

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26
Printed on 17 June 2020 at 11:23:11

Project Information:

Assessed By: Giles Murgatroyd (STRO014966)

Building Type: Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 238.6m²

Site Reference : Swallowfield

Plot Reference: Swallowfield - PV

Address : Swallowfield, Eastergate Lane, Eastergate, PO20 3SJ

Client Details:

Name: Downsview

Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas

Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 14.3 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.30 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 56.3 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 53.0 kWh/m² OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.22 (max. 0.25)	0.22 (max. 0.70)	OK
Roof	0.17 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.41 (max. 2.00)	1.60 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Database: (rev 461, product index 017493):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Worcester
Model: Greenstar
Model qualifier: 30i System Compact ErP
(Regular)
Efficiency 89.0 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: Room heaters - wood
Closed room heater
Efficiency 65.0 %
Minimum 65.0 % OK

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5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 2.55 kWh/day	
	Permitted by DBSCG: 2.86 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
Boiler interlock:	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summer time temperature

Overheating risk (South East England):	Not significant	OK
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Based on:

Overshading:	Average or unknown
Windows facing: South	0.67m ²
Windows facing: South	2.25m ²
Windows facing: South	0.67m ²
Windows facing: North	2.04m ²
Windows facing: North	0.9m ²
Windows facing: West	1.19m ²
Windows facing: West	1.45m ²
Windows facing: West	2.1m ²
Windows facing: South	0.44m ²
Windows facing: South	1.06m ²
Windows facing: South	0.77m ²
Windows facing: East	1.06m ²
Windows facing: West	1.05m ²
Windows facing: West	1.05m ²
Windows facing: West	5.81m ²
Windows facing: North	3.4m ²
Windows facing: North	1.82m ²
Windows facing: North	3.4m ²
Roof windows facing: East	1.14m ²
Roof windows facing: West	1.14m ²
Roof windows facing: West	0.68m ²
Roof windows facing: South	0.68m ²
Roof windows facing: North	0.54m ²
Roof windows facing: North	1.14m ²
Roof windows facing: North	0.54m ²
Ventilation rate:	4.00
Blinds/curtains:	Light-coloured curtain or roller blind
	Closed 50% of daylight hours

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10 Key features

Photovoltaic array
Secondary heating (wood logs)
Secondary heating fuel wood logs

DRAFT

Predicted Energy Assessment



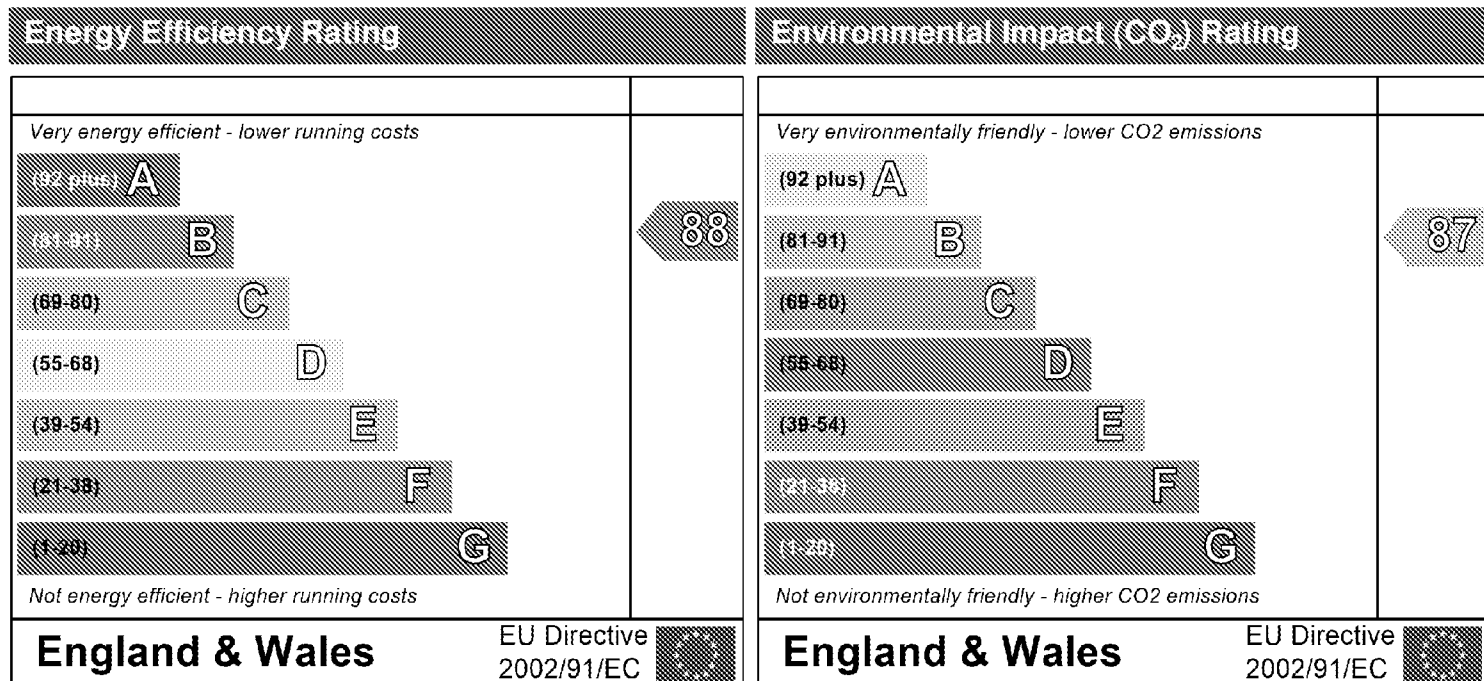
Swallowfield
Eastergate Lane
Eastergate
PO20 3SJ

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

Detached House
28 May 2020
Giles Murgatroyd
238.6 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.

SAP Input

Property Details: Swallowfield - PV

Address: Swallowfield, Eastergate Lane, Eastergate, PO20 3SJ
Located in: England
Region: South East England
UPRN:
Date of assessment: 28 May 2020
Date of certificate: 17 June 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: 461

Property Description

Dwelling type: House
Detachment: Detached
Year Completed: 2020

	Floor Location:	Floor area:	Storey height:
Floor 0		119.6 m ²	2.5 m
Floor 1		119 m ²	2.45 m
Living area:		18.6 m ² (fraction 0.078)	
Front of dwelling faces:		North	

Opening Details

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D01	BFRC	Solid			Wood
W01	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W02	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W03	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W05	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W06	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W07	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W08	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W09	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W10	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W11	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W12	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W13	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W14	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
W15	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
D02	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
D03	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
D04	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
D05	BFRC	Windows	low-E, En = 0.05, soft coat	Yes	
R01	BFRC	Roof Windows	low-E, En = 0.05, soft coat	Yes	Wood
R02	BFRC	Roof Windows	low-E, En = 0.05, soft coat	Yes	Wood
R03	BFRC	Roof Windows	low-E, En = 0.05, soft coat	Yes	Wood
R04	BFRC	Roof Windows	low-E, En = 0.05, soft coat	Yes	Wood
R05	BFRC	Roof Windows	low-E, En = 0.05, soft coat	Yes	Wood
R06	BFRC	Roof Windows	low-E, En = 0.05, soft coat	Yes	Wood
R07	BFRC	Roof Windows	low-E, En = 0.05, soft coat	Yes	Wood

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
D01	mm	0.7	0.63	1.6	1.93	1

SAP Input

W01	12mm	0	0.62	1.4	0.67	1
W02	12mm	0	0.62	1.4	2.25	1
W03	12mm	0	0.62	1.4	0.67	1
W05	12mm	0	0.62	1.4	2.04	1
W06	12mm	0	0.62	1.4	0.9	1
W07	12mm	0	0.62	1.4	1.19	1
W08	12mm	0	0.62	1.4	1.45	1
W09	12mm	0	0.62	1.4	2.1	1
W10	12mm	0	0.62	1.4	0.44	1
W11	12mm	0	0.62	1.4	1.06	1
W12	12mm	0	0.62	1.4	0.77	1
W13	12mm	0	0.62	1.4	1.06	1
W14	12mm	0	0.62	1.4	1.05	1
W15	12mm	0	0.62	1.4	1.05	1
D02	12mm	0	0.62	1.4	5.81	1
D03	12mm	0	0.62	1.4	3.4	1
D04	12mm	0	0.62	1.4	1.82	1
D05	12mm	0	0.62	1.4	3.4	1
R01	12mm	0	0.63	1.4	1.14	1
R02	12mm	0	0.63	1.4	1.14	1
R03	12mm	0	0.63	1.4	0.68	1
R04	12mm	0	0.63	1.4	0.68	1
R05	12mm	0	0.63	1.4	0.54	1
R06	12mm	0	0.63	1.4	1.14	1
R07	12mm	0	0.63	1.4	0.54	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D01		External walls - BRICK	North	0.93	2.076
W01		External walls - BRICK	South	0.5	1.345
W02		External walls - BRICK	South	1.675	1.345
W03		External walls - BRICK	South	0.5	1.345
W05		External walls - BRICK	North	1.52	1.345
W06		External walls - BRICK	North	0.9	1
W07		External walls - BRICK	West	0.965	1.23
W08		External walls - BRICK	West	0.965	1.5
W09		External walls - BRICK	West	1.24	1.69
W10		Dormer cheeks	South	0.87	0.5
W11		Dormer cheeks	South	0.9	1.175
W12		Dormer cheeks	South	0.9	0.85
W13		Dormer cheeks	East	0.9	1.175
W14		External walls - BRICK	West	1	1.05
W15		External walls - BRICK	West	1	1.05
D02		External walls - BRICK	West	2.87	2.025
D03		External walls - BRICK	North	1.68	2.025
D04		External walls - BRICK	North	0.9	2.025
D05		External walls - BRICK	North	1.68	2.025
R01		Pitched roof - RAFTER	East	1	1.14
R02		Pitched roof - RAFTER	West	1	1.14
R03		Pitched roof - RAFTER	West	0.75	0.9
R04		Pitched roof - RAFTER	South	0.75	0.9
R05		Pitched roof - RAFTER	North	0.47	1.14
R06		Pitched roof - RAFTER	North	1	1.14
R07		Pitched roof - RAFTER	North	0.47	1.14

Overshading: Average or unknown

Opaque Elements

Type: Gross area: Openings: Net area: U-value: Ru value: Curtain wall: Kappa:

SAP Input

External Elements

External walls - BRICK	190.08	29.73	160.35	0.27	0	False	N/A
External walls - LARCH	7.6	0	7.6	0.26	0	False	N/A
External walls - TILE	10	0	10	0.25	0	False	N/A
Dormer cheeks	11.48	3.33	8.15	0.27	0	False	N/A
Pitched roof - CEILING	71.5	0	71.5	0.16	0		N/A
Pitched roof - RAFTER	95.12	5.86	89.26	0.18	0		N/A
Ground floor	119.6			0.22			N/A
Exposed floor	19.5			0.22			N/A

Internal Elements

Party Elements

Thermal bridges:

Thermal bridges:	User-defined (individual PSI-values) Y-Value = 0.0529				
	Length	Psi-value			
[Approved]	21.9	0.3	E2	Other lintels (including other steel lintels)	
[Approved]	13.8	0.04	E3	Sill	
[Approved]	53.6	0.05	E4	Jamb	
[Approved]	60.46	0.16	E5	Ground floor (normal)	
[Approved]	39.1	0.04	E11	Eaves (insulation at rafter level)	
[Approved]	20.1	0.04	E13	Gable (insulation at rafter level)	
[Approved]	25	0.09	E16	Corner (normal)	
[Approved]	15	-0.09	E17	Corner (inverted internal area greater than external area)	
	9.95	0.32	E20	Exposed floor (normal)	
	46	0.04	R5	Ridge (inverted)	

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	6
Number of passive stacks:	0
Number of sides sheltered:	0
Pressure test:	5

Main heating system:

Main heating system:	Boiler systems with radiators or underfloor heating
	Gas boilers and oil boilers
	Fuel: mains gas
	Info Source: Boiler Database
	Database: (rev 461, product index 017493) Efficiency: Winter 79.3 % Summer: 90.0
	Brand name: Worcester
	Model: Greenstar
	Model qualifier: 30i System Compact ErP
	(Regular boiler)
	Systems with radiators
	Central heating pump : 2013 or later
	Design flow temperature: Design flow temperature > 45°C
	Unknown
	Boiler interlock: Yes
	Delayed start

Main heating Control:

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

Secondary heating system:

Secondary heating system:	Room heaters
	Solid fuel room heaters
	Fuel :wood logs
	Closed room heater

SAP Input

Water heating:

Water heating: From main heating system
Water code: 901
Fuel :mains gas
Hot water cylinder
Cylinder volume: 300 litres
Cylinder insulation: Factory 80 mm
Primary pipework insulation: True
Cylinderstat: True
Cylinder in heated space: True
Solar panel: False

Others

Electricity tariff: Standard Tariff
In Smoke Control Area: No
Conservatory: No conservatory
Low energy lights: 100%
Terrain type: Low rise urban / suburban
EPC language: English
Wind turbine: No
Photovoltaics: Photovoltaic 1
Installed Peak power: 0.415
Tilt of collector: 30°
Overshading: None or very little
Collector Orientation: South
Photovoltaic 2
Installed Peak power: 0.415
Tilt of collector: 30°
Overshading: None or very little
Collector Orientation: West
Photovoltaic 3
Installed Peak power: 0.415
Tilt of collector: 30°
Overshading: None or very little
Collector Orientation: East
Assess Zero Carbon Home: No

SAP WorkSheet: New dwelling design stage

User Details

Assessor Name: Giles Murgatroyd **Stroma Number:** STRO014966
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.4.26

Property Address: Swallowfield, PV

Address : Swallowfield, Eastergate Lane, Eastergate, PO20 3SJ

1. General dwelling dimensions

	Area(m ²)		Av. Height(m)		Volume(m ³)	
Ground floor	119.6	(1a) x	2.5	(2a) =	299	(3a)
First floor	119	(1b) x	2.45	(2b) =	291.55	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	238.6	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	590.55	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m³ per hour
Number of chimneys	0	+	0	+	0	=	0	× 40 =	0 (6a)
Number of open flues	0	+	0	+	0	=	0	× 20 =	0 (6b)
Number of intermittent fans							6	× 10 =	60 (7a)
Number of passive vents							0	× 10 =	0 (7b)
Number of flueless gas fires							0	× 40 =	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	60	÷ (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) = (21 a) x (22a)m

	0.45	0.44	0.43	0.39	0.38	0.33	0.33	0.33	0.35	0.38	0.4	0.41
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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 × 0.5]

(24d)m=	0.6	0.6	0.59	0.57	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	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59
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(25)

3. Thermal 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			1.93	1.6	3.088		(26)
Windows Type 1			0.67	$\times 1/[1/(1.4) + 0.04]$	0.89		(27)
Windows Type 2			2.25	$\times 1/[1/(1.4) + 0.04]$	2.98		(27)
Windows Type 3			0.67	$\times 1/[1/(1.4) + 0.04]$	0.89		(27)
Windows Type 4			2.04	$\times 1/[1/(1.4) + 0.04]$	2.7		(27)
Windows Type 5			0.9	$\times 1/[1/(1.4) + 0.04]$	1.19		(27)
Windows Type 6			1.19	$\times 1/[1/(1.4) + 0.04]$	1.58		(27)
Windows Type 7			1.45	$\times 1/[1/(1.4) + 0.04]$	1.92		(27)
Windows Type 8			2.1	$\times 1/[1/(1.4) + 0.04]$	2.78		(27)
Windows Type 9			0.44	$\times 1/[1/(1.4) + 0.04]$	0.58		(27)
Windows Type 10			1.06	$\times 1/[1/(1.4) + 0.04]$	1.41		(27)
Windows Type 11			0.77	$\times 1/[1/(1.4) + 0.04]$	1.02		(27)
Windows Type 12			1.06	$\times 1/[1/(1.4) + 0.04]$	1.41		(27)
Windows Type 13			1.05	$\times 1/[1/(1.4) + 0.04]$	1.39		(27)
Windows Type 14			1.05	$\times 1/[1/(1.4) + 0.04]$	1.39		(27)
Windows Type 15			5.81	$\times 1/[1/(1.4) + 0.04]$	7.7		(27)
Windows Type 16			3.4	$\times 1/[1/(1.4) + 0.04]$	4.51		(27)

SAP WorkSheet: New dwelling design stage

Windows Type 17			1.82	$\times 1/[1/(1.4) + 0.04] =$	2.41			(27)
Windows Type 18			3.4	$\times 1/[1/(1.4) + 0.04] =$	4.51			(27)
Rooflights Type 1			1.14	$\times 1/[1/(1.4) + 0.04] =$	1.596			(27b)
Rooflights Type 2			1.14	$\times 1/[1/(1.4) + 0.04] =$	1.596			(27b)
Rooflights Type 3			0.68	$\times 1/[1/(1.4) + 0.04] =$	0.952			(27b)
Rooflights Type 4			0.68	$\times 1/[1/(1.4) + 0.04] =$	0.952			(27b)
Rooflights Type 5			0.54	$\times 1/[1/(1.4) + 0.04] =$	0.756			(27b)
Rooflights Type 6			1.14	$\times 1/[1/(1.4) + 0.04] =$	1.596			(27b)
Rooflights Type 7			0.54	$\times 1/[1/(1.4) + 0.04] =$	0.756			(27b)
Floor Type 1			119.6	$\times$	0.22	$=$	26.312	(28)
Floor Type 2			19.5	$\times$	0.22	$=$	4.29	(28)
Walls Type1	190.08	29.73	160.35	$\times$	0.27	$=$	43.29	(29)
Walls Type2	7.6	0	7.6	$\times$	0.26	$=$	1.98	(29)
Walls Type3	10	0	10	$\times$	0.25	$=$	2.5	(29)
Walls Type4	11.48	3.33	8.15	$\times$	0.27	$=$	2.2	(29)
Roof Type1	71.5	0	71.5	$\times$	0.16	$=$	11.44	(30)
Roof Type2	95.12	5.86	89.26	$\times$	0.18	$=$	16.07	(30)
Total area of elements, m ²			524.88					(31)

* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U\text{-value})+0.04]$ 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) =	160.21	(33)
Heat capacity Cm = S(A x k)	((28) ... (30) + (32) + (32a) ... (32e) =	41505.09	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K	Indicative Value: Medium	250	(35)

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

Thermal bridges : S (L x Y) calculated using Appendix K		27.77	(36)
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if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss	(33) + (36) =	187.98	(37)
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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=	117.02	116.26	115.52	112.02	111.36	108.31	108.31	107.75	109.49	111.36	112.69	114.07	(38)

Heat transfer coefficient, W/K												(39)m = (37) + (38)m		
(39)m=	305	304.24	303.49	299.99	299.34	296.29	296.29	295.72	297.46	299.34	300.66	302.05		
Average = Sum(39):1..12/12=													299.99	(39)

Heat loss parameter (HLP), W/m ² K												{40}m = {39}m ÷ {4}		
{40}m=	1.28	1.28	1.27	1.26	1.25	1.24	1.24	1.24	1.25	1.25	1.26	1.27		
Average = Sum{40}1..12/12=													1.26	{40}

Number of days in month (Table 1a)													
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4 Water heating energy requirement

Assumed occupancy, N	3.05	(42)
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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 SAP 2012 Version 10.4.20 SAP 9.925 - Imp./www.stroma.com	Annual average hot water usage in litres per day Vd average = (25 x N) + 36	106.69	(43)
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Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of 105 litres per day

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Energy content of hot water used - calculated monthly = $4.190 \times V_{d,m} \times n_m \times DT_m / 3600$ kWh/month (see Tables 1b, 1c, 1d)

{45}m=	174.04	152.21	157.07	136.94	131.39	113.38	105.07	120.57	122.01	142.19	155.21	168.54		
Total = Sum{45} _{1..12} =													1678.61	{45}

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

{46}m=	26.11	22.83	23.56	20.54	19.71	17.01	15.76	18.08	18.3	21.33	23.28	25.28		{46}
--------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	--	------

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel	300	{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} =	300	{50}
--	---------------	-----	------

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

Hot water storage loss factor from Table 2 (kWh/litre/day)	0.01	{51}
--	------	------

If community heating see section 4.3

Volume factor from Table 2a	0.74	{52}
-----------------------------	------	------

Temperature factor from Table 2b	0.54	{53}
----------------------------------	------	------

Energy lost from water storage, kWh/year	{47} x {51} x {52} x {53} =	1.38	{54}
--	-----------------------------	------	------

Enter (50) or (54) in (55)	1.38	{55}
----------------------------	------	------

Water storage loss calculated for each month $\{(56)m = (55) \times (41)m$

{56}m=	42.73	38.59	42.73	41.35	42.73	41.35	42.73	42.73	41.35	42.73	41.35	42.73		{56}
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where (H11) is from Appendix H

{57}m=	42.73	38.59	42.73	41.35	42.73	41.35	42.73	42.73	41.35	42.73	41.35	42.73		{57}
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--	------

Primary circuit loss (annual) from Table 3	0	{58}
--	---	------

Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$

(modified by factor from Table H5 if there is solar water heating and a cylinder 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 $(61)m = (60) \div 365 \times (41)m$

{61}m=	0	0	0	0	0	0	0	0	0	0	0	0		{61}
--------	---	---	---	---	---	---	---	---	---	---	---	---	--	------

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

{62}m=	240.03	211.82	223.06	200.8	197.39	177.25	171.06	186.56	185.87	208.18	219.07	234.54		{62}
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--	------

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

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

{63}m=	0	0	0	0	0	0	0	0	0	0	0	0		{63}
--------	---	---	---	---	---	---	---	---	---	---	---	---	--	------

Output from water heater

{64}m=	240.03	211.82	223.06	200.8	197.39	177.25	171.06	186.56	185.87	208.18	219.07	234.54		{64}
Output from water heater (annual) =													2455.61	

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=	110.66	98.29	105.02	96.62	96.48	88.79	87.73	92.88	91.66	100.07	102.7	108.83		{65}
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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
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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(66)m= 183.13 183.13 183.13 183.13 183.13 183.13 183.13 183.13 183.13 183.13 183.13 183.13 (66)

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

(67)m= 94.49 83.92 68.25 51.67 38.62 32.61 35.23 45.8 61.47 78.05 91.1 97.12 (67)

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

(68)m= 606.56 612.86 596.99 563.23 520.6 480.54 453.78 447.49 463.35 497.11 539.74 579.8 (68)

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

(69)m= 56.36 56.36 56.36 56.36 56.36 56.36 56.36 56.36 56.36 56.36 56.36 56.36 (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= -122.08 -122.08 -122.08 -122.08 -122.08 -122.08 -122.08 -122.08 -122.08 -122.08 -122.08 -122.08 (71)

Water heating gains (Table 5)

(72)m= 148.74 146.27 141.15 134.2 129.68 123.32 117.91 124.84 127.3 134.5 142.63 146.28 (72)

Total internal gains =

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

(73)m= 970.19 963.46 926.81 869.5 809.32 756.88 727.34 738.53 772.53 830.08 893.88 943.6 (73)

6. Solar gains

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

Orientation:		Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.04	x	10.63	x	0.62	x	1.11	=	10.36	(74)
North	0.9x	0.77	x	0.9	x	10.63	x	0.62	x	1.11	=	4.57	(74)
North	0.9x	0.77	x	3.4	x	10.63	x	0.62	x	1.11	=	17.26	(74)
North	0.9x	0.77	x	1.82	x	10.63	x	0.62	x	1.11	=	9.24	(74)
North	0.9x	0.77	x	3.4	x	10.63	x	0.62	x	1.11	=	17.26	(74)
North	0.9x	0.77	x	2.04	x	20.32	x	0.62	x	1.11	=	19.79	(74)
North	0.9x	0.77	x	0.9	x	20.32	x	0.62	x	1.11	=	8.73	(74)
North	0.9x	0.77	x	3.4	x	20.32	x	0.62	x	1.11	=	32.98	(74)
North	0.9x	0.77	x	1.82	x	20.32	x	0.62	x	1.11	=	17.66	(74)
North	0.9x	0.77	x	3.4	x	20.32	x	0.62	x	1.11	=	32.98	(74)
North	0.9x	0.77	x	2.04	x	34.53	x	0.62	x	1.11	=	33.63	(74)
North	0.9x	0.77	x	0.9	x	34.53	x	0.62	x	1.11	=	14.84	(74)
North	0.9x	0.77	x	3.4	x	34.53	x	0.62	x	1.11	=	56.05	(74)
North	0.9x	0.77	x	1.82	x	34.53	x	0.62	x	1.11	=	30	(74)
North	0.9x	0.77	x	3.4	x	34.53	x	0.62	x	1.11	=	56.05	(74)
North	0.9x	0.77	x	2.04	x	55.46	x	0.62	x	1.11	=	54.02	(74)
North	0.9x	0.77	x	0.9	x	55.46	x	0.62	x	1.11	=	23.83	(74)
North	0.9x	0.77	x	3.4	x	55.46	x	0.62	x	1.11	=	90.03	(74)
North	0.9x	0.77	x	1.82	x	55.46	x	0.62	x	1.11	=	48.19	(74)
North	0.9x	0.77	x	3.4	x	55.46	x	0.62	x	1.11	=	90.03	(74)
North	0.9x	0.77	x	2.04	x	74.72	x	0.62	x	1.11	=	72.77	(74)

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North	0.9x	0.77	x	0.9	x	74.72	x	0.62	x	1.11	=	32.1	{74}
North	0.9x	0.77	x	3.4	x	74.72	x	0.62	x	1.11	=	121.28	{74}
North	0.9x	0.77	x	1.82	x	74.72	x	0.62	x	1.11	=	64.92	{74}
North	0.9x	0.77	x	3.4	x	74.72	x	0.62	x	1.11	=	121.28	{74}
North	0.9x	0.77	x	2.04	x	79.99	x	0.62	x	1.11	=	77.9	{74}
North	0.9x	0.77	x	0.9	x	79.99	x	0.62	x	1.11	=	34.37	{74}
North	0.9x	0.77	x	3.4	x	79.99	x	0.62	x	1.11	=	129.83	{74}
North	0.9x	0.77	x	1.82	x	79.99	x	0.62	x	1.11	=	69.5	{74}
North	0.9x	0.77	x	3.4	x	79.99	x	0.62	x	1.11	=	129.83	{74}
North	0.9x	0.77	x	2.04	x	74.68	x	0.62	x	1.11	=	72.73	{74}
North	0.9x	0.77	x	0.9	x	74.68	x	0.62	x	1.11	=	32.09	{74}
North	0.9x	0.77	x	3.4	x	74.68	x	0.62	x	1.11	=	121.21	{74}
North	0.9x	0.77	x	1.82	x	74.68	x	0.62	x	1.11	=	64.88	{74}
North	0.9x	0.77	x	3.4	x	74.68	x	0.62	x	1.11	=	121.21	{74}
North	0.9x	0.77	x	2.04	x	59.25	x	0.62	x	1.11	=	57.7	{74}
North	0.9x	0.77	x	0.9	x	59.25	x	0.62	x	1.11	=	25.46	{74}
North	0.9x	0.77	x	3.4	x	59.25	x	0.62	x	1.11	=	96.17	{74}
North	0.9x	0.77	x	1.82	x	59.25	x	0.62	x	1.11	=	51.48	{74}
North	0.9x	0.77	x	3.4	x	59.25	x	0.62	x	1.11	=	96.17	{74}
North	0.9x	0.77	x	2.04	x	41.52	x	0.62	x	1.11	=	40.43	{74}
North	0.9x	0.77	x	0.9	x	41.52	x	0.62	x	1.11	=	17.84	{74}
North	0.9x	0.77	x	3.4	x	41.52	x	0.62	x	1.11	=	67.39	{74}
North	0.9x	0.77	x	1.82	x	41.52	x	0.62	x	1.11	=	36.07	{74}
North	0.9x	0.77	x	3.4	x	41.52	x	0.62	x	1.11	=	67.39	{74}
North	0.9x	0.77	x	2.04	x	24.19	x	0.62	x	1.11	=	23.56	{74}
North	0.9x	0.77	x	0.9	x	24.19	x	0.62	x	1.11	=	10.39	{74}
North	0.9x	0.77	x	3.4	x	24.19	x	0.62	x	1.11	=	39.26	{74}
North	0.9x	0.77	x	1.82	x	24.19	x	0.62	x	1.11	=	21.02	{74}
North	0.9x	0.77	x	3.4	x	24.19	x	0.62	x	1.11	=	39.26	{74}
North	0.9x	0.77	x	2.04	x	13.12	x	0.62	x	1.11	=	12.78	{74}
North	0.9x	0.77	x	0.9	x	13.12	x	0.62	x	1.11	=	5.64	{74}
North	0.9x	0.77	x	3.4	x	13.12	x	0.62	x	1.11	=	21.29	{74}
North	0.9x	0.77	x	1.82	x	13.12	x	0.62	x	1.11	=	11.4	{74}
North	0.9x	0.77	x	3.4	x	13.12	x	0.62	x	1.11	=	21.29	{74}
North	0.9x	0.77	x	2.04	x	8.86	x	0.62	x	1.11	=	8.63	{74}
North	0.9x	0.77	x	0.9	x	8.86	x	0.62	x	1.11	=	3.81	{74}
North	0.9x	0.77	x	3.4	x	8.86	x	0.62	x	1.11	=	14.39	{74}
North	0.9x	0.77	x	1.82	x	8.86	x	0.62	x	1.11	=	7.7	{74}
North	0.9x	0.77	x	3.4	x	8.86	x	0.62	x	1.11	=	14.39	{74}
East	0.9x	0.77	x	1.06	x	19.64	x	0.62	x	1.11	=	9.94	{76}
East	0.9x	0.77	x	1.06	x	38.42	x	0.62	x	1.11	=	19.44	{76}

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East	0.9x	0.77	x	1.06	x	63.27	x	0.62	x	1.11	=	32.02	(76)
East	0.9x	0.77	x	1.06	x	92.28	x	0.62	x	1.11	=	46.7	(76)
East	0.9x	0.77	x	1.06	x	113.09	x	0.62	x	1.11	=	57.23	(76)
East	0.9x	0.77	x	1.06	x	115.77	x	0.62	x	1.11	=	58.58	(76)
East	0.9x	0.77	x	1.06	x	110.22	x	0.62	x	1.11	=	55.78	(76)
East	0.9x	0.77	x	1.06	x	94.68	x	0.62	x	1.11	=	47.91	(76)
East	0.9x	0.77	x	1.06	x	73.59	x	0.62	x	1.11	=	37.24	(76)
East	0.9x	0.77	x	1.06	x	45.59	x	0.62	x	1.11	=	23.07	(76)
East	0.9x	0.77	x	1.06	x	24.49	x	0.62	x	1.11	=	12.39	(76)
East	0.9x	0.77	x	1.06	x	16.15	x	0.62	x	1.11	=	8.17	(76)
South	0.9x	0.77	x	0.67	x	46.75	x	0.62	x	1.11	=	14.95	(78)
South	0.9x	0.77	x	2.25	x	46.75	x	0.62	x	1.11	=	50.22	(78)
South	0.9x	0.77	x	0.67	x	46.75	x	0.62	x	1.11	=	14.95	(78)
South	0.9x	0.77	x	0.44	x	46.75	x	0.62	x	1.11	=	9.82	(78)
South	0.9x	0.77	x	1.06	x	46.75	x	0.62	x	1.11	=	23.66	(78)
South	0.9x	0.77	x	0.77	x	46.75	x	0.62	x	1.11	=	17.19	(78)
South	0.9x	0.77	x	0.67	x	76.57	x	0.62	x	1.11	=	24.49	(78)
South	0.9x	0.77	x	2.25	x	76.57	x	0.62	x	1.11	=	82.25	(78)
South	0.9x	0.77	x	0.67	x	76.57	x	0.62	x	1.11	=	24.49	(78)
South	0.9x	0.77	x	0.44	x	76.57	x	0.62	x	1.11	=	16.08	(78)
South	0.9x	0.77	x	1.06	x	76.57	x	0.62	x	1.11	=	38.75	(78)
South	0.9x	0.77	x	0.77	x	76.57	x	0.62	x	1.11	=	28.15	(78)
South	0.9x	0.77	x	0.67	x	97.53	x	0.62	x	1.11	=	31.2	(78)
South	0.9x	0.77	x	2.25	x	97.53	x	0.62	x	1.11	=	104.77	(78)
South	0.9x	0.77	x	0.67	x	97.53	x	0.62	x	1.11	=	31.2	(78)
South	0.9x	0.77	x	0.44	x	97.53	x	0.62	x	1.11	=	20.49	(78)
South	0.9x	0.77	x	1.06	x	97.53	x	0.62	x	1.11	=	49.36	(78)
South	0.9x	0.77	x	0.77	x	97.53	x	0.62	x	1.11	=	35.85	(78)
South	0.9x	0.77	x	0.67	x	110.23	x	0.62	x	1.11	=	35.26	(78)
South	0.9x	0.77	x	2.25	x	110.23	x	0.62	x	1.11	=	118.41	(78)
South	0.9x	0.77	x	0.67	x	110.23	x	0.62	x	1.11	=	35.26	(78)
South	0.9x	0.77	x	0.44	x	110.23	x	0.62	x	1.11	=	23.16	(78)
South	0.9x	0.77	x	1.06	x	110.23	x	0.62	x	1.11	=	55.78	(78)
South	0.9x	0.77	x	0.77	x	110.23	x	0.62	x	1.11	=	40.52	(78)
South	0.9x	0.77	x	0.67	x	114.87	x	0.62	x	1.11	=	36.74	(78)
South	0.9x	0.77	x	2.25	x	114.87	x	0.62	x	1.11	=	123.39	(78)
South	0.9x	0.77	x	0.67	x	114.87	x	0.62	x	1.11	=	36.74	(78)
South	0.9x	0.77	x	0.44	x	114.87	x	0.62	x	1.11	=	24.13	(78)
South	0.9x	0.77	x	1.06	x	114.87	x	0.62	x	1.11	=	58.13	(78)
South	0.9x	0.77	x	0.77	x	114.87	x	0.62	x	1.11	=	42.23	(78)
South	0.9x	0.77	x	0.67	x	110.55	x	0.62	x	1.11	=	35.36	(78)

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South	0.9x	0.77	x	2.25	x	110.55	x	0.62	x	1.11	=	118.74	(78)
South	0.9x	0.77	x	0.67	x	110.55	x	0.62	x	1.11	=	35.36	(78)
South	0.9x	0.77	x	0.44	x	110.55	x	0.62	x	1.11	=	23.22	(78)
South	0.9x	0.77	x	1.06	x	110.55	x	0.62	x	1.11	=	55.94	(78)
South	0.9x	0.77	x	0.77	x	110.55	x	0.62	x	1.11	=	40.64	(78)
South	0.9x	0.77	x	0.67	x	108.01	x	0.62	x	1.11	=	34.55	(78)
South	0.9x	0.77	x	2.25	x	108.01	x	0.62	x	1.11	=	116.02	(78)
South	0.9x	0.77	x	0.67	x	108.01	x	0.62	x	1.11	=	34.55	(78)
South	0.9x	0.77	x	0.44	x	108.01	x	0.62	x	1.11	=	22.69	(78)
South	0.9x	0.77	x	1.06	x	108.01	x	0.62	x	1.11	=	54.66	(78)
South	0.9x	0.77	x	0.77	x	108.01	x	0.62	x	1.11	=	39.7	(78)
South	0.9x	0.77	x	0.67	x	104.89	x	0.62	x	1.11	=	33.55	(78)
South	0.9x	0.77	x	2.25	x	104.89	x	0.62	x	1.11	=	112.67	(78)
South	0.9x	0.77	x	0.67	x	104.89	x	0.62	x	1.11	=	33.55	(78)
South	0.9x	0.77	x	0.44	x	104.89	x	0.62	x	1.11	=	22.03	(78)
South	0.9x	0.77	x	1.06	x	104.89	x	0.62	x	1.11	=	53.08	(78)
South	0.9x	0.77	x	0.77	x	104.89	x	0.62	x	1.11	=	38.56	(78)
South	0.9x	0.77	x	0.67	x	101.89	x	0.62	x	1.11	=	32.59	(78)
South	0.9x	0.77	x	2.25	x	101.89	x	0.62	x	1.11	=	109.44	(78)
South	0.9x	0.77	x	0.67	x	101.89	x	0.62	x	1.11	=	32.59	(78)
South	0.9x	0.77	x	0.44	x	101.89	x	0.62	x	1.11	=	21.4	(78)
South	0.9x	0.77	x	1.06	x	101.89	x	0.62	x	1.11	=	51.56	(78)
South	0.9x	0.77	x	0.77	x	101.89	x	0.62	x	1.11	=	37.45	(78)
South	0.9x	0.77	x	0.67	x	82.59	x	0.62	x	1.11	=	26.42	(78)
South	0.9x	0.77	x	2.25	x	82.59	x	0.62	x	1.11	=	88.71	(78)
South	0.9x	0.77	x	0.67	x	82.59	x	0.62	x	1.11	=	26.42	(78)
South	0.9x	0.77	x	0.44	x	82.59	x	0.62	x	1.11	=	17.35	(78)
South	0.9x	0.77	x	1.06	x	82.59	x	0.62	x	1.11	=	41.79	(78)
South	0.9x	0.77	x	0.77	x	82.59	x	0.62	x	1.11	=	30.36	(78)
South	0.9x	0.77	x	0.67	x	55.42	x	0.62	x	1.11	=	17.73	(78)
South	0.9x	0.77	x	2.25	x	55.42	x	0.62	x	1.11	=	59.53	(78)
South	0.9x	0.77	x	0.67	x	55.42	x	0.62	x	1.11	=	17.73	(78)
South	0.9x	0.77	x	0.44	x	55.42	x	0.62	x	1.11	=	11.64	(78)
South	0.9x	0.77	x	1.06	x	55.42	x	0.62	x	1.11	=	28.04	(78)
South	0.9x	0.77	x	0.77	x	55.42	x	0.62	x	1.11	=	20.37	(78)
South	0.9x	0.77	x	0.67	x	40.4	x	0.62	x	1.11	=	12.92	(78)
South	0.9x	0.77	x	2.25	x	40.4	x	0.62	x	1.11	=	43.39	(78)
South	0.9x	0.77	x	0.67	x	40.4	x	0.62	x	1.11	=	12.92	(78)
South	0.9x	0.77	x	0.44	x	40.4	x	0.62	x	1.11	=	8.49	(78)
South	0.9x	0.77	x	1.06	x	40.4	x	0.62	x	1.11	=	20.44	(78)
South	0.9x	0.77	x	0.77	x	40.4	x	0.62	x	1.11	=	14.85	(78)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.19	x	19.64	x	0.62	x	1.11	=	11.16	(80)
West	0.9x	0.77	x	1.45	x	19.64	x	0.62	x	1.11	=	13.6	(80)
West	0.9x	0.77	x	2.1	x	19.64	x	0.62	x	1.11	=	19.69	(80)
West	0.9x	0.77	x	1.05	x	19.64	x	0.62	x	1.11	=	9.85	(80)
West	0.9x	0.77	x	1.05	x	19.64	x	0.62	x	1.11	=	9.85	(80)
West	0.9x	0.77	x	5.81	x	19.64	x	0.62	x	1.11	=	54.48	(80)
West	0.9x	0.77	x	1.19	x	38.42	x	0.62	x	1.11	=	21.83	(80)
West	0.9x	0.77	x	1.45	x	38.42	x	0.62	x	1.11	=	26.6	(80)
West	0.9x	0.77	x	2.1	x	38.42	x	0.62	x	1.11	=	38.52	(80)
West	0.9x	0.77	x	1.05	x	38.42	x	0.62	x	1.11	=	19.26	(80)
West	0.9x	0.77	x	1.05	x	38.42	x	0.62	x	1.11	=	19.26	(80)
West	0.9x	0.77	x	5.81	x	38.42	x	0.62	x	1.11	=	106.57	(80)
West	0.9x	0.77	x	1.19	x	63.27	x	0.62	x	1.11	=	35.95	(80)
West	0.9x	0.77	x	1.45	x	63.27	x	0.62	x	1.11	=	43.8	(80)
West	0.9x	0.77	x	2.1	x	63.27	x	0.62	x	1.11	=	63.43	(80)
West	0.9x	0.77	x	1.05	x	63.27	x	0.62	x	1.11	=	31.72	(80)
West	0.9x	0.77	x	1.05	x	63.27	x	0.62	x	1.11	=	31.72	(80)
West	0.9x	0.77	x	5.81	x	63.27	x	0.62	x	1.11	=	175.5	(80)
West	0.9x	0.77	x	1.19	x	92.28	x	0.62	x	1.11	=	52.42	(80)
West	0.9x	0.77	x	1.45	x	92.28	x	0.62	x	1.11	=	63.88	(80)
West	0.9x	0.77	x	2.1	x	92.28	x	0.62	x	1.11	=	92.51	(80)
West	0.9x	0.77	x	1.05	x	92.28	x	0.62	x	1.11	=	46.26	(80)
West	0.9x	0.77	x	1.05	x	92.28	x	0.62	x	1.11	=	46.26	(80)
West	0.9x	0.77	x	5.81	x	92.28	x	0.62	x	1.11	=	255.96	(80)
West	0.9x	0.77	x	1.19	x	113.09	x	0.62	x	1.11	=	64.25	(80)
West	0.9x	0.77	x	1.45	x	113.09	x	0.62	x	1.11	=	78.29	(80)
West	0.9x	0.77	x	2.1	x	113.09	x	0.62	x	1.11	=	113.38	(80)
West	0.9x	0.77	x	1.05	x	113.09	x	0.62	x	1.11	=	56.69	(80)
West	0.9x	0.77	x	1.05	x	113.09	x	0.62	x	1.11	=	56.69	(80)
West	0.9x	0.77	x	5.81	x	113.09	x	0.62	x	1.11	=	313.68	(80)
West	0.9x	0.77	x	1.19	x	115.77	x	0.62	x	1.11	=	65.77	(80)
West	0.9x	0.77	x	1.45	x	115.77	x	0.62	x	1.11	=	80.14	(80)
West	0.9x	0.77	x	2.1	x	115.77	x	0.62	x	1.11	=	116.06	(80)
West	0.9x	0.77	x	1.05	x	115.77	x	0.62	x	1.11	=	58.03	(80)
West	0.9x	0.77	x	1.05	x	115.77	x	0.62	x	1.11	=	58.03	(80)
West	0.9x	0.77	x	5.81	x	115.77	x	0.62	x	1.11	=	321.11	(80)
West	0.9x	0.77	x	1.19	x	110.22	x	0.62	x	1.11	=	62.62	(80)
West	0.9x	0.77	x	1.45	x	110.22	x	0.62	x	1.11	=	76.3	(80)
West	0.9x	0.77	x	2.1	x	110.22	x	0.62	x	1.11	=	110.5	(80)
West	0.9x	0.77	x	1.05	x	110.22	x	0.62	x	1.11	=	55.25	(80)
West	0.9x	0.77	x	1.05	x	110.22	x	0.62	x	1.11	=	55.25	(80)

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West	0.9x	0.77	x	5.81	x	110.22	x	0.62	x	1.11	=	305.71	(80)
West	0.9x	0.77	x	1.19	x	94.68	x	0.62	x	1.11	=	53.79	(80)
West	0.9x	0.77	x	1.45	x	94.68	x	0.62	x	1.11	=	65.54	(80)
West	0.9x	0.77	x	2.1	x	94.68	x	0.62	x	1.11	=	94.92	(80)
West	0.9x	0.77	x	1.05	x	94.68	x	0.62	x	1.11	=	47.46	(80)
West	0.9x	0.77	x	1.05	x	94.68	x	0.62	x	1.11	=	47.46	(80)
West	0.9x	0.77	x	5.81	x	94.68	x	0.62	x	1.11	=	262.6	(80)
West	0.9x	0.77	x	1.19	x	73.59	x	0.62	x	1.11	=	41.81	(80)
West	0.9x	0.77	x	1.45	x	73.59	x	0.62	x	1.11	=	50.94	(80)
West	0.9x	0.77	x	2.1	x	73.59	x	0.62	x	1.11	=	73.78	(80)
West	0.9x	0.77	x	1.05	x	73.59	x	0.62	x	1.11	=	36.89	(80)
West	0.9x	0.77	x	1.05	x	73.59	x	0.62	x	1.11	=	36.89	(80)
West	0.9x	0.77	x	5.81	x	73.59	x	0.62	x	1.11	=	204.11	(80)
West	0.9x	0.77	x	1.19	x	45.59	x	0.62	x	1.11	=	25.9	(80)
West	0.9x	0.77	x	1.45	x	45.59	x	0.62	x	1.11	=	31.56	(80)
West	0.9x	0.77	x	2.1	x	45.59	x	0.62	x	1.11	=	45.7	(80)
West	0.9x	0.77	x	1.05	x	45.59	x	0.62	x	1.11	=	22.85	(80)
West	0.9x	0.77	x	1.05	x	45.59	x	0.62	x	1.11	=	22.85	(80)
West	0.9x	0.77	x	5.81	x	45.59	x	0.62	x	1.11	=	126.45	(80)
West	0.9x	0.77	x	1.19	x	24.49	x	0.62	x	1.11	=	13.91	(80)
West	0.9x	0.77	x	1.45	x	24.49	x	0.62	x	1.11	=	16.95	(80)
West	0.9x	0.77	x	2.1	x	24.49	x	0.62	x	1.11	=	24.55	(80)
West	0.9x	0.77	x	1.05	x	24.49	x	0.62	x	1.11	=	12.28	(80)
West	0.9x	0.77	x	1.05	x	24.49	x	0.62	x	1.11	=	12.28	(80)
West	0.9x	0.77	x	5.81	x	24.49	x	0.62	x	1.11	=	67.93	(80)
West	0.9x	0.77	x	1.19	x	16.15	x	0.62	x	1.11	=	9.18	(80)
West	0.9x	0.77	x	1.45	x	16.15	x	0.62	x	1.11	=	11.18	(80)
West	0.9x	0.77	x	2.1	x	16.15	x	0.62	x	1.11	=	16.19	(80)
West	0.9x	0.77	x	1.05	x	16.15	x	0.62	x	1.11	=	8.1	(80)
West	0.9x	0.77	x	1.05	x	16.15	x	0.62	x	1.11	=	8.1	(80)
West	0.9x	0.77	x	5.81	x	16.15	x	0.62	x	1.11	=	44.8	(80)
Rooflights	0.9x	1	x	1.14	x	26.61	x	0.63	x	0.7	=	19.11	(82)
Rooflights	0.9x	1	x	1.14	x	26.61	x	0.63	x	0.7	=	19.11	(82)
Rooflights	0.9x	1	x	0.68	x	26.61	x	0.63	x	0.7	=	11.4	(82)
Rooflights	0.9x	1	x	0.68	x	42.08	x	0.63	x	0.7	=	18.03	(82)
Rooflights	0.9x	1	x	0.54	x	16.8	x	0.63	x	0.7	=	5.71	(82)
Rooflights	0.9x	1	x	1.14	x	16.8	x	0.63	x	0.7	=	12.06	(82)
Rooflights	0.9x	1	x	0.54	x	16.8	x	0.63	x	0.7	=	5.71	(82)
Rooflights	0.9x	1	x	1.14	x	53.79	x	0.63	x	1.11	=	38.63	(82)
Rooflights	0.9x	1	x	1.14	x	53.79	x	0.63	x	1.11	=	38.63	(82)
Rooflights	0.9x	1	x	0.68	x	53.79	x	0.63	x	1.11	=	23.04	(82)

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Rooflights 0.9x	1	x	0.68	x	77.73	x	0.63	x	1.11	=	33.3	(82)
Rooflights 0.9x	1	x	0.54	x	32.18	x	0.63	x	1.11	=	10.95	(82)
Rooflights 0.9x	1	x	1.14	x	32.18	x	0.63	x	1.11	=	23.11	(82)
Rooflights 0.9x	1	x	0.54	x	32.18	x	0.63	x	1.11	=	10.95	(82)
Rooflights 0.9x	1	x	1.14	x	92.95	x	0.63	x	1.11	=	66.75	(82)
Rooflights 0.9x	1	x	1.14	x	92.95	x	0.63	x	1.11	=	66.75	(82)
Rooflights 0.9x	1	x	0.68	x	92.95	x	0.63	x	1.11	=	39.82	(82)
Rooflights 0.9x	1	x	0.68	x	119.58	x	0.63	x	1.11	=	51.23	(82)
Rooflights 0.9x	1	x	0.54	x	59.16	x	0.63	x	1.11	=	20.13	(82)
Rooflights 0.9x	1	x	1.14	x	59.16	x	0.63	x	1.11	=	42.49	(82)
Rooflights 0.9x	1	x	0.54	x	59.16	x	0.63	x	1.11	=	20.13	(82)
Rooflights 0.9x	1	x	1.14	x	142.44	x	0.63	x	1.11	=	102.3	(82)
Rooflights 0.9x	1	x	1.14	x	142.44	x	0.63	x	1.11	=	102.3	(82)
Rooflights 0.9x	1	x	0.68	x	142.44	x	0.63	x	1.11	=	61.02	(82)
Rooflights 0.9x	1	x	0.68	x	165.6	x	0.63	x	1.11	=	70.94	(82)
Rooflights 0.9x	1	x	0.54	x	107.87	x	0.63	x	1.11	=	36.7	(82)
Rooflights 0.9x	1	x	1.14	x	107.87	x	0.63	x	1.11	=	77.47	(82)
Rooflights 0.9x	1	x	0.54	x	107.87	x	0.63	x	1.11	=	36.7	(82)
Rooflights 0.9x	1	x	1.14	x	180.71	x	0.63	x	1.11	=	129.79	(82)
Rooflights 0.9x	1	x	1.14	x	180.71	x	0.63	x	1.11	=	129.79	(82)
Rooflights 0.9x	1	x	0.68	x	180.71	x	0.63	x	1.11	=	77.42	(82)
Rooflights 0.9x	1	x	0.68	x	197.99	x	0.63	x	1.11	=	84.82	(82)
Rooflights 0.9x	1	x	0.54	x	159.03	x	0.63	x	1.11	=	54.1	(82)
Rooflights 0.9x	1	x	1.14	x	159.03	x	0.63	x	1.11	=	114.22	(82)
Rooflights 0.9x	1	x	0.54	x	159.03	x	0.63	x	1.11	=	54.1	(82)
Rooflights 0.9x	1	x	1.14	x	187.72	x	0.63	x	1.11	=	134.82	(82)
Rooflights 0.9x	1	x	1.14	x	187.72	x	0.63	x	1.11	=	134.82	(82)
Rooflights 0.9x	1	x	0.68	x	187.72	x	0.63	x	1.11	=	80.42	(82)
Rooflights 0.9x	1	x	0.68	x	201.14	x	0.63	x	1.11	=	86.17	(82)
Rooflights 0.9x	1	x	0.54	x	176.47	x	0.63	x	1.11	=	60.04	(82)
Rooflights 0.9x	1	x	1.14	x	176.47	x	0.63	x	1.11	=	126.74	(82)
Rooflights 0.9x	1	x	0.54	x	176.47	x	0.63	x	1.11	=	60.04	(82)
Rooflights 0.9x	1	x	1.14	x	177.6	x	0.63	x	1.11	=	127.55	(82)
Rooflights 0.9x	1	x	1.14	x	177.6	x	0.63	x	1.11	=	127.55	(82)
Rooflights 0.9x	1	x	0.68	x	177.6	x	0.63	x	1.11	=	76.08	(82)
Rooflights 0.9x	1	x	0.68	x	192.08	x	0.63	x	1.11	=	82.29	(82)
Rooflights 0.9x	1	x	0.54	x	162.27	x	0.63	x	1.11	=	55.21	(82)
Rooflights 0.9x	1	x	1.14	x	162.27	x	0.63	x	1.11	=	116.54	(82)
Rooflights 0.9x	1	x	0.54	x	162.27	x	0.63	x	1.11	=	55.21	(82)
Rooflights 0.9x	1	x	1.14	x	148.43	x	0.63	x	1.11	=	106.6	(82)
Rooflights 0.9x	1	x	1.14	x	148.43	x	0.63	x	1.11	=	106.6	(82)

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Rooflights 0.9x	1	x	0.68	x	148.43	x	0.63	x	1.11	=	63.59	(82)
Rooflights 0.9x	1	x	0.68	x	167.82	x	0.63	x	1.11	=	71.89	(82)
Rooflights 0.9x	1	x	0.54	x	120.08	x	0.63	x	1.11	=	40.85	(82)
Rooflights 0.9x	1	x	1.14	x	120.08	x	0.63	x	1.11	=	86.24	(82)
Rooflights 0.9x	1	x	0.54	x	120.08	x	0.63	x	1.11	=	40.85	(82)
Rooflights 0.9x	1	x	1.14	x	110.34	x	0.63	x	1.11	=	79.24	(82)
Rooflights 0.9x	1	x	1.14	x	110.34	x	0.63	x	1.11	=	79.24	(82)
Rooflights 0.9x	1	x	0.68	x	110.34	x	0.63	x	1.11	=	47.27	(82)
Rooflights 0.9x	1	x	0.68	x	135.82	x	0.63	x	1.11	=	58.18	(82)
Rooflights 0.9x	1	x	0.54	x	74.77	x	0.63	x	1.11	=	25.44	(82)
Rooflights 0.9x	1	x	1.14	x	74.77	x	0.63	x	1.11	=	53.7	(82)
Rooflights 0.9x	1	x	0.54	x	74.77	x	0.63	x	1.11	=	25.44	(82)
Rooflights 0.9x	1	x	1.14	x	64.97	x	0.63	x	1.11	=	46.66	(82)
Rooflights 0.9x	1	x	1.14	x	64.97	x	0.63	x	1.11	=	46.66	(82)
Rooflights 0.9x	1	x	0.68	x	64.97	x	0.63	x	1.11	=	27.83	(82)
Rooflights 0.9x	1	x	0.68	x	89.76	x	0.63	x	1.11	=	38.45	(82)
Rooflights 0.9x	1	x	0.54	x	39.1	x	0.63	x	1.11	=	13.3	(82)
Rooflights 0.9x	1	x	1.14	x	39.1	x	0.63	x	1.11	=	28.08	(82)
Rooflights 0.9x	1	x	0.54	x	39.1	x	0.63	x	1.11	=	13.3	(82)
Rooflights 0.9x	1	x	1.14	x	33.49	x	0.63	x	1.11	=	24.05	(82)
Rooflights 0.9x	1	x	1.14	x	33.49	x	0.63	x	1.11	=	24.05	(82)
Rooflights 0.9x	1	x	0.68	x	33.49	x	0.63	x	1.11	=	14.35	(82)
Rooflights 0.9x	1	x	0.68	x	51.57	x	0.63	x	1.11	=	22.09	(82)
Rooflights 0.9x	1	x	0.54	x	20.63	x	0.63	x	1.11	=	7.02	(82)
Rooflights 0.9x	1	x	1.14	x	20.63	x	0.63	x	1.11	=	14.82	(82)
Rooflights 0.9x	1	x	0.54	x	20.63	x	0.63	x	1.11	=	7.02	(82)
Rooflights 0.9x	1	x	1.14	x	21.68	x	0.63	x	1.11	=	15.57	(82)
Rooflights 0.9x	1	x	1.14	x	21.68	x	0.63	x	1.11	=	15.57	(82)
Rooflights 0.9x	1	x	0.68	x	21.68	x	0.63	x	1.11	=	9.29	(82)
Rooflights 0.9x	1	x	0.68	x	35.21	x	0.63	x	1.11	=	15.08	(82)
Rooflights 0.9x	1	x	0.54	x	14.12	x	0.63	x	1.11	=	4.8	(82)
Rooflights 0.9x	1	x	1.14	x	14.12	x	0.63	x	1.11	=	10.14	(82)
Rooflights 0.9x	1	x	0.54	x	14.12	x	0.63	x	1.11	=	4.8	(82)

Solar gains in watts, calculated for each month

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

(83)m=	409.16	756.44	1184.85	1705.9	2118.14	2191.47	2076.11	1756.71	1364.32	877.22	501.11	342.91	(83)
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Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	1379.35	1719.9	2111.66	2575.4	2927.46	2948.35	2803.45	2495.25	2136.85	1707.3	1394.99	1286.51	(84)
--------	---------	--------	---------	--------	---------	---------	---------	---------	---------	--------	---------	---------	------

7. Mean internal temperature (see table 9a)

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
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

SAP WorkSheet: New dwelling design stage

(86)m=	1	0.99	0.98	0.93	0.8	0.61	0.46	0.53	0.81	0.97	1	1	(86)
--------	---	------	------	------	-----	------	------	------	------	------	---	---	------

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

(87)m=	19.57	19.77	20.1	20.53	20.83	20.96	20.99	20.99	20.87	20.44	19.92	19.54	(87)
--------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(88)m=	19.86	19.86	19.86	19.87	19.88	19.89	19.89	19.89	19.88	19.88	19.87	19.87	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	1	0.99	0.98	0.91	0.74	0.52	0.35	0.41	0.73	0.96	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=	17.96	18.26	18.74	19.34	19.72	19.87	19.88	19.88	19.79	19.23	18.49	17.92	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

$$fLA = \text{Living area} \div (4) = 0.08 \quad (91)$$

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

(92)m=	18.09	18.38	18.84	19.43	19.81	19.95	19.97	19.97	19.87	19.33	18.6	18.05	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	------

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

(93)m=	17.94	18.23	18.69	19.28	19.66	19.8	19.82	19.82	19.72	19.18	18.45	17.9	(93)
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4. Space heating requirement

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

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

Utilisation factor for gains, hm:

(94)m=	1	0.99	0.97	0.89	0.73	0.51	0.34	0.4	0.71	0.95	0.99	1	(94)
--------	---	------	------	------	------	------	------	-----	------	------	------	---	------

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

(95)m=	1373.73	1701.08	2041.58	2297.9	2138.07	1505.9	950.39	1002.77	1520.26	1613.65	1382.3	1282.66	(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=	4158.81	4054.21	3701	3113.42	2382.63	1540.97	954.25	1011.16	1672.14	2566.85	3411.89	4137.16	(97)
--------	---------	---------	------	---------	---------	---------	--------	---------	---------	---------	---------	---------	------

Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$

(98)m=	2072.1	1581.31	1234.61	587.17	181.95	0	0	0	0	709.18	1461.31	2123.75	(98)
--------	--------	---------	---------	--------	--------	---	---	---	---	--------	---------	---------	------

$$\text{Total per year (kWh/year)} = \text{Sum}(98)_{1..12} = 9951.37 \quad (98)$$

Space heating requirement in kWh/m²/year

$$41.71 \quad (99)$$

5a. Energy requirements - individual heating systems including micro-CHP

Space heating:

Fraction of space heat from secondary/supplementary system 0.1 (201)

Fraction of space heat from main system(s) (202) = 1 - (201) = 0.9 (202)

Fraction of total heating from main system 1 (204) = (202) x [1 - (203)] = 0.9 (204)

Efficiency of main space heating system 1 90 (206)

Efficiency of secondary/supplementary heating system, % 65 (208)

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

Space heating requirement (calculated above)

2072.1	1581.31	1234.61	587.17	181.95	0	0	0	0	709.18	1461.31	2123.75
--------	---------	---------	--------	--------	---	---	---	---	--------	---------	---------

(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

2072.1	1581.31	1234.61	587.17	181.95	0	0	0	0	709.18	1461.31	2123.75
--------	---------	---------	--------	--------	---	---	---	---	--------	---------	---------

$$\text{Total (kWh/year)} = \text{Sum}(211)_{1..12} = 9951.37 \quad (211)$$

SAP WorkSheet: New dwelling design stage

Space heating fuel (secondary), kWh/month

$$= \{[(98)m \times (201)]\} \times 100 \div (208)$$

(215)m=	318.79	243.28	189.94	90.33	27.99	0	0	0	0	109.1	224.82	326.73	
Total (kWh/year) =Sum(215) _{1..5,10...12} =													1530.98 (215)

Water heating

Output from water heater (calculated above)

	240.03	211.82	223.06	200.8	197.39	177.25	171.06	186.56	185.87	208.18	219.07	234.54	
Efficiency of water heater													79.3 (216)
(217)m=	88.64	88.45	88.01	86.78	83.82	79.3	79.3	79.3	79.3	87.11	88.3	88.69	(217)

Fuel for water heating, kWh/month

$$(219)m = (64)m \times 100 \div (217)m$$

(219)m=	270.8	239.47	253.44	231.4	235.49	223.51	215.71	235.25	234.39	238.98	248.1	264.44	
Total = Sum(219a) _{1...12} =													2890.99 (219)

Annual totals

Space heating fuel used, main system 1

Space heating fuel used, secondary

Water heating fuel used

Electricity for pumps, fans and electric keep-hot

central heating pump: 30 (230a)

boiler with a fan-assisted flue 45 (230e)

Total electricity for the above, kWh/year sum of (230a)...(230g) = 75 (231)

Electricity for lighting 667.49 (232)

Electricity generated by PVs -961.22 (233)

10a. Fuel costs - individual heating systems

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.48 x 0.01 =	346.31 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	4.23 x 0.01 =	64.76 (242)
Water heating cost (other fuel)	(219)	3.48 x 0.01 =	100.61 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	9.89 (249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a			
Energy for lighting	(232)	13.19 x 0.01 =	88.04 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x	13.19 x 0.01 =	-126.78 (252)
Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost	(245)...(247) + (250)...(254) =		602.82 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12) 0.42 (256)

SAP WorkSheet: New dwelling design stage

Energy cost factor (ECF)	$[(255) \times (256)] \div [(4) + 45.0] =$	0.89	(257)
SAP rating (Section 12)		87.55	(258)

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

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	{211} x	0.216	=	2149.5	(261)
Space heating (secondary)	{215} x	0.019	=	29.09	(263)
Water heating	{219} x	0.216	=	624.45	(264)
Space and water heating	{261} + {262} + {263} + {264} =			2803.04	(265)
Electricity for pumps, fans and electric keep-hot	{231} x	0.519	=	38.93	(267)
Electricity for lighting	{232} x	0.519	=	346.43	(268)
Energy saving/generation technologies Item 1		0.519	=	-498.87	(269)
Total CO2, kg/year		sum of (265)...(271) =		2689.52	(272)
CO2 emissions per m²		{272} ÷ (4) =		11.27	(273)
El rating (section 14)				87	(274)

13a. Primary Energy

	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	{211} x	1.22	=	12140.68	(261)
Space heating (secondary)	{215} x	1.04	=	1592.22	(263)
Energy for water heating	{219} x	1.22	=	3527	(264)
Space and water heating	{261} + {262} + {263} + {264} =			17259.9	(265)
Electricity for pumps, fans and electric keep-hot	{231} x	3.07	=	230.25	(267)
Electricity for lighting	{232} x	0	=	2049.18	(268)
Energy saving/generation technologies Item 1		3.07	=	-2950.94	(269)
'Total Primary Energy		sum of (265) ..(271) =		16588.39	(272)
Primary energy kWh/m²/year		{272} ÷ (4) =		69.52	(273)

SAP 2012 Overheating Assessment

co.uk

Calculated by Stroma FSAP 2012 program, produced and printed on 17 June 2020

Property Details: Swainfield - PV

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

Overheating Details:

Summer ventilation heat loss coefficient:	779.53	(P1)
Transmission heat loss coefficient:	188	
Summer heat loss coefficient:	967.5	(P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
South (W01)	0	1
South (W02)	0	1
South (W03)	0	1
North (W05)	0	1
North (W06)	0	1
West (W07)	0	1
West (W08)	0	1
West (W09)	0	1
South (W10)	0	1
South (W11)	0	1
South (W12)	0	1
East (W13)	0	1
West (W14)	0	1
West (W15)	0	1
West (D02)	0	1
North (D03)	0	1
North (D04)	0	1
North (D05)	0	1
East (R01)	0	1
West (R02)	0	1
West (R03)	0	1
South (R04)	0	1
North (R05)	0	1
North (R06)	0	1
North (R07)	0	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South (W01)	0.8	0.9	1	0.72	(P8)
South (W02)	0.8	0.9	1	0.72	(P8)

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South (W03)	0.8	0.9	1	0.72	(P8)
North (W05)	0.8	0.9	1	0.72	(P8)
North (W06)	0.8	0.9	1	0.72	(P8)
West (W07)	0.8	0.9	1	0.72	(P8)
West (W08)	0.8	0.9	1	0.72	(P8)
West (W09)	0.8	0.9	1	0.72	(P8)
South (W10)	0.8	0.9	1	0.72	(P8)
South (W11)	0.8	0.9	1	0.72	(P8)
South (W12)	0.8	0.9	1	0.72	(P8)
East (W13)	0.8	0.9	1	0.72	(P8)
West (W14)	0.8	0.9	1	0.72	(P8)
West (W15)	0.8	0.9	1	0.72	(P8)
West (D02)	0.8	0.9	1	0.72	(P8)
North (D03)	0.8	0.9	1	0.72	(P8)
North (D04)	0.8	0.9	1	0.72	(P8)
North (D05)	0.8	0.9	1	0.72	(P8)
East (R01)	0.8	1	1	0.8	(P8)
West (R02)	0.8	1	1	0.8	(P8)
West (R03)	0.8	1	1	0.8	(P8)
South (R04)	0.8	1	1	0.8	(P8)
North (R05)	0.8	1	1	0.8	(P8)
North (R06)	0.8	1	1	0.8	(P8)
North (R07)	0.8	1	1	0.8	(P8)

Solar gains

Orientation		Area	Flux	g _u	FF	Shading	Gains
South (W01)	0.9 x	0.67	118.4	0.62	0	0.72	35.41
South (W02)	0.9 x	2.25	118.4	0.62	0	0.72	118.92
South (W03)	0.9 x	0.67	118.4	0.62	0	0.72	35.41
North (W05)	0.9 x	2.04	86.66	0.62	0	0.72	78.92
North (W06)	0.9 x	0.9	86.66	0.62	0	0.72	34.82
West (W07)	0.9 x	1.19	124.8	0.62	0	0.72	66.29
West (W08)	0.9 x	1.45	124.8	0.62	0	0.72	80.78
West (W09)	0.9 x	2.1	124.8	0.62	0	0.72	116.99
South (W10)	0.9 x	0.44	118.4	0.62	0	0.72	23.26
South (W11)	0.9 x	1.06	118.4	0.62	0	0.72	56.02
South (W12)	0.9 x	0.77	118.4	0.62	0	0.72	40.7
East (W13)	0.9 x	1.06	124.8	0.62	0	0.72	59.05
West (W14)	0.9 x	1.05	124.8	0.62	0	0.72	58.49
West (W15)	0.9 x	1.05	124.8	0.62	0	0.72	58.49
West (D02)	0.9 x	5.81	124.8	0.62	0	0.72	323.67
North (D03)	0.9 x	3.4	86.66	0.62	0	0.72	131.53
North (D04)	0.9 x	1.82	86.66	0.62	0	0.72	70.41
North (D05)	0.9 x	3.4	86.66	0.62	0	0.72	131.53
	1 x	1.14	202.69	0.63	0.7	0.8	73.37
	1 x	1.14	202.69	0.63	0.7	0.8	73.37
	1 x	0.68	202.69	0.63	0.7	0.8	43.76
	1 x	0.68	216.67	0.63	0.7	0.8	46.78
	1 x	0.54	191.93	0.63	0.7	0.8	32.91
	1 x	1.14	191.93	0.63	0.7	0.8	69.47
	1 x	0.54	191.93	0.63	0.7	0.8	32.91
Total							1893.26 (P3/P4)

Internal gains

	June	July	August
Internal gains	753.88	724.34	735.53
Total summer gains	2772.09	2617.6	2364.9 (P5)

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Summer gain/loss ratio	2.87	2.71	2.44	(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	18.52	20.36	20.19	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	

Assessment of likelihood of high internal temperature: Not significant