	---------	---------	---------	--------	--------	--------	--------	--------	---------	---------	---------	------

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

(98)m=	1204.68	938.65	754.02	382.4	140.16	0	0	0	0	480.7	880.96	1228.31	(98)
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Total per year (kWh/year) = Sum(98)_{1...5,9...12} =

6009.89

Space heating requirement in kWh/m²/year

60.39

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
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Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	1381.45	1087.52	1114.8	0	0	0	0	(100)
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Utilisation factor for loss hm

(101)m=	0	0	0	0	0	0.87	0.92	0.89	0	0	0	0	(101)
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Useful loss, hmLm (Watts) = (100)m x (101)m

(102)m=	0	0	0	0	0	1206.94	1003.7	986.99	0	0	0	0	(102)
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Gains (solar gains calculated for applicable weather region, see Table 10)

(103)m=	0	0	0	0	0	1672.01	1586.58	1401.5	0	0	0	0	(103)
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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

(104)m=	0	0	0	0	0	334.85	433.66	308.39	0	0	0	0	(104)
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Total = Sum(104) =

1076.91

Cooled fraction

f C = cooled area ÷ (4) =

1

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	(106)
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Total = Sum(104) =

0

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

(107)m=	0	0	0	0	0	83.71	108.41	77.1	0	0	0	0	(107)
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Total = Sum(107) =

269.23

Space cooling requirement in kWh/m²/year

(107) ÷ (4) =

2.71

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

Fabric Energy Efficiency (99) + (108) =

63.1

Target Fabric Energy Efficiency (TFEE)

72.57

DFEE WorkSheet: New dwelling design stage

User Details:

Assessor Name: Mark Heptonstall **Stroma Number:** STRO004925
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.4.23

Property Address: V1 - 10528

Address : Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA

1. Overall dwelling dimensions:

	Area(m ²)	Av. Height(m)	Volume(m ³)
Ground floor	84.35 (1a) x	3.04 (2a) =	256.22 (3a)
First floor	15.16 (1b) x	1.99 (2b) =	30.18 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.51 (4)		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	286.4 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				3	30 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.1 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
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)
<i>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</i>			
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)			0.35 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35 (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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DFEE 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
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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

	0.45	0.44	0.43	0.39	0.38	0.34	0.34	0.33	0.35	0.38	0.4	0.42
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

(23a)

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

(23b)

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

(23c)

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

(24a)m=

0	0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---

(24a)

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

(24b)m=

0	0	0	0	0	0	0	0	0	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	0
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(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=

0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	0.59
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(24d)

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

(25)m=

0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	0.59
-----	-----	------	------	------	------	------	------	------	------	------	------	------

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Doors			2.42	x 1.4	= 3.388		(26)
Windows Type 1			0.62	x1/[1/(1.4)+0.04]	= 0.82		(27)
Windows Type 2			4.07	x1/[1/(1.4)+0.04]	= 5.4		(27)
Windows Type 3			3.78	x1/[1/(1.4)+0.04]	= 5.01		(27)
Windows Type 4			5.66	x1/[1/(1.4)+0.04]	= 7.5		(27)
Rooflights Type 1			4.1	x1/[1/(1.4)+0.04]	= 5.74		(27b)
Rooflights Type 2			1.17	x1/[1/(1.4)+0.04]	= 1.638		(27b)
Rooflights Type 3			3.1	x1/[1/(1.4)+0.04]	= 4.34		(27b)
Rooflights Type 4			2.34	x1/[1/(1.4)+0.04]	= 3.276		(27b)
Floor			84.35	x 0.13	= 10.9655		(28)
Walls Type1	93.34	5.66	87.68	x 0.2	= 17.54		(29)
Walls Type2	44.67	10.89	33.78	x 0.19	= 6.42		(29)
Roof	90.09	10.71	79.38	x 0.13	= 10.32		(30)
Total area of elements, m²			312.45				(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) = 81.56 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 0 (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

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can be used instead of a detailed calculation.

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

15.35 (36)

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

Total fabric heat loss

(33) + (36) =

96.91 (37)

Ventilation heat loss calculated monthly

(38)m = 0.33 x (25)m x (5)

(38)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
56.92	56.55	56.18	54.45	54.13	52.62	52.62	52.34	53.2	54.13	54.78	55.47

(38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=

153.84	153.46	153.09	151.37	151.04	149.54	149.54	149.26	150.12	151.04	151.7	152.38
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	--------

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

151.36 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.55	1.54	1.54	1.52	1.52	1.5	1.5	1.5	1.51	1.52	1.52	1.53
------	------	------	------	------	-----	-----	-----	------	------	------	------

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

1.52 (40)

Number of days in month (Table 1a)

(41)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.73

(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

99.15

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 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=

109.07	105.1	101.14	97.17	93.21	89.24	89.24	93.21	97.17	101.14	105.1	109.07
--------	-------	--------	-------	-------	-------	-------	-------	-------	--------	-------	--------

Total = Sum(44)_{1...12} =

1189.86 (44)

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

(45)m=

161.75	141.47	145.98	127.27	122.12	105.38	97.65	112.05	113.39	132.15	144.25	156.64
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

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

1560.09 (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

150

(47)

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

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

Water storage loss:

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

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)

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

0
0

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

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

(61)m=

0	0	0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---

(61)

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

(62)m=

137.49	120.25	124.08	108.18	103.8	89.57	83	95.25	96.38	112.32	122.61	133.15
--------	--------	--------	--------	-------	-------	----	-------	-------	--------	--------	--------

(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=

137.49	120.25	124.08	108.18	103.8	89.57	83	95.25	96.38	112.32	122.61	133.15
--------	--------	--------	--------	-------	-------	----	-------	-------	--------	--------	--------

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

1326.08

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=

34.37	30.06	31.02	27.04	25.95	22.39	20.75	23.81	24.1	28.08	30.65	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

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75

(66)

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

(67)m=

22.78	20.23	16.46	12.46	9.31	7.86	8.49	11.04	14.82	18.82	21.96	23.41
-------	-------	-------	-------	------	------	------	-------	-------	-------	-------	-------

(67)

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

(68)m=

255.53	258.18	251.5	237.28	219.32	202.44	191.17	188.52	195.2	209.42	227.38	244.26
--------	--------	-------	--------	--------	--------	--------	--------	-------	--------	--------	--------

(68)

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

(69)m=

36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=

-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(71)

Water heating gains (Table 5)

(72)m=

46.2	44.73	41.69	37.56	34.88	31.1	27.89	32	33.47	37.74	42.57	44.74
------	-------	-------	-------	-------	------	-------	----	-------	-------	-------	-------

(72)

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

(73)m=

388.54	387.18	373.68	351.32	327.54	305.43	291.58	295.59	307.51	330.01	355.94	376.44
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(73)

6. Solar gains:

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

DFEE WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	4.07	x	11.28	x	0.63	x	0.7	=	14.03	(75)
Northeast 0.9x	0.77	x	4.07	x	22.97	x	0.63	x	0.7	=	28.57	(75)
Northeast 0.9x	0.77	x	4.07	x	41.38	x	0.63	x	0.7	=	51.47	(75)
Northeast 0.9x	0.77	x	4.07	x	67.96	x	0.63	x	0.7	=	84.53	(75)
Northeast 0.9x	0.77	x	4.07	x	91.35	x	0.63	x	0.7	=	113.62	(75)
Northeast 0.9x	0.77	x	4.07	x	97.38	x	0.63	x	0.7	=	121.13	(75)
Northeast 0.9x	0.77	x	4.07	x	91.1	x	0.63	x	0.7	=	113.32	(75)
Northeast 0.9x	0.77	x	4.07	x	72.63	x	0.63	x	0.7	=	90.34	(75)
Northeast 0.9x	0.77	x	4.07	x	50.42	x	0.63	x	0.7	=	62.72	(75)
Northeast 0.9x	0.77	x	4.07	x	28.07	x	0.63	x	0.7	=	34.91	(75)
Northeast 0.9x	0.77	x	4.07	x	14.2	x	0.63	x	0.7	=	17.66	(75)
Northeast 0.9x	0.77	x	4.07	x	9.21	x	0.63	x	0.7	=	11.46	(75)
Southeast 0.9x	0.77	x	0.62	x	36.79	x	0.63	x	0.7	=	6.97	(77)
Southeast 0.9x	0.77	x	0.62	x	62.67	x	0.63	x	0.7	=	11.88	(77)
Southeast 0.9x	0.77	x	0.62	x	85.75	x	0.63	x	0.7	=	16.25	(77)
Southeast 0.9x	0.77	x	0.62	x	106.25	x	0.63	x	0.7	=	20.13	(77)
Southeast 0.9x	0.77	x	0.62	x	119.01	x	0.63	x	0.7	=	22.55	(77)
Southeast 0.9x	0.77	x	0.62	x	118.15	x	0.63	x	0.7	=	22.39	(77)
Southeast 0.9x	0.77	x	0.62	x	113.91	x	0.63	x	0.7	=	21.58	(77)
Southeast 0.9x	0.77	x	0.62	x	104.39	x	0.63	x	0.7	=	19.78	(77)
Southeast 0.9x	0.77	x	0.62	x	92.85	x	0.63	x	0.7	=	17.59	(77)
Southeast 0.9x	0.77	x	0.62	x	69.27	x	0.63	x	0.7	=	13.12	(77)
Southeast 0.9x	0.77	x	0.62	x	44.07	x	0.63	x	0.7	=	8.35	(77)
Southeast 0.9x	0.77	x	0.62	x	31.49	x	0.63	x	0.7	=	5.97	(77)
Northwest 0.9x	0.77	x	3.78	x	11.28	x	0.63	x	0.7	=	13.03	(81)
Northwest 0.9x	0.77	x	5.66	x	11.28	x	0.63	x	0.7	=	19.52	(81)
Northwest 0.9x	0.77	x	3.78	x	22.97	x	0.63	x	0.7	=	26.53	(81)
Northwest 0.9x	0.77	x	5.66	x	22.97	x	0.63	x	0.7	=	39.73	(81)
Northwest 0.9x	0.77	x	3.78	x	41.38	x	0.63	x	0.7	=	47.8	(81)
Northwest 0.9x	0.77	x	5.66	x	41.38	x	0.63	x	0.7	=	71.58	(81)
Northwest 0.9x	0.77	x	3.78	x	67.96	x	0.63	x	0.7	=	78.5	(81)
Northwest 0.9x	0.77	x	5.66	x	67.96	x	0.63	x	0.7	=	117.55	(81)
Northwest 0.9x	0.77	x	3.78	x	91.35	x	0.63	x	0.7	=	105.52	(81)
Northwest 0.9x	0.77	x	5.66	x	91.35	x	0.63	x	0.7	=	158.01	(81)
Northwest 0.9x	0.77	x	3.78	x	97.38	x	0.63	x	0.7	=	112.5	(81)
Northwest 0.9x	0.77	x	5.66	x	97.38	x	0.63	x	0.7	=	168.45	(81)
Northwest 0.9x	0.77	x	3.78	x	91.1	x	0.63	x	0.7	=	105.24	(81)
Northwest 0.9x	0.77	x	5.66	x	91.1	x	0.63	x	0.7	=	157.58	(81)
Northwest 0.9x	0.77	x	3.78	x	72.63	x	0.63	x	0.7	=	83.9	(81)

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Northwest 0.9x	0.77	x	5.66	x	72.63	x	0.63	x	0.7	=	125.63	(81)
Northwest 0.9x	0.77	x	3.78	x	50.42	x	0.63	x	0.7	=	58.25	(81)
Northwest 0.9x	0.77	x	5.66	x	50.42	x	0.63	x	0.7	=	87.22	(81)
Northwest 0.9x	0.77	x	3.78	x	28.07	x	0.63	x	0.7	=	32.42	(81)
Northwest 0.9x	0.77	x	5.66	x	28.07	x	0.63	x	0.7	=	48.55	(81)
Northwest 0.9x	0.77	x	3.78	x	14.2	x	0.63	x	0.7	=	16.4	(81)
Northwest 0.9x	0.77	x	5.66	x	14.2	x	0.63	x	0.7	=	24.56	(81)
Northwest 0.9x	0.77	x	3.78	x	9.21	x	0.63	x	0.7	=	10.64	(81)
Northwest 0.9x	0.77	x	5.66	x	9.21	x	0.63	x	0.7	=	15.94	(81)
Rooflights 0.9x	1	x	4.1	x	36.49	x	0.63	x	0.7	=	59.38	(82)
Rooflights 0.9x	1	x	1.17	x	30.69	x	0.63	x	0.7	=	14.25	(82)
Rooflights 0.9x	1	x	3.1	x	36.49	x	0.63	x	0.7	=	44.9	(82)
Rooflights 0.9x	1	x	2.34	x	22.07	x	0.63	x	0.7	=	20.5	(82)
Rooflights 0.9x	1	x	4.1	x	69.59	x	0.63	x	0.7	=	113.24	(82)
Rooflights 0.9x	1	x	1.17	x	61.32	x	0.63	x	0.7	=	28.48	(82)
Rooflights 0.9x	1	x	3.1	x	69.59	x	0.63	x	0.7	=	85.62	(82)
Rooflights 0.9x	1	x	2.34	x	46.51	x	0.63	x	0.7	=	43.2	(82)
Rooflights 0.9x	1	x	4.1	x	111.44	x	0.63	x	0.7	=	181.35	(82)
Rooflights 0.9x	1	x	1.17	x	104.11	x	0.63	x	0.7	=	48.34	(82)
Rooflights 0.9x	1	x	3.1	x	111.44	x	0.63	x	0.7	=	137.12	(82)
Rooflights 0.9x	1	x	2.34	x	85.44	x	0.63	x	0.7	=	79.35	(82)
Rooflights 0.9x	1	x	4.1	x	159.56	x	0.63	x	0.7	=	259.65	(82)
Rooflights 0.9x	1	x	1.17	x	156.63	x	0.63	x	0.7	=	72.74	(82)
Rooflights 0.9x	1	x	3.1	x	159.56	x	0.63	x	0.7	=	196.32	(82)
Rooflights 0.9x	1	x	2.34	x	139.34	x	0.63	x	0.7	=	129.41	(82)
Rooflights 0.9x	1	x	4.1	x	194.18	x	0.63	x	0.7	=	315.99	(82)
Rooflights 0.9x	1	x	1.17	x	196.16	x	0.63	x	0.7	=	91.09	(82)
Rooflights 0.9x	1	x	3.1	x	194.18	x	0.63	x	0.7	=	238.92	(82)
Rooflights 0.9x	1	x	2.34	x	184.4	x	0.63	x	0.7	=	171.26	(82)
Rooflights 0.9x	1	x	4.1	x	198.47	x	0.63	x	0.7	=	322.97	(82)
Rooflights 0.9x	1	x	1.17	x	202.65	x	0.63	x	0.7	=	94.1	(82)
Rooflights 0.9x	1	x	3.1	x	198.47	x	0.63	x	0.7	=	244.2	(82)
Rooflights 0.9x	1	x	2.34	x	194.93	x	0.63	x	0.7	=	181.04	(82)
Rooflights 0.9x	1	x	4.1	x	189.06	x	0.63	x	0.7	=	307.66	(82)
Rooflights 0.9x	1	x	1.17	x	192.17	x	0.63	x	0.7	=	89.24	(82)
Rooflights 0.9x	1	x	3.1	x	189.06	x	0.63	x	0.7	=	232.62	(82)
Rooflights 0.9x	1	x	2.34	x	183.04	x	0.63	x	0.7	=	170	(82)
Rooflights 0.9x	1	x	4.1	x	163.09	x	0.63	x	0.7	=	265.4	(82)
Rooflights 0.9x	1	x	1.17	x	162.27	x	0.63	x	0.7	=	75.35	(82)
Rooflights 0.9x	1	x	3.1	x	163.09	x	0.63	x	0.7	=	200.67	(82)
Rooflights 0.9x	1	x	2.34	x	148	x	0.63	x	0.7	=	137.46	(82)

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Rooflights 0.9x	1	x	4.1	x	128.47	x	0.63	x	0.7	=	209.06	(82)
Rooflights 0.9x	1	x	1.17	x	122.65	x	0.63	x	0.7	=	56.96	(82)
Rooflights 0.9x	1	x	3.1	x	128.47	x	0.63	x	0.7	=	158.07	(82)
Rooflights 0.9x	1	x	2.34	x	104.09	x	0.63	x	0.7	=	96.67	(82)
Rooflights 0.9x	1	x	4.1	x	81.62	x	0.63	x	0.7	=	132.83	(82)
Rooflights 0.9x	1	x	1.17	x	73.59	x	0.63	x	0.7	=	34.17	(82)
Rooflights 0.9x	1	x	3.1	x	81.62	x	0.63	x	0.7	=	100.43	(82)
Rooflights 0.9x	1	x	2.34	x	57.46	x	0.63	x	0.7	=	53.37	(82)
Rooflights 0.9x	1	x	4.1	x	45.15	x	0.63	x	0.7	=	73.47	(82)
Rooflights 0.9x	1	x	1.17	x	38.5	x	0.63	x	0.7	=	17.88	(82)
Rooflights 0.9x	1	x	3.1	x	45.15	x	0.63	x	0.7	=	55.55	(82)
Rooflights 0.9x	1	x	2.34	x	28.1	x	0.63	x	0.7	=	26.1	(82)
Rooflights 0.9x	1	x	4.1	x	30.25	x	0.63	x	0.7	=	49.23	(82)
Rooflights 0.9x	1	x	1.17	x	25.09	x	0.63	x	0.7	=	11.65	(82)
Rooflights 0.9x	1	x	3.1	x	30.25	x	0.63	x	0.7	=	37.22	(82)
Rooflights 0.9x	1	x	2.34	x	17.78	x	0.63	x	0.7	=	16.51	(82)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	192.59	377.23	633.26	958.84	1216.97	1266.79	1197.24	998.53	746.53	449.81	239.96	158.63	(83)
--------	--------	--------	--------	--------	---------	---------	---------	--------	--------	--------	--------	--------	------

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

(84)m=	581.12	764.41	1006.94	1310.16	1544.5	1572.22	1488.82	1294.12	1054.04	779.82	595.9	535.06	(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)

(86)m=	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(86)
	1	0.99	0.98	0.91	0.76	0.57	0.43	0.51	0.8	0.97	1	1	

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

(87)m=	19.25	19.49	19.91	20.43	20.8	20.95	20.99	20.98	20.83	20.28	19.66	19.21	(87)
--------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	------

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

(88)m=	19.65	19.66	19.66	19.67	19.67	19.69	19.69	19.69	19.68	19.67	19.67	19.66	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	1	0.99	0.97	0.88	0.69	0.47	0.31	0.37	0.7	0.95	0.99	1	(89)
--------	---	------	------	------	------	------	------	------	-----	------	------	---	------

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

(90)m=	18.08	18.33	18.74	19.25	19.55	19.67	19.68	19.68	19.59	19.12	18.51	18.06	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.52 (91)

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

(92)m=	18.69	18.94	19.35	19.87	20.2	20.34	20.36	20.36	20.24	19.72	19.11	18.66	(92)
--------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.69	18.94	19.35	19.87	20.2	20.34	20.36	20.36	20.24	19.72	19.11	18.66	(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
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

DFEE WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	1	0.99	0.97	0.88	0.72	0.52	0.37	0.45	0.75	0.95	0.99	1	(94)
--------	---	------	------	------	------	------	------	------	------	------	------	---	------

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

(95)m=	579.07	756.56	972.21	1158	1115.24	823.45	556.17	577.48	785.55	744.07	591.48	533.7	(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=	2213.98	2153.97	1967.47	1660.02	1284.38	857.95	562.82	590.76	921.15	1378.17	1821.78	2203.27	(97)
--------	---------	---------	---------	---------	---------	--------	--------	--------	--------	---------	---------	---------	------

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

(98)m=	1216.37	939.06	740.47	361.45	125.83	0	0	0	0	471.77	885.81	1242.16	(98)
--------	---------	--------	--------	--------	--------	---	---	---	---	--------	--------	---------	------

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

5982.92

Space heating requirement in kWh/m²/year

60.12

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	1405.65	1106.57	1134.36	0	0	0	0	(100)
---------	---	---	---	---	---	---------	---------	---------	---	---	---	---	-------

Utilisation factor for loss hm

(101)m=	0	0	0	0	0	0.89	0.93	0.9	0	0	0	0	(101)
---------	---	---	---	---	---	------	------	-----	---	---	---	---	-------

Useful loss, hmLm (Watts) = (100)m x (101)m

(102)m=	0	0	0	0	0	1248.76	1032.04	1018.45	0	0	0	0	(102)
---------	---	---	---	---	---	---------	---------	---------	---	---	---	---	-------

Gains (solar gains calculated for applicable weather region, see Table 10)

(103)m=	0	0	0	0	0	1800.2	1707.68	1502.32	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

(104)m=	0	0	0	0	0	397.04	502.68	359.99	0	0	0	0	(104)
---------	---	---	---	---	---	--------	--------	--------	---	---	---	---	-------

Total = Sum(104) =

1259.71

Cooled fraction

f C = cooled area ÷ (4) =

1

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	(106)
---------	---	---	---	---	---	------	------	------	---	---	---	---	-------

Total = Sum(104) =

0

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

(107)m=	0	0	0	0	0	99.26	125.67	90	0	0	0	0	(107)
---------	---	---	---	---	---	-------	--------	----	---	---	---	---	-------

Total = Sum(107) =

314.93

Space cooling requirement in kWh/m²/year

(107) ÷ (4) =

3.16

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

Fabric Energy Efficiency

(99) + (108) =

63.29

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name: Mark Heptonstall **Stroma Number:** STRO004925
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.4.23

Property Address: V1 - 10528

Address : Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	84.35	(1a) x	3.04	(2a) =	256.22
First floor	15.16	(1b) x	1.99	(2b) =	30.18
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.51	(4)			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			286.4

2. Ventilation rate:

	main heating		secondary heating		other		total		m ³ per hour
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0
Number of open flues	0	+	0	+	0	=	0	x 20 =	0
Number of intermittent fans							3	x 10 =	30
Number of passive vents							0	x 10 =	0
Number of flueless gas fires							0	x 40 =	0

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.1
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
Number of storeys in the dwelling (ns)			0
Additional infiltration		[(9)-1]x0.1 =	0
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0
<i>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</i>			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0
If no draught lobby, enter 0.05, else enter 0			0
Percentage of windows and doors draught stripped			0
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =		0
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =		0
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5
If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16)			0.35
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0
Shelter factor	(20) = 1 - [0.075 x (19)] =		1
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35

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

	0.45	0.44	0.43	0.39	0.38	0.34	0.34	0.33	0.35	0.38	0.4	0.42
--	------	------	------	------	------	------	------	------	------	------	-----	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

(23a)

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

(23b)

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

(23c)

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

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

(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0
---------	---	---	---	---	---	---	---	---	---	---	---	---

(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0
---------	---	---	---	---	---	---	---	---	---	---	---	---

(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
---------	-----	-----	------	------	------	------	------	------	------	------	------	------

(24d)

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

(25)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
--------	-----	-----	------	------	------	------	------	------	------	------	------	------

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Doors			2.42	x 1.4	= 3.388		(26)
Windows Type 1			0.62	x1/[1/(1.4)+0.04]	= 0.82		(27)
Windows Type 2			4.07	x1/[1/(1.4)+0.04]	= 5.4		(27)
Windows Type 3			3.78	x1/[1/(1.4)+0.04]	= 5.01		(27)
Windows Type 4			5.66	x1/[1/(1.4)+0.04]	= 7.5		(27)
Rooflights Type 1			4.1	x1/[1/(1.4)+0.04]	= 5.74		(27b)
Rooflights Type 2			1.17	x1/[1/(1.4)+0.04]	= 1.638		(27b)
Rooflights Type 3			3.1	x1/[1/(1.4)+0.04]	= 4.34		(27b)
Rooflights Type 4			2.34	x1/[1/(1.4)+0.04]	= 3.276		(27b)
Floor			84.35	x 0.13	= 10.9655		(28)
Walls Type1	93.34	5.66	87.68	x 0.2	= 17.54		(29)
Walls Type2	44.67	10.89	33.78	x 0.19	= 6.42		(29)
Roof	90.09	10.71	79.38	x 0.13	= 10.32		(30)
Total area of elements, m²			312.45				(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) = 81.56 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 0 (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

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can be used instead of a detailed calculation.

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

15.35 (36)

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

Total fabric heat loss

(33) + (36) =

96.91 (37)

Ventilation heat loss calculated monthly

(38)m = 0.33 x (25)m x (5)

(38)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
56.92	56.55	56.18	54.45	54.13	52.62	52.62	52.34	53.2	54.13	54.78	55.47

(38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=

153.84	153.46	153.09	151.37	151.04	149.54	149.54	149.26	150.12	151.04	151.7	152.38
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	--------

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

151.36 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.55	1.54	1.54	1.52	1.52	1.5	1.5	1.5	1.51	1.52	1.52	1.53
------	------	------	------	------	-----	-----	-----	------	------	------	------

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

1.52 (40)

Number of days in month (Table 1a)

(41)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.73

(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

99.15

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 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=

109.07	105.1	101.14	97.17	93.21	89.24	89.24	93.21	97.17	101.14	105.1	109.07
--------	-------	--------	-------	-------	-------	-------	-------	-------	--------	-------	--------

Total = Sum(44)_{1...12} =

1189.86 (44)

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

(45)m=

161.75	141.47	145.98	127.27	122.12	105.38	97.65	112.05	113.39	132.15	144.25	156.64
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

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

1560.09 (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

150

(47)

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

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

Water storage loss:

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

1.89

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

(48) x (49) =

1.02

(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)

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Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0
1.02

(54)

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

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

(56)m=	31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(56)

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

(57)m=	31.64	28.58	31.64	30.62	31.64	30.62	31.64	31.64	30.62	31.64	30.62	31.64
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(57)

Primary circuit loss (annual) from Table 3

0

(58)

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

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

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

(59)

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

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

(61)

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

(62)m=	216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------

(62)

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

(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)

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

(63)

Output from water heater

(64)m=	216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------

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

2206.51

(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	97.7	86.71	92.46	84.82	84.52	77.54	76.39	81.18	80.21	87.86	90.47	96.01
--------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75

(66)

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

(67)m=	22.78	20.23	16.46	12.46	9.31	7.86	8.49	11.04	14.82	18.82	21.96	23.41
--------	-------	-------	-------	-------	------	------	------	-------	-------	-------	-------	-------

(67)

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

(68)m=	255.53	258.18	251.5	237.28	219.32	202.44	191.17	188.52	195.2	209.42	227.38	244.26
--------	--------	--------	-------	--------	--------	--------	--------	--------	-------	--------	--------	--------

(68)

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

(69)m=	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3
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(70)

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

(71)m=	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4
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(71)

Water heating gains (Table 5)

(72)m=	131.32	129.03	124.27	117.81	113.61	107.7	102.67	109.11	111.4	118.09	125.65	129.04
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(72)

Total internal gains =

$$(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$$

(73)m=	476.66	474.47	459.26	434.57	409.27	385.03	369.36	375.69	388.44	413.36	442.02	463.74
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(73)

6. Solar gains:

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

DER WorkSheet: New dwelling design stage

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	4.07	x	11.28	x	0.63	x	0.7	=	14.03	(75)
Northeast 0.9x	0.77	x	4.07	x	22.97	x	0.63	x	0.7	=	28.57	(75)
Northeast 0.9x	0.77	x	4.07	x	41.38	x	0.63	x	0.7	=	51.47	(75)
Northeast 0.9x	0.77	x	4.07	x	67.96	x	0.63	x	0.7	=	84.53	(75)
Northeast 0.9x	0.77	x	4.07	x	91.35	x	0.63	x	0.7	=	113.62	(75)
Northeast 0.9x	0.77	x	4.07	x	97.38	x	0.63	x	0.7	=	121.13	(75)
Northeast 0.9x	0.77	x	4.07	x	91.1	x	0.63	x	0.7	=	113.32	(75)
Northeast 0.9x	0.77	x	4.07	x	72.63	x	0.63	x	0.7	=	90.34	(75)
Northeast 0.9x	0.77	x	4.07	x	50.42	x	0.63	x	0.7	=	62.72	(75)
Northeast 0.9x	0.77	x	4.07	x	28.07	x	0.63	x	0.7	=	34.91	(75)
Northeast 0.9x	0.77	x	4.07	x	14.2	x	0.63	x	0.7	=	17.66	(75)
Northeast 0.9x	0.77	x	4.07	x	9.21	x	0.63	x	0.7	=	11.46	(75)
Southeast 0.9x	0.77	x	0.62	x	36.79	x	0.63	x	0.7	=	6.97	(77)
Southeast 0.9x	0.77	x	0.62	x	62.67	x	0.63	x	0.7	=	11.88	(77)
Southeast 0.9x	0.77	x	0.62	x	85.75	x	0.63	x	0.7	=	16.25	(77)
Southeast 0.9x	0.77	x	0.62	x	106.25	x	0.63	x	0.7	=	20.13	(77)
Southeast 0.9x	0.77	x	0.62	x	119.01	x	0.63	x	0.7	=	22.55	(77)
Southeast 0.9x	0.77	x	0.62	x	118.15	x	0.63	x	0.7	=	22.39	(77)
Southeast 0.9x	0.77	x	0.62	x	113.91	x	0.63	x	0.7	=	21.58	(77)
Southeast 0.9x	0.77	x	0.62	x	104.39	x	0.63	x	0.7	=	19.78	(77)
Southeast 0.9x	0.77	x	0.62	x	92.85	x	0.63	x	0.7	=	17.59	(77)
Southeast 0.9x	0.77	x	0.62	x	69.27	x	0.63	x	0.7	=	13.12	(77)
Southeast 0.9x	0.77	x	0.62	x	44.07	x	0.63	x	0.7	=	8.35	(77)
Southeast 0.9x	0.77	x	0.62	x	31.49	x	0.63	x	0.7	=	5.97	(77)
Northwest 0.9x	0.77	x	3.78	x	11.28	x	0.63	x	0.7	=	13.03	(81)
Northwest 0.9x	0.77	x	5.66	x	11.28	x	0.63	x	0.7	=	19.52	(81)
Northwest 0.9x	0.77	x	3.78	x	22.97	x	0.63	x	0.7	=	26.53	(81)
Northwest 0.9x	0.77	x	5.66	x	22.97	x	0.63	x	0.7	=	39.73	(81)
Northwest 0.9x	0.77	x	3.78	x	41.38	x	0.63	x	0.7	=	47.8	(81)
Northwest 0.9x	0.77	x	5.66	x	41.38	x	0.63	x	0.7	=	71.58	(81)
Northwest 0.9x	0.77	x	3.78	x	67.96	x	0.63	x	0.7	=	78.5	(81)
Northwest 0.9x	0.77	x	5.66	x	67.96	x	0.63	x	0.7	=	117.55	(81)
Northwest 0.9x	0.77	x	3.78	x	91.35	x	0.63	x	0.7	=	105.52	(81)
Northwest 0.9x	0.77	x	5.66	x	91.35	x	0.63	x	0.7	=	158.01	(81)
Northwest 0.9x	0.77	x	3.78	x	97.38	x	0.63	x	0.7	=	112.5	(81)
Northwest 0.9x	0.77	x	5.66	x	97.38	x	0.63	x	0.7	=	168.45	(81)
Northwest 0.9x	0.77	x	3.78	x	91.1	x	0.63	x	0.7	=	105.24	(81)
Northwest 0.9x	0.77	x	5.66	x	91.1	x	0.63	x	0.7	=	157.58	(81)
Northwest 0.9x	0.77	x	3.78	x	72.63	x	0.63	x	0.7	=	83.9	(81)

DER WorkSheet: New dwelling design stage

Northwest 0.9x	0.77	x	5.66	x	72.63	x	0.63	x	0.7	=	125.63	(81)
Northwest 0.9x	0.77	x	3.78	x	50.42	x	0.63	x	0.7	=	58.25	(81)
Northwest 0.9x	0.77	x	5.66	x	50.42	x	0.63	x	0.7	=	87.22	(81)
Northwest 0.9x	0.77	x	3.78	x	28.07	x	0.63	x	0.7	=	32.42	(81)
Northwest 0.9x	0.77	x	5.66	x	28.07	x	0.63	x	0.7	=	48.55	(81)
Northwest 0.9x	0.77	x	3.78	x	14.2	x	0.63	x	0.7	=	16.4	(81)
Northwest 0.9x	0.77	x	5.66	x	14.2	x	0.63	x	0.7	=	24.56	(81)
Northwest 0.9x	0.77	x	3.78	x	9.21	x	0.63	x	0.7	=	10.64	(81)
Northwest 0.9x	0.77	x	5.66	x	9.21	x	0.63	x	0.7	=	15.94	(81)
Rooflights 0.9x	1	x	4.1	x	36.49	x	0.63	x	0.7	=	59.38	(82)
Rooflights 0.9x	1	x	1.17	x	30.69	x	0.63	x	0.7	=	14.25	(82)
Rooflights 0.9x	1	x	3.1	x	36.49	x	0.63	x	0.7	=	44.9	(82)
Rooflights 0.9x	1	x	2.34	x	22.07	x	0.63	x	0.7	=	20.5	(82)
Rooflights 0.9x	1	x	4.1	x	69.59	x	0.63	x	0.7	=	113.24	(82)
Rooflights 0.9x	1	x	1.17	x	61.32	x	0.63	x	0.7	=	28.48	(82)
Rooflights 0.9x	1	x	3.1	x	69.59	x	0.63	x	0.7	=	85.62	(82)
Rooflights 0.9x	1	x	2.34	x	46.51	x	0.63	x	0.7	=	43.2	(82)
Rooflights 0.9x	1	x	4.1	x	111.44	x	0.63	x	0.7	=	181.35	(82)
Rooflights 0.9x	1	x	1.17	x	104.11	x	0.63	x	0.7	=	48.34	(82)
Rooflights 0.9x	1	x	3.1	x	111.44	x	0.63	x	0.7	=	137.12	(82)
Rooflights 0.9x	1	x	2.34	x	85.44	x	0.63	x	0.7	=	79.35	(82)
Rooflights 0.9x	1	x	4.1	x	159.56	x	0.63	x	0.7	=	259.65	(82)
Rooflights 0.9x	1	x	1.17	x	156.63	x	0.63	x	0.7	=	72.74	(82)
Rooflights 0.9x	1	x	3.1	x	159.56	x	0.63	x	0.7	=	196.32	(82)
Rooflights 0.9x	1	x	2.34	x	139.34	x	0.63	x	0.7	=	129.41	(82)
Rooflights 0.9x	1	x	4.1	x	194.18	x	0.63	x	0.7	=	315.99	(82)
Rooflights 0.9x	1	x	1.17	x	196.16	x	0.63	x	0.7	=	91.09	(82)
Rooflights 0.9x	1	x	3.1	x	194.18	x	0.63	x	0.7	=	238.92	(82)
Rooflights 0.9x	1	x	2.34	x	184.4	x	0.63	x	0.7	=	171.26	(82)
Rooflights 0.9x	1	x	4.1	x	198.47	x	0.63	x	0.7	=	322.97	(82)
Rooflights 0.9x	1	x	1.17	x	202.65	x	0.63	x	0.7	=	94.1	(82)
Rooflights 0.9x	1	x	3.1	x	198.47	x	0.63	x	0.7	=	244.2	(82)
Rooflights 0.9x	1	x	2.34	x	194.93	x	0.63	x	0.7	=	181.04	(82)
Rooflights 0.9x	1	x	4.1	x	189.06	x	0.63	x	0.7	=	307.66	(82)
Rooflights 0.9x	1	x	1.17	x	192.17	x	0.63	x	0.7	=	89.24	(82)
Rooflights 0.9x	1	x	3.1	x	189.06	x	0.63	x	0.7	=	232.62	(82)
Rooflights 0.9x	1	x	2.34	x	183.04	x	0.63	x	0.7	=	170	(82)
Rooflights 0.9x	1	x	4.1	x	163.09	x	0.63	x	0.7	=	265.4	(82)
Rooflights 0.9x	1	x	1.17	x	162.27	x	0.63	x	0.7	=	75.35	(82)
Rooflights 0.9x	1	x	3.1	x	163.09	x	0.63	x	0.7	=	200.67	(82)
Rooflights 0.9x	1	x	2.34	x	148	x	0.63	x	0.7	=	137.46	(82)

DER WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	4.1	x	128.47	x	0.63	x	0.7	=	209.06	(82)
Rooflights 0.9x	1	x	1.17	x	122.65	x	0.63	x	0.7	=	56.96	(82)
Rooflights 0.9x	1	x	3.1	x	128.47	x	0.63	x	0.7	=	158.07	(82)
Rooflights 0.9x	1	x	2.34	x	104.09	x	0.63	x	0.7	=	96.67	(82)
Rooflights 0.9x	1	x	4.1	x	81.62	x	0.63	x	0.7	=	132.83	(82)
Rooflights 0.9x	1	x	1.17	x	73.59	x	0.63	x	0.7	=	34.17	(82)
Rooflights 0.9x	1	x	3.1	x	81.62	x	0.63	x	0.7	=	100.43	(82)
Rooflights 0.9x	1	x	2.34	x	57.46	x	0.63	x	0.7	=	53.37	(82)
Rooflights 0.9x	1	x	4.1	x	45.15	x	0.63	x	0.7	=	73.47	(82)
Rooflights 0.9x	1	x	1.17	x	38.5	x	0.63	x	0.7	=	17.88	(82)
Rooflights 0.9x	1	x	3.1	x	45.15	x	0.63	x	0.7	=	55.55	(82)
Rooflights 0.9x	1	x	2.34	x	28.1	x	0.63	x	0.7	=	26.1	(82)
Rooflights 0.9x	1	x	4.1	x	30.25	x	0.63	x	0.7	=	49.23	(82)
Rooflights 0.9x	1	x	1.17	x	25.09	x	0.63	x	0.7	=	11.65	(82)
Rooflights 0.9x	1	x	3.1	x	30.25	x	0.63	x	0.7	=	37.22	(82)
Rooflights 0.9x	1	x	2.34	x	17.78	x	0.63	x	0.7	=	16.51	(82)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	192.59	377.23	633.26	958.84	1216.97	1266.79	1197.24	998.53	746.53	449.81	239.96	158.63	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	669.24	851.71	1092.52	1393.4	1626.23	1651.81	1566.6	1374.22	1134.97	863.17	681.98	622.36	(84)
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7. Mean internal temperature (heating season)

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

21

(85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.97	0.89	0.74	0.55	0.41	0.48	0.76	0.96	0.99	1	(86)

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

(87)m=	19.33	19.57	19.98	20.48	20.82	20.96	20.99	20.98	20.85	20.34	19.74	19.29	(87)
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Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.65	19.66	19.66	19.67	19.67	19.69	19.69	19.69	19.68	19.67	19.67	19.66	(88)
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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.96	0.86	0.67	0.45	0.29	0.35	0.67	0.94	0.99	1	(89)
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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	17.47	17.82	18.41	19.11	19.52	19.66	19.68	19.68	19.58	18.95	18.08	17.42	(90)
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fLA = Living area ÷ (4) =

0.52

(91)

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

(92)m=	18.44	18.73	19.23	19.83	20.2	20.34	20.36	20.36	20.24	19.67	18.94	18.39	(92)
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.44	18.73	19.23	19.83	20.2	20.34	20.36	20.36	20.24	19.67	18.94	18.39	(93)
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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
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DER WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.99	0.98	0.95	0.86	0.7	0.5	0.36	0.42	0.71	0.94	0.99	1	(94)
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Useful gains, hmGm , W = (94)m x (84)m

(95)m=	665.05	838.37	1042.58	1203.74	1134.87	828.6	557.37	580.13	807.86	808.78	673.43	619.41	(95)
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Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
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Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	2174.68	2122.51	1948.49	1653.84	1283.68	858.14	562.93	590.99	921.84	1370.6	1796.25	2162.98	(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=	1123.17	862.94	673.99	324.07	110.71	0	0	0	0	417.99	808.43	1148.42	(98)
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Total per year (kWh/year) = Sum(98)_{1...5,9...12} =

5469.72

Space heating requirement in kWh/m²/year

54.97

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

Space heating:

Fraction of space heat from secondary/supplementary system

0

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

1

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

1

Efficiency of main space heating system 1

170

Efficiency of secondary/supplementary heating system, %

0

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
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Space heating requirement (calculated above)

1123.17	862.94	673.99	324.07	110.71	0	0	0	0	417.99	808.43	1148.42
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(211)m = {[(98)m x (204)] } x 100 ÷ (206)

660.69	507.61	396.47	190.63	65.12	0	0	0	0	245.88	475.55	675.54
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Total (kWh/year) =Sum(211)_{1...5,10...12} =

3217.49

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

0

Water heating

Output from water heater (calculated above)

216.65	191.05	200.88	180.4	177.02	158.51	152.55	166.95	166.52	187.05	197.38	211.55
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Efficiency of water heater

170

(217)m=	170	170	170	170	170	170	170	170	170	170	170	(217)
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Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	127.44	112.38	118.17	106.12	104.13	93.24	89.74	98.21	97.95	110.03	116.11	124.44	(219)
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Total = Sum(219a)_{1...12} =

1297.95

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1

3217.49

Water heating fuel used

1297.95

Electricity for pumps, fans and electric keep-hot

DER WorkSheet: New dwelling design stage

central heating pump:		30	(230c)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	30	(231)
Electricity for lighting		402.32	(232)

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	0.519	= 1669.87 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating	(219) x	0.519	= 673.63 (264)
Space and water heating	(261) + (262) + (263) + (264) =		2343.51 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= 15.57 (267)
Electricity for lighting	(232) x	0.519	= 208.8 (268)
Total CO2, kg/year		sum of (265)...(271) =	2567.88 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	25.81 (273)
El rating (section 14)			76 (274)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name: Mark Heptonstall **Stroma Number:** STRO004925
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.4.23

Property Address: V1 - 10528

Address : Reptune, Main Road, Yapton, ARUNDEL, BN18 0EA

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	84.35 (1a)	x	3.04 (2a)	=	256.22 (3a)
First floor	15.16 (1b)	x	1.99 (2b)	=	30.18 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	99.51 (4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	286.4 (5)

2. Ventilation rate:

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0	0 (6a)
Number of open flues	0	0	0	0	0 (6b)
Number of intermittent fans				3	30 (7a)
Number of passive vents				0	0 (7b)
Number of flueless gas fires				0	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30	÷ (5) =	0.1 (8)
<i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i>			
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)
<i>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</i>			
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)			0.35 (18)
<i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i>			
Number of sides sheltered			0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		1 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.35 (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

	0.45	0.44	0.43	0.39	0.38	0.34	0.34	0.33	0.35	0.38	0.4	0.42
--	------	------	------	------	------	------	------	------	------	------	-----	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

(23a)

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

(23b)

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

(23c)

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

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

(24a)

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

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0
---------	---	---	---	---	---	---	---	---	---	---	---	---

(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0
---------	---	---	---	---	---	---	---	---	---	---	---	---

(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
---------	-----	-----	------	------	------	------	------	------	------	------	------	------

(24d)

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

(25)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
--------	-----	-----	------	------	------	------	------	------	------	------	------	------

(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Doors			2.42	x 1	= 2.42		(26)
Windows Type 1			0.56	x1/[1/(1.4)+0.04]	= 0.74		(27)
Windows Type 2			3.68	x1/[1/(1.4)+0.04]	= 4.88		(27)
Windows Type 3			3.42	x1/[1/(1.4)+0.04]	= 4.53		(27)
Windows Type 4			5.12	x1/[1/(1.4)+0.04]	= 6.79		(27)
Rooflights Type 1			3.706753	x1/[1/(1.7)+0.04]	= 6.30148		(27b)
Rooflights Type 2			1.057781	x1/[1/(1.7)+0.04]	= 1.798227		(27b)
Rooflights Type 3			2.802667	x1/[1/(1.7)+0.04]	= 4.764534		(27b)
Rooflights Type 4			2.115561	x1/[1/(1.7)+0.04]	= 3.596455		(27b)
Floor			84.35	x 0.13	= 10.9655		(28)
Walls Type1	93.34	5.12	88.22	x 0.18	= 15.88		(29)
Walls Type2	44.67	10.08	34.59	x 0.18	= 6.23		(29)
Roof	90.09	9.68	80.41	x 0.13	= 10.45		(30)
Total area of elements, m²			312.45				(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) =

78.3 (33)

Heat capacity Cm = S(A x k)

((28)...(30) + (32) + (32a)...(32e) =

0 (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

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can be used instead of a detailed calculation.

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

16.04 (36)

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

Total fabric heat loss

(33) + (36) =

94.34 (37)

Ventilation heat loss calculated monthly

(38)m = 0.33 x (25)m x (5)

(38)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
56.92	56.55	56.18	54.45	54.13	52.62	52.62	52.34	53.2	54.13	54.78	55.47

(38)

Heat transfer coefficient, W/K

(39)m = (37) + (38)m

(39)m=

151.26	150.89	150.52	148.79	148.47	146.96	146.96	146.68	147.54	148.47	149.12	149.81
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

148.79 (39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.52	1.52	1.51	1.5	1.49	1.48	1.48	1.47	1.48	1.49	1.5	1.51
------	------	------	-----	------	------	------	------	------	------	-----	------

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

1.5 (40)

Number of days in month (Table 1a)

(41)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement:

kWh/year:

Assumed occupancy, N

2.73

(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

99.15

(43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more than 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=

109.07	105.1	101.14	97.17	93.21	89.24	89.24	93.21	97.17	101.14	105.1	109.07
--------	-------	--------	-------	-------	-------	-------	-------	-------	--------	-------	--------

Total = Sum(44)_{1...12} =

1189.86 (44)

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

(45)m=

161.75	141.47	145.98	127.27	122.12	105.38	97.65	112.05	113.39	132.15	144.25	156.64
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

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

1560.09 (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

150

(47)

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

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

Water storage loss:

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

1.39

(48)

Temperature factor from Table 2b

0.54

(49)

Energy lost from water storage, kWh/year

(48) x (49) =

0.75

(50)

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

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

0

(51)

If community heating see section 4.3

Volume factor from Table 2a

0

(52)

Temperature factor from Table 2b

0

(53)

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Energy lost from water storage, kWh/year

$$(47) \times (51) \times (52) \times (53) =$$

0
0.75

(54)

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

(55)

Water storage loss calculated for each month

$$((56)m = (55) \times (41)m$$

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

(56)

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

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

(57)

Primary circuit loss (annual) from Table 3

0

(58)

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

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

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

(59)

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

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

(61)

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

(62)m=	208.34	183.55	192.58	172.36	168.71	150.47	144.24	158.65	158.48	178.74	189.34	203.24
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(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=	208.34	183.55	192.58	172.36	168.71	150.47	144.24	158.65	158.48	178.74	189.34	203.24
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

2108.71

(64)

Heat gains from water heating, kWh/month $0.25 \times [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$

(65)m=	91.06	80.71	85.81	78.39	77.88	71.11	69.74	74.53	73.78	81.21	84.04	89.36
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m=	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75	136.75

(66)

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

(67)m=	22.78	20.23	16.46	12.46	9.31	7.86	8.49	11.04	14.82	18.82	21.96	23.41
--------	-------	-------	-------	-------	------	------	------	-------	-------	-------	-------	-------

(67)

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

(68)m=	255.53	258.18	251.5	237.28	219.32	202.44	191.17	188.52	195.2	209.42	227.38	244.26
--------	--------	--------	-------	--------	--------	--------	--------	--------	-------	--------	--------	--------

(68)

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

(69)m=	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67	36.67
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4	-109.4
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(71)

Water heating gains (Table 5)

(72)m=	122.39	120.1	115.34	108.88	104.68	98.77	93.74	100.18	102.47	109.16	116.72	120.11
--------	--------	-------	--------	--------	--------	-------	-------	--------	--------	--------	--------	--------

(72)

Total internal gains =

$$(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$$

(73)m=	467.73	465.54	450.32	425.64	400.33	376.1	360.43	366.76	379.51	404.43	433.09	454.8
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(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 m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	3.68	x	11.28	x	0.63	x	0.7	=	12.69	(75)
Northeast 0.9x	0.77	x	3.68	x	22.97	x	0.63	x	0.7	=	25.83	(75)
Northeast 0.9x	0.77	x	3.68	x	41.38	x	0.63	x	0.7	=	46.54	(75)
Northeast 0.9x	0.77	x	3.68	x	67.96	x	0.63	x	0.7	=	76.43	(75)
Northeast 0.9x	0.77	x	3.68	x	91.35	x	0.63	x	0.7	=	102.73	(75)
Northeast 0.9x	0.77	x	3.68	x	97.38	x	0.63	x	0.7	=	109.52	(75)
Northeast 0.9x	0.77	x	3.68	x	91.1	x	0.63	x	0.7	=	102.46	(75)
Northeast 0.9x	0.77	x	3.68	x	72.63	x	0.63	x	0.7	=	81.68	(75)
Northeast 0.9x	0.77	x	3.68	x	50.42	x	0.63	x	0.7	=	56.71	(75)
Northeast 0.9x	0.77	x	3.68	x	28.07	x	0.63	x	0.7	=	31.57	(75)
Northeast 0.9x	0.77	x	3.68	x	14.2	x	0.63	x	0.7	=	15.97	(75)
Northeast 0.9x	0.77	x	3.68	x	9.21	x	0.63	x	0.7	=	10.36	(75)
Southeast 0.9x	0.77	x	0.56	x	36.79	x	0.63	x	0.7	=	6.3	(77)
Southeast 0.9x	0.77	x	0.56	x	62.67	x	0.63	x	0.7	=	10.73	(77)
Southeast 0.9x	0.77	x	0.56	x	85.75	x	0.63	x	0.7	=	14.68	(77)
Southeast 0.9x	0.77	x	0.56	x	106.25	x	0.63	x	0.7	=	18.18	(77)
Southeast 0.9x	0.77	x	0.56	x	119.01	x	0.63	x	0.7	=	20.37	(77)
Southeast 0.9x	0.77	x	0.56	x	118.15	x	0.63	x	0.7	=	20.22	(77)
Southeast 0.9x	0.77	x	0.56	x	113.91	x	0.63	x	0.7	=	19.49	(77)
Southeast 0.9x	0.77	x	0.56	x	104.39	x	0.63	x	0.7	=	17.87	(77)
Southeast 0.9x	0.77	x	0.56	x	92.85	x	0.63	x	0.7	=	15.89	(77)
Southeast 0.9x	0.77	x	0.56	x	69.27	x	0.63	x	0.7	=	11.85	(77)
Southeast 0.9x	0.77	x	0.56	x	44.07	x	0.63	x	0.7	=	7.54	(77)
Southeast 0.9x	0.77	x	0.56	x	31.49	x	0.63	x	0.7	=	5.39	(77)
Northwest 0.9x	0.77	x	3.42	x	11.28	x	0.63	x	0.7	=	11.79	(81)
Northwest 0.9x	0.77	x	5.12	x	11.28	x	0.63	x	0.7	=	17.65	(81)
Northwest 0.9x	0.77	x	3.42	x	22.97	x	0.63	x	0.7	=	24	(81)
Northwest 0.9x	0.77	x	5.12	x	22.97	x	0.63	x	0.7	=	35.94	(81)
Northwest 0.9x	0.77	x	3.42	x	41.38	x	0.63	x	0.7	=	43.25	(81)
Northwest 0.9x	0.77	x	5.12	x	41.38	x	0.63	x	0.7	=	64.75	(81)
Northwest 0.9x	0.77	x	3.42	x	67.96	x	0.63	x	0.7	=	71.03	(81)
Northwest 0.9x	0.77	x	5.12	x	67.96	x	0.63	x	0.7	=	106.33	(81)
Northwest 0.9x	0.77	x	3.42	x	91.35	x	0.63	x	0.7	=	95.47	(81)
Northwest 0.9x	0.77	x	5.12	x	91.35	x	0.63	x	0.7	=	142.93	(81)
Northwest 0.9x	0.77	x	3.42	x	97.38	x	0.63	x	0.7	=	101.79	(81)
Northwest 0.9x	0.77	x	5.12	x	97.38	x	0.63	x	0.7	=	152.38	(81)
Northwest 0.9x	0.77	x	3.42	x	91.1	x	0.63	x	0.7	=	95.22	(81)
Northwest 0.9x	0.77	x	5.12	x	91.1	x	0.63	x	0.7	=	142.55	(81)
Northwest 0.9x	0.77	x	3.42	x	72.63	x	0.63	x	0.7	=	75.91	(81)

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Northwest 0.9x	0.77	x	5.12	x	72.63	x	0.63	x	0.7	=	113.64	(81)
Northwest 0.9x	0.77	x	3.42	x	50.42	x	0.63	x	0.7	=	52.7	(81)
Northwest 0.9x	0.77	x	5.12	x	50.42	x	0.63	x	0.7	=	78.9	(81)
Northwest 0.9x	0.77	x	3.42	x	28.07	x	0.63	x	0.7	=	29.34	(81)
Northwest 0.9x	0.77	x	5.12	x	28.07	x	0.63	x	0.7	=	43.92	(81)
Northwest 0.9x	0.77	x	3.42	x	14.2	x	0.63	x	0.7	=	14.84	(81)
Northwest 0.9x	0.77	x	5.12	x	14.2	x	0.63	x	0.7	=	22.21	(81)
Northwest 0.9x	0.77	x	3.42	x	9.21	x	0.63	x	0.7	=	9.63	(81)
Northwest 0.9x	0.77	x	5.12	x	9.21	x	0.63	x	0.7	=	14.42	(81)
Rooflights 0.9x	1	x	3.71	x	36.49	x	0.63	x	0.7	=	53.69	(82)
Rooflights 0.9x	1	x	1.06	x	30.69	x	0.63	x	0.7	=	12.89	(82)
Rooflights 0.9x	1	x	2.8	x	36.49	x	0.63	x	0.7	=	40.59	(82)
Rooflights 0.9x	1	x	2.12	x	22.07	x	0.63	x	0.7	=	18.53	(82)
Rooflights 0.9x	1	x	3.71	x	69.59	x	0.63	x	0.7	=	102.38	(82)
Rooflights 0.9x	1	x	1.06	x	61.32	x	0.63	x	0.7	=	25.74	(82)
Rooflights 0.9x	1	x	2.8	x	69.59	x	0.63	x	0.7	=	77.41	(82)
Rooflights 0.9x	1	x	2.12	x	46.51	x	0.63	x	0.7	=	39.05	(82)
Rooflights 0.9x	1	x	3.71	x	111.44	x	0.63	x	0.7	=	163.96	(82)
Rooflights 0.9x	1	x	1.06	x	104.11	x	0.63	x	0.7	=	43.71	(82)
Rooflights 0.9x	1	x	2.8	x	111.44	x	0.63	x	0.7	=	123.97	(82)
Rooflights 0.9x	1	x	2.12	x	85.44	x	0.63	x	0.7	=	71.74	(82)
Rooflights 0.9x	1	x	3.71	x	159.56	x	0.63	x	0.7	=	234.75	(82)
Rooflights 0.9x	1	x	1.06	x	156.63	x	0.63	x	0.7	=	65.76	(82)
Rooflights 0.9x	1	x	2.8	x	159.56	x	0.63	x	0.7	=	177.49	(82)
Rooflights 0.9x	1	x	2.12	x	139.34	x	0.63	x	0.7	=	117	(82)
Rooflights 0.9x	1	x	3.71	x	194.18	x	0.63	x	0.7	=	285.68	(82)
Rooflights 0.9x	1	x	1.06	x	196.16	x	0.63	x	0.7	=	82.35	(82)
Rooflights 0.9x	1	x	2.8	x	194.18	x	0.63	x	0.7	=	216	(82)
Rooflights 0.9x	1	x	2.12	x	184.4	x	0.63	x	0.7	=	154.84	(82)
Rooflights 0.9x	1	x	3.71	x	198.47	x	0.63	x	0.7	=	291.99	(82)
Rooflights 0.9x	1	x	1.06	x	202.65	x	0.63	x	0.7	=	85.08	(82)
Rooflights 0.9x	1	x	2.8	x	198.47	x	0.63	x	0.7	=	220.78	(82)
Rooflights 0.9x	1	x	2.12	x	194.93	x	0.63	x	0.7	=	163.68	(82)
Rooflights 0.9x	1	x	3.71	x	189.06	x	0.63	x	0.7	=	278.15	(82)
Rooflights 0.9x	1	x	1.06	x	192.17	x	0.63	x	0.7	=	80.68	(82)
Rooflights 0.9x	1	x	2.8	x	189.06	x	0.63	x	0.7	=	210.31	(82)
Rooflights 0.9x	1	x	2.12	x	183.04	x	0.63	x	0.7	=	153.69	(82)
Rooflights 0.9x	1	x	3.71	x	163.09	x	0.63	x	0.7	=	239.95	(82)
Rooflights 0.9x	1	x	1.06	x	162.27	x	0.63	x	0.7	=	68.13	(82)
Rooflights 0.9x	1	x	2.8	x	163.09	x	0.63	x	0.7	=	181.42	(82)
Rooflights 0.9x	1	x	2.12	x	148	x	0.63	x	0.7	=	124.27	(82)

TER WorkSheet: New dwelling design stage

Rooflights 0.9x	1	x	3.71	x	128.47	x	0.63	x	0.7	=	189.01	(82)
Rooflights 0.9x	1	x	1.06	x	122.65	x	0.63	x	0.7	=	51.49	(82)
Rooflights 0.9x	1	x	2.8	x	128.47	x	0.63	x	0.7	=	142.91	(82)
Rooflights 0.9x	1	x	2.12	x	104.09	x	0.63	x	0.7	=	87.4	(82)
Rooflights 0.9x	1	x	3.71	x	81.62	x	0.63	x	0.7	=	120.09	(82)
Rooflights 0.9x	1	x	1.06	x	73.59	x	0.63	x	0.7	=	30.9	(82)
Rooflights 0.9x	1	x	2.8	x	81.62	x	0.63	x	0.7	=	90.8	(82)
Rooflights 0.9x	1	x	2.12	x	57.46	x	0.63	x	0.7	=	48.25	(82)
Rooflights 0.9x	1	x	3.71	x	45.15	x	0.63	x	0.7	=	66.42	(82)
Rooflights 0.9x	1	x	1.06	x	38.5	x	0.63	x	0.7	=	16.16	(82)
Rooflights 0.9x	1	x	2.8	x	45.15	x	0.63	x	0.7	=	50.22	(82)
Rooflights 0.9x	1	x	2.12	x	28.1	x	0.63	x	0.7	=	23.6	(82)
Rooflights 0.9x	1	x	3.71	x	30.25	x	0.63	x	0.7	=	44.51	(82)
Rooflights 0.9x	1	x	1.06	x	25.09	x	0.63	x	0.7	=	10.53	(82)
Rooflights 0.9x	1	x	2.8	x	30.25	x	0.63	x	0.7	=	33.65	(82)
Rooflights 0.9x	1	x	2.12	x	17.78	x	0.63	x	0.7	=	14.93	(82)

Solar gains in watts, calculated for each month

(83)m = Sum(74)m ... (82)m

(83)m=	174.13	341.08	572.58	866.97	1100.38	1145.44	1082.55	902.87	675	406.7	216.96	143.42	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	641.85	806.62	1022.91	1292.61	1500.72	1521.53	1442.98	1269.63	1054.51	811.13	650.05	598.23	(84)
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7. Mean internal temperature (heating season)

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

21 (85)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.97	0.91	0.77	0.58	0.44	0.51	0.79	0.96	0.99	1	(86)

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

(87)m=	19.33	19.56	19.95	20.45	20.8	20.95	20.99	20.98	20.84	20.32	19.73	19.3	(87)
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Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.67	19.68	19.68	19.69	19.69	19.7	19.7	19.71	19.7	19.69	19.69	19.68	(88)
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Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.97	0.88	0.7	0.48	0.31	0.38	0.7	0.95	0.99	1	(89)
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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	17.49	17.82	18.39	19.08	19.52	19.68	19.7	19.7	19.58	18.94	18.09	17.45	(90)
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fLA = Living area ÷ (4) =

0.52 (91)

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

(92)m=	18.45	18.73	19.2	19.79	20.19	20.34	20.37	20.37	20.24	19.66	18.95	18.41	(92)
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Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.45	18.73	19.2	19.79	20.19	20.34	20.37	20.37	20.24	19.66	18.95	18.41	(93)
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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
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TER WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.99	0.99	0.96	0.88	0.73	0.53	0.38	0.45	0.74	0.95	0.99	1	(94)
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Useful gains, hmGm , W = (94)m x (84)m

(95)m=	638.41	796.03	983.74	1141.26	1092.79	809.38	547.84	569.17	779.32	767.4	643.11	595.79	(95)
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Monthly average external temperature from Table 8

(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
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Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	2140.44	2086.36	1912	1620.95	1259.82	843.91	554.43	581.85	905.23	1345.06	1766.44	2129.09	(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=	1117.51	867.1	690.62	345.38	124.28	0	0	0	0	429.78	808.8	1140.77	(98)
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Total per year (kWh/year) = Sum(98)_{1...5,9...12} = 5524.25

Space heating requirement in kWh/m²/year

55.51 (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) x [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
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Space heating requirement (calculated above)

1117.51	867.1	690.62	345.38	124.28	0	0	0	0	429.78	808.8	1140.77
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(211)m = {[(98)m x (204)] } x 100 ÷ (206)

(211)

1195.2	927.38	738.64	369.39	132.92	0	0	0	0	459.66	865.02	1220.08
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Total (kWh/year) =Sum(211)_{1...5,10...12} = 5908.29 (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
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Total (kWh/year) =Sum(215)_{1...5,10...12} = 0 (215)

Water heating

Output from water heater (calculated above)

208.34	183.55	192.58	172.36	168.71	150.47	144.24	158.65	158.48	178.74	189.34	203.24
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Efficiency of water heater

79.8 (216)

(217)m=	88.63	88.43	87.93	86.63	84.01	79.8	79.8	79.8	79.8	87.07	88.26	88.7	(217)
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Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	235.06	207.57	219.01	198.96	200.82	188.56	180.76	198.81	198.6	205.28	214.54	229.13
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Total = Sum(219a)_{1...12} = 2477.09 (219)

Annual totals

kWh/year

kWh/year

Space heating fuel used, main system 1

5908.29

Water heating fuel used

2477.09

Electricity for pumps, fans and electric keep-hot

TER WorkSheet: New dwelling design stage

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		402.32	(232)

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	=	1276.19	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	535.05	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1811.24	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	208.8	(268)
Total CO2, kg/year		sum of (265)...(271) =			2058.97	(272)
TER =					30.7	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 26 February 2020

Property Details: V1 - 10528

Dwelling type:	Detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	South East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
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:	378.05	(P1)
Transmission heat loss coefficient:	96.9	
Summer heat loss coefficient:	474.96	(P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
South East (SE)	0	1
North East (NE)	0	1
North West (NW)	0	1
North West (NW)	0	1
South West (SW)	0	1
South West (SW)	0	1
South West (NW)	0	1
North West (NW)	0	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South East (SE)	1	0.9	1	0.9	(P8)
North East (NE)	1	0.9	1	0.9	(P8)
North West (NW)	1	0.9	1	0.9	(P8)
North West (NW)	1	0.9	1	0.9	(P8)
South West (SW)	1	1	1	1	(P8)
South West (SW)	1	1	1	1	(P8)
South West (NW)	1	1	1	1	(P8)
North West (NW)	1	1	1	1	(P8)

Solar gains:

Orientation		Area	Flux	g_	FF	Shading	Gains
South East (SE)	0.9 x	0.62	126.97	0.63	0.7	0.9	28.12
North East (NE)	0.9 x	4.07	105.45	0.63	0.7	0.9	153.31
North West (NW)	0.9 x	3.78	105.45	0.63	0.7	0.9	142.39
North West (NW)	0.9 x	5.66	105.45	0.63	0.7	0.9	213.2
	1 x	4.1	213.92	0.63	0.7	1	348.11
	1 x	1.17	218.67	0.63	0.7	1	101.54
	1 x	3.1	213.92	0.63	0.7	1	263.21
	1 x	2.34	210.87	0.63	0.7	1	195.85

SAP 2012 Overheating Assessment

Total

1445.73 **(P3/P4)**

Internal gains:

	June	July	August
Internal gains	538.35	518.08	526.93
Total summer gains	2085.52	1963.81	1745.34 (P5)
Summer gain/loss ratio	4.39	4.13	3.67 (P6)
Mean summer external temperature (South East England)	15.4	17.4	17.5
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	20.04	21.78	21.42 (P7)
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight