

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.56
Printed on 26 September 2022 at 00:59:47

Project Information:

Assessed By: George Achilleos (STRO009373)

Building Type: End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 89.9m²

Site Reference : New Project

Plot Reference: HOUSE 1 - ASHP

Address : Development, 69 Scales Road, LONDON, N17 9EY

Client Details:

Name: John Zenonos

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) 27.66 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.46 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 57.1 kWh/m²

OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.42 (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:

Heat pumps with radiators or underfloor heating - electric
Mitsubishi Electric Ecodan 5.0 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 2.01 kWh/day	
	Permitted by DBSCG: 2.30 kWh/day	OK

Regulations Compliance Report

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 Summertime temperature

Overheating risk (Thames valley):	Slight	OK
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Based on:

Overshading:	Average or unknown
Windows facing: East	3.47m ²
Windows facing: North	1.77m ²
Windows facing: North	1.18m ²
Windows facing: East	2.76m ²
Windows facing: West	3.07m ²
Windows facing: South	1.26m ²
Windows facing: East	1.38m ²
Windows facing: West	1.38m ²
Ventilation rate:	4.00
Blinds/curtains:	Net curtain (covering whole window) Closed 100% of daylight hours

10 Key features

Roofs U-value	0.1 W/m ² K
Party Walls U-value	0 W/m ² K
Floors U-value	0.1 W/m ² K

Thermal Bridge Report

Property Details: HOUSE 1 - ASHP

Address: Development, 69 Scales Road, LONDON, N17 9EY
Located in: England
Region: Thames valley

Thermal bridges:

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.0549

External Junctions Details:

Junction Type	PSI-Value	Length	Reference	Type
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Code for Sustainable Homes Report

For use with Nov 2010 addendum 2014 England

Assessor and House Details

Assessor Name: George Achilleos
Property Address: Development
69 Scales Road
LONDON
N17 9EY

Assessor Number: STRO009373

Buiding regulation assessment

	kg/m ² /year
TER	27.66
DER	16.46

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO₂ Emissions for Codes Levels 1 - 5

	%	kg/m ² /year	
DER from SAP 2012 DER Worksheet		16.46	(ZC1)
TER		27.66	
Residual CO2 emissions offset from biofuel CHP		0	(ZC5)
CO2 emissions offset from additional allowable electricity generation		0	(ZC7)
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		16.46	
% improvement DER/TER	40.5		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m ² /year	
DER accounting for SAP Section 16 allowances	16.46	(ZC1)
CO2 emissions from appliances, equation (L14)	15.69	(ZC2)
CO2 emissions from cooking, equation (L16)	2.02	(ZC3)
Net CO2 emissions	34.2	(ZC8)

Result:

Credits awarded for ENE 1 = 4.7

Code Level = 4

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 57.14

Credits awarded for ENE 2 = 3.6

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m ² /year	
Standard Case CO2 emissions		37.32	
Standard DER		19.61	
Actual Case CO2 emissions		34.17	
Actual DER		16.46	
Reduction in CO2 emissions	8.44		

Credits awarded for ENE 7 = 0

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibility of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

Predicted Energy Assessment



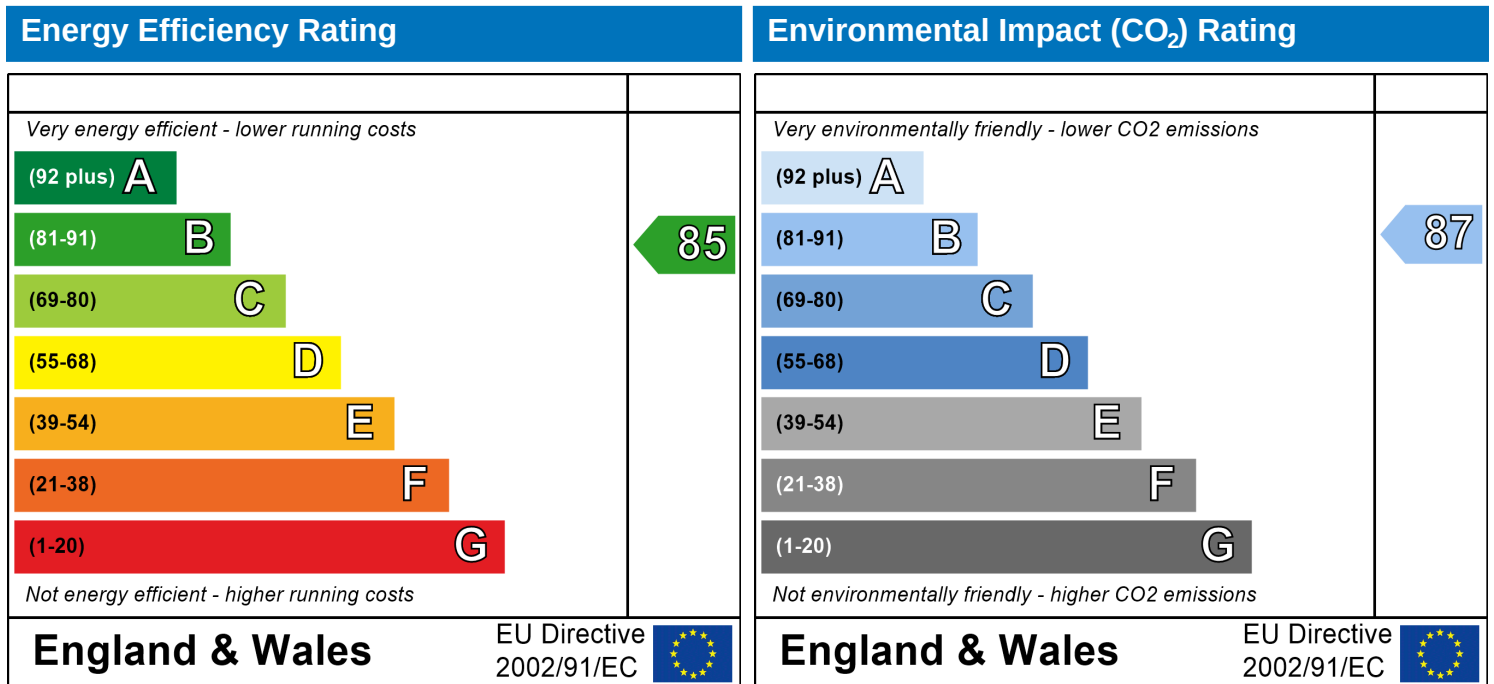
Development
69 Scales Road
LONDON
N17 9EY

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

End-terrace House
17 August 2022
George Achilleos
89.9 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: HOUSE 1 - ASHP

Address: Development, 69 Scales Road, LONDON, N17 9EY
Located in: England
Region: Thames valley
UPRN: UPRN-551151214619
Date of assessment: 17 August 2022
Date of certificate: 26 September 2022
Assessment type: New dwelling design stage
Transaction type: Rental
Tenure type: Rented (private)
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 505

Property description:

Dwelling type: House
Detachment: End-terrace
Year Completed: 2022
Floor Location: Floor area: Storey height:
 Floor 0 51.462 m² 2.665 m
 Floor 1 38.441 m² 2.665 m
Living area: 24.985 m² (fraction 0.278)
Front of dwelling faces: South

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
D001	Manufacturer	Half glazed	low-E, En = 0.05, soft coat	No	PVC-U
W001	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
W002	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
W003	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
W004/W005	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
W006	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
W007	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
W008	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U
W009	SAP 2012	Windows	low-E, En = 0.05, soft coat	Yes	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
D001	16mm or more mm	0.7	0.63	1.6	2.11	1
W001	16mm or more	0.7	0.63	1.4	3.47	1
W002	16mm or more	0.7	0.63	1.4	1.77	1
W003	16mm or more	0.7	0.63	1.4	1.18	1
W004/W005	16mm or more	0.7	0.63	1.4	1.38	2
W006	16mm or more	0.7	0.63	1.4	3.07	1
W007	16mm or more	0.7	0.63	1.4	1.26	1
W008	16mm or more	0.7	0.63	1.4	1.38	1
W009	16mm or more	0.7	0.63	1.4	1.38	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
D001		CAVITY WALL	South	0.95	2.225
W001		CAVITY WALL	East	1.651	2.1
W002		CAVITY WALL	North	1.5	1.177
W003		CAVITY WALL	North	1	1.177
W004/W005		CAVITY WALL	East	1	1.377
W006		CAVITY WALL	West	2.015	1.525
W007		CAVITY WALL	South	0.95	1.327

SAP Input

W008	CAVITY WALL	East	1	1.377
W009	CAVITY WALL	West	1	1.377

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
<u>External Elements</u>							
CAVITY WALL	168.924	18.38	150.54	0.16	0	False	N/A
PITCHED ROOF	38.441	0	38.44	0.1	0		N/A
FLAT ROOF	14.605	0	14.6	0.1	0		N/A
GRD FLR	51.462			0.1			N/A
<u>Internal Elements</u>							
INT WALLS	49.355						N/A
INT CEILING	51.462						N/A
INT FLR	51.462						N/A
<u>Party Elements</u>							
PARTY WALL	39.522						N/A

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0549

Length Psi-value

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	2
Number of passive stacks:	0
Number of sides sheltered:	1
Pressure test:	5

Main heating system:

Main heating system:	Heat pumps with radiators or underfloor heating
	Electric heat pumps
	Fuel: Electricity
	Info Source: Boiler Database
	Database: (rev 505, product index 104568, SEDBUK 245%):
	Brand name: Mitsubishi Electric
	Model: Ecodan 5.0 kW
	Model qualifier: PUZ-WM50VHA - Radiators
	(provides DHW all year)
	Systems with radiators
	Central heating pump : 2013 or later
	Design flow temperature: Design flow temperature<=35°C
	Boiler interlock: Yes

Main heating Control:

Main heating Control:	Time and temperature zone control by suitable arrangement of plumbing and electrical services
	Control code: 2207

Secondary heating system:

Secondary heating system:	None
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Water heating:

Water heating:	From main heating system
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SAP Input

Water code: 901
Fuel :Electricity
Hot water cylinder
Cylinder volume: 210 litres
Cylinder insulation: Factory 80 mm
Primary pipework insulation: True
Cylinderstat: True
Cylinder in heated space: True
Flue Gas Heat Recovery System:
Database (rev 505, product index 060037)
Brand name: Alpha
Model: Gas-Saver
Model qualifier: GS-2-ALPCD
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: George Achilleos **Stroma Number:** STRO009373
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.56

Property Address: HOUSE 1 - ASHP

Address : Development, 69 Scales Road, LONDON, N17 9EY

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	51.46 (1a)	x	2.66 (2a)	=	137.15 (3a)
First floor	38.44 (1b)	x	2.66 (2b)	=	102.45 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	89.9 (4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	239.59 (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							2	x 10 =	20 (7a)
Number of passive vents							0	x 10 =	0 (7b)
Number of flueless gas fires							0	x 40 =	0 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.08 (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)			0.33 (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			1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.31 (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

	0.39	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)
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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)
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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)
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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=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57	(24d)
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Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57	(25)
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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			2.11	x 1.6	= 3.376		(26)
Windows Type 1			3.47	x1/[1/(1.4)+ 0.04] =	4.6		(27)
Windows Type 2			1.77	x1/[1/(1.4)+ 0.04] =	2.35		(27)
Windows Type 3			1.18	x1/[1/(1.4)+ 0.04] =	1.56		(27)
Windows Type 4			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 5			3.07	x1/[1/(1.4)+ 0.04] =	4.07		(27)
Windows Type 6			1.26	x1/[1/(1.4)+ 0.04] =	1.67		(27)
Windows Type 7			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 8			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Floor			51.462	x 0.1	= 5.1462		(28)
Walls	168.92	18.38	150.54	x 0.16	= 24.09		(29)
Roof Type1	38.44	0	38.44	x 0.1	= 3.84		(30)
Roof Type2	14.6	0	14.6	x 0.1	= 1.46		(30)
Total area of elements, m²			273.43				(31)
Party wall			39.52	x 0	= 0		(32)
Internal wall **			49.35				(32c)
Internal floor			51.46				(32d)

SAP WorkSheet: New dwelling design stage

Internal ceiling

51.46

(32e)

* 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) =

59.48

(33)

Heat capacity Cm = S(A x k)

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

42108.34

(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

Indicative Value: Medium

250

(35)

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

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

15

(36)

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

Total fabric heat loss

(33) + (36) =

74.48

(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
45.65	45.41	45.18	44.08	43.88	42.93	42.93	42.75	43.29	43.88	44.29	44.73

(38)

Heat transfer coefficient, W/K

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

(39)m=

120.13	119.89	119.66	118.57	118.36	117.41	117.41	117.23	117.78	118.36	118.78	119.21
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Average = Sum(39)_{1...12} /12=

118.57

(39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.34	1.33	1.33	1.32	1.32	1.31	1.31	1.3	1.31	1.32	1.32	1.33
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Average = Sum(40)_{1...12} /12=

1.32

(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

2.62

(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

96.53

(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=

106.18	102.32	98.46	94.6	90.74	86.88	86.88	90.74	94.6	98.46	102.32	106.18
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Total = Sum(44)_{1...12} =

1158.35

(44)

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

(45)m=

157.47	137.72	142.11	123.9	118.88	102.59	95.06	109.09	110.39	128.65	140.43	152.5
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Total = Sum(45)_{1...12} =

1518.78

(45)

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

(46)m=

23.62	20.66	21.32	18.58	17.83	15.39	14.26	16.36	16.56	19.3	21.06	22.87
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(46)

Water storage loss:

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

210

(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)

SAP WorkSheet: New dwelling design stage

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

210

 (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

0.83

 (52)

Temperature factor from Table 2b

0.54

 (53)

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

1.09

 (54)

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

1.09

 (55)

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

(56)m=

33.69	30.43	33.69	32.6	33.69	32.6	33.69	33.69	32.6	33.69	32.6	33.69
-------	-------	-------	------	-------	------	-------	-------	------	-------	------	-------

 (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=

33.69	30.43	33.69	32.6	33.69	32.6	33.69	33.69	32.6	33.69	32.6	33.69
-------	-------	-------	------	-------	------	-------	-------	------	-------	------	-------

 (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=

214.41	189.16	199.06	179.01	175.83	157.7	152.01	166.03	165.5	185.6	195.54	209.45
--------	--------	--------	--------	--------	-------	--------	--------	-------	-------	--------	--------

 (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)

FHRS 129.61 117.95 118.39 107.07 61.19 12.58 11.71 13.32 13.46 109.29 118.26 127.72 (63) (G2)

Output from water heater

(64)m=

82.3	68.94	78.16	69.52	112.14	142.69	137.8	150.21	149.62	73.8	74.85	79.22
------	-------	-------	-------	--------	--------	-------	--------	--------	------	-------	-------

Output from water heater (annual) _{1...12}	1219.24
---	---------

 (64)

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

(65)m=

97.92	86.94	92.81	85.29	85.09	78.2	77.17	81.83	80.79	88.33	90.78	96.26
-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------

 (65)

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

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

Metabolic gains (Table 5), Watts

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46

 (66)

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

(67)m=

53.51	47.52	38.65	29.26	21.87	18.47	19.95	25.93	34.81	44.2	51.59	54.99
-------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------

 (67)

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

(68)m=

356.57	360.27	350.94	331.09	306.04	282.49	266.75	263.05	272.38	292.23	317.28	340.83
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (68)

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

(69)m=

53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (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=

-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------

 (71)

SAP WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=

131.61	129.38	124.75	118.45	114.37	108.61	103.72	109.99	112.21	118.73	126.09	129.39
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (72)

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

(73)m=

647.54	643.03	620.2	584.66	548.13	515.42	496.28	504.83	525.26	561.01	600.81	631.07
--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (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	Area			Flux			g_			FF			Gains					
	Table 6d		m²		Table 6a		Table 6b		Table 6c				(W)						
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>10.63</td></tr></table>	10.63	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>5.75</td></tr></table>	5.75	(74)
0.77																			
1.77																			
10.63																			
0.63																			
0.7																			
5.75																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>10.63</td></tr></table>	10.63	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>3.83</td></tr></table>	3.83	(74)
0.77																			
1.18																			
10.63																			
0.63																			
0.7																			
3.83																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>20.32</td></tr></table>	20.32	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>10.99</td></tr></table>	10.99	(74)
0.77																			
1.77																			
20.32																			
0.63																			
0.7																			
10.99																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>20.32</td></tr></table>	20.32	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>7.33</td></tr></table>	7.33	(74)
0.77																			
1.18																			
20.32																			
0.63																			
0.7																			
7.33																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>34.53</td></tr></table>	34.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>18.68</td></tr></table>	18.68	(74)
0.77																			
1.77																			
34.53																			
0.63																			
0.7																			
18.68																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>34.53</td></tr></table>	34.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>12.45</td></tr></table>	12.45	(74)
0.77																			
1.18																			
34.53																			
0.63																			
0.7																			
12.45																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>55.46</td></tr></table>	55.46	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>30</td></tr></table>	30	(74)
0.77																			
1.77																			
55.46																			
0.63																			
0.7																			
30																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>55.46</td></tr></table>	55.46	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>20</td></tr></table>	20	(74)
0.77																			
1.18																			
55.46																			
0.63																			
0.7																			
20																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>74.72</td></tr></table>	74.72	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.42</td></tr></table>	40.42	(74)
0.77																			
1.77																			
74.72																			
0.63																			
0.7																			
40.42																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>74.72</td></tr></table>	74.72	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>26.94</td></tr></table>	26.94	(74)
0.77																			
1.18																			
74.72																			
0.63																			
0.7																			
26.94																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>79.99</td></tr></table>	79.99	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>43.27</td></tr></table>	43.27	(74)
0.77																			
1.77																			
79.99																			
0.63																			
0.7																			
43.27																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>79.99</td></tr></table>	79.99	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>28.84</td></tr></table>	28.84	(74)
0.77																			
1.18																			
79.99																			
0.63																			
0.7																			
28.84																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>74.68</td></tr></table>	74.68	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.4</td></tr></table>	40.4	(74)
0.77																			
1.77																			
74.68																			
0.63																			
0.7																			
40.4																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>74.68</td></tr></table>	74.68	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>26.93</td></tr></table>	26.93	(74)
0.77																			
1.18																			
74.68																			
0.63																			
0.7																			
26.93																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>59.25</td></tr></table>	59.25	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>32.05</td></tr></table>	32.05	(74)
0.77																			
1.77																			
59.25																			
0.63																			
0.7																			
32.05																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>59.25</td></tr></table>	59.25	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>21.37</td></tr></table>	21.37	(74)
0.77																			
1.18																			
59.25																			
0.63																			
0.7																			
21.37																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>41.52</td></tr></table>	41.52	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>22.46</td></tr></table>	22.46	(74)
0.77																			
1.77																			
41.52																			
0.63																			
0.7																			
22.46																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>41.52</td></tr></table>	41.52	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>14.97</td></tr></table>	14.97	(74)
0.77																			
1.18																			
41.52																			
0.63																			
0.7																			
14.97																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>24.19</td></tr></table>	24.19	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>13.08</td></tr></table>	13.08	(74)
0.77																			
1.77																			
24.19																			
0.63																			
0.7																			
13.08																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>24.19</td></tr></table>	24.19	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>8.72</td></tr></table>	8.72	(74)
0.77																			
1.18																			
24.19																			
0.63																			
0.7																			
8.72																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>13.12</td></tr></table>	13.12	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>7.1</td></tr></table>	7.1	(74)
0.77																			
1.77																			
13.12																			
0.63																			
0.7																			
7.1																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>13.12</td></tr></table>	13.12	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>4.73</td></tr></table>	4.73	(74)
0.77																			
1.18																			
13.12																			
0.63																			
0.7																			
4.73																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>8.86</td></tr></table>	8.86	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>4.8</td></tr></table>	4.8	(74)
0.77																			
1.77																			
8.86																			
0.63																			
0.7																			
4.8																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>8.86</td></tr></table>	8.86	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>3.2</td></tr></table>	3.2	(74)
0.77																			
1.18																			
8.86																			
0.63																			
0.7																			
3.2																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>20.83</td></tr></table>	20.83	(76)
0.77																			
3.47																			
19.64																			
0.63																			
0.7																			
20.83																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>16.57</td></tr></table>	16.57	(76)
0.77																			
1.38																			
19.64																			
0.63																			
0.7																			
16.57																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>8.28</td></tr></table>	8.28	(76)
0.77																			
1.38																			
19.64																			
0.63																			
0.7																			
8.28																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.74</td></tr></table>	40.74	(76)
0.77																			
3.47																			
38.42																			
0.63																			
0.7																			
40.74																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>32.41</td></tr></table>	32.41	(76)
0.77																			
1.38																			
38.42																			
0.63																			
0.7																			
32.41																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>16.2</td></tr></table>	16.2	(76)
0.77																			
1.38																			
38.42																			
0.63																			
0.7																			
16.2																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>63.27</td></tr></table>	63.27	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>67.1</td></tr></table>	67.1	(76)
0.77																			
3.47																			
63.27																			
0.63																			
0.7																			
67.1																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>63.27</td></tr></table>	63.27	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>53.37</td></tr></table>	53.37	(76)
0.77																			
1.38																			
63.27																			
0.63																			
0.7																			
53.37																			

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(76)
East	0.9x	0.77	x	3.47	x	92.28	x	0.63	x	0.7	=	97.86	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	77.84	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(76)
East	0.9x	0.77	x	3.47	x	113.09	x	0.63	x	0.7	=	119.93	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	95.39	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(76)
East	0.9x	0.77	x	3.47	x	115.77	x	0.63	x	0.7	=	122.77	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	97.65	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(76)
East	0.9x	0.77	x	3.47	x	110.22	x	0.63	x	0.7	=	116.88	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	92.97	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(76)
East	0.9x	0.77	x	3.47	x	94.68	x	0.63	x	0.7	=	100.4	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	79.86	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(76)
East	0.9x	0.77	x	3.47	x	73.59	x	0.63	x	0.7	=	78.04	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	62.07	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(76)
East	0.9x	0.77	x	3.47	x	45.59	x	0.63	x	0.7	=	48.35	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	38.45	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	3.47	x	24.49	x	0.63	x	0.7	=	25.97	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	20.66	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(76)
East	0.9x	0.77	x	3.47	x	16.15	x	0.63	x	0.7	=	17.13	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	13.62	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(76)
South	0.9x	0.77	x	1.26	x	46.75	x	0.63	x	0.7	=	18	(78)
South	0.9x	0.77	x	1.26	x	76.57	x	0.63	x	0.7	=	29.48	(78)
South	0.9x	0.77	x	1.26	x	97.53	x	0.63	x	0.7	=	37.56	(78)
South	0.9x	0.77	x	1.26	x	110.23	x	0.63	x	0.7	=	42.45	(78)
South	0.9x	0.77	x	1.26	x	114.87	x	0.63	x	0.7	=	44.23	(78)
South	0.9x	0.77	x	1.26	x	110.55	x	0.63	x	0.7	=	42.57	(78)
South	0.9x	0.77	x	1.26	x	108.01	x	0.63	x	0.7	=	41.59	(78)
South	0.9x	0.77	x	1.26	x	104.89	x	0.63	x	0.7	=	40.39	(78)
South	0.9x	0.77	x	1.26	x	101.89	x	0.63	x	0.7	=	39.23	(78)
South	0.9x	0.77	x	1.26	x	82.59	x	0.63	x	0.7	=	31.8	(78)
South	0.9x	0.77	x	1.26	x	55.42	x	0.63	x	0.7	=	21.34	(78)
South	0.9x	0.77	x	1.26	x	40.4	x	0.63	x	0.7	=	15.56	(78)
West	0.9x	0.77	x	3.07	x	19.64	x	0.63	x	0.7	=	18.43	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	8.28	(80)
West	0.9x	0.77	x	3.07	x	38.42	x	0.63	x	0.7	=	36.05	(80)
West	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	16.2	(80)
West	0.9x	0.77	x	3.07	x	63.27	x	0.63	x	0.7	=	59.36	(80)
West	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(80)
West	0.9x	0.77	x	3.07	x	92.28	x	0.63	x	0.7	=	86.58	(80)
West	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(80)
West	0.9x	0.77	x	3.07	x	113.09	x	0.63	x	0.7	=	106.11	(80)
West	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(80)
West	0.9x	0.77	x	3.07	x	115.77	x	0.63	x	0.7	=	108.62	(80)
West	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(80)
West	0.9x	0.77	x	3.07	x	110.22	x	0.63	x	0.7	=	103.41	(80)
West	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(80)
West	0.9x	0.77	x	3.07	x	94.68	x	0.63	x	0.7	=	88.83	(80)
West	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(80)
West	0.9x	0.77	x	3.07	x	73.59	x	0.63	x	0.7	=	69.04	(80)
West	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(80)
West	0.9x	0.77	x	3.07	x	45.59	x	0.63	x	0.7	=	42.77	(80)
West	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(80)
West	0.9x	0.77	x	3.07	x	24.49	x	0.63	x	0.7	=	22.98	(80)
West	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(80)
West	0.9x	0.77	x	3.07	x	16.15	x	0.63	x	0.7	=	15.15	(80)
West	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(80)

Solar gains in watts, calculated for each month

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

(83)m= 99.98 189.41 301.89 432.57 528.42 541.37 515.15 442.75 347.89 221.64 123.43 83.08 (83)

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

(84)m= 747.52 832.44 922.09 1017.23 1076.55 1056.8 1011.43 947.59 873.15 782.65 724.24 714.15 (84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(86)m=	0.99	0.99	0.97	0.93	0.83	0.66	0.5	0.55	0.79	0.95	0.99	0.99

(86)

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

(87)m= 19.73 19.88 20.15 20.5 20.79 20.95 20.99 20.98 20.87 20.51 20.04 19.69 (87)

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

(88)m= 19.81 19.81 19.82 19.83 19.83 19.84 19.84 19.84 19.83 19.83 19.82 19.82 (88)

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

(89)m= 0.99 0.98 0.96 0.9 0.77 0.56 0.37 0.42 0.7 0.93 0.98 0.99 (89)

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

(90)m= 18.15 18.38 18.77 19.27 19.63 19.8 19.83 19.83 19.74 19.28 18.64 18.11 (90)

fLA = Living area ÷ (4) = 0.28 (91)

SAP WorkSheet: New dwelling design stage

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

(92)m=	18.59	18.79	19.15	19.61	19.95	20.12	20.15	20.15	20.05	19.62	19.03	18.55	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.59	18.79	19.15	19.61	19.95	20.12	20.15	20.15	20.05	19.62	19.03	18.55	(93)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

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

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

Utilisation factor for gains, hm:

(94)m=	0.99	0.98	0.95	0.9	0.78	0.59	0.41	0.46	0.72	0.92	0.98	0.99	(94)
--------	------	------	------	-----	------	------	------	------	------	------	------	------	------

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

(95)m=	737.09	813.29	880.21	911.69	836.23	618.98	412.77	432.41	628.58	719.98	706.56	705.85	(95)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

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

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

(97)m=	1716.39	1665.92	1514.23	1269.57	976.72	648.06	417.18	439.67	701.31	1067.82	1416.6	1710.67	(97)
--------	---------	---------	---------	---------	--------	--------	--------	--------	--------	---------	--------	---------	------

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

(98)m=	728.6	572.97	471.71	257.68	104.52	0	0	0	0	258.79	511.23	747.58	
Total per year (kWh/year) = Sum(98) _{1...5,9...12} =												3653.08	(98)

Space heating requirement in kWh/m²/year

40.63	(99)
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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

245.06	(206)
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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)

728.6	572.97	471.71	257.68	104.52	0	0	0	0	258.79	511.23	747.58
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(211)m = {[(98)m x (204)] } x 100 ÷ (206)

297.32	233.81	192.49	105.15	42.65	0	0	0	0	105.6	208.62	305.06
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Total (kWh/year) =Sum(211)_{1...5,10...12} =

1490.7	(211)
--------	-------

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)

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

Water heating

Output from water heater (calculated above)

82.3	68.94	78.16	69.52	112.14	142.69	137.8	150.21	149.62	73.8	74.85	79.22
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Efficiency of water heater

172.8	(216)
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(217)m=

172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8
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Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	47.63	39.9	45.23	40.23	64.89	82.58	79.74	86.93	86.58	42.71	43.32	45.84	
Total = Sum(219a) _{1...12} =												705.58	(219)

SAP WorkSheet: New dwelling design stage

Annual totals

	kWh/year	kWh/year
Space heating fuel used, main system 1		1490.7
Water heating fuel used		705.58
Electricity for pumps, fans and electric keep-hot		
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0 (231)
Electricity for lighting		377.97 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2574.25 (338)

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 = 196.62 (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 = 93.07 (247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 = 0 (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 = 49.85 (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) =		339.54 (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] =	1.06 (257)
SAP rating (Section 12)		85.25 (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	= 773.67 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating	(219) x	0.519	= 366.2 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1139.87 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= 0 (267)
Electricity for lighting	(232) x	0.519	= 196.17 (268)
Total CO2, kg/year		sum of (265)...(271) =	1336.04 (272)
CO2 emissions per m²		(272) ÷ (4) =	14.86 (273)
El rating (section 14)			87 (274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year	Primary factor		P. Energy kWh/year
Space heating (main system 1)	(211) x	3.07	=	4576.45 (261)
Space heating (secondary)	(215) x	3.07	=	0 (263)
Energy for water heating	(219) x	3.07	=	2166.12 (264)
Space and water heating	(261) + (262) + (263) + (264) =			6742.57 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0 (267)
Electricity for lighting	(232) x	0	=	1160.38 (268)
'Total Primary Energy		sum of (265)...(271) =		7902.95 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =		87.91 (273)

EPC Costs WorkSheet: New dwelling design stage

User Details:

Assessor Name:	George Achilleos	Stroma Number:	STRO009373
Software Name:	Stroma FSAP 2012	Software Version:	Version: 1.0.5.56

Property Address: HOUSE 1 - ASHP

Address : Development, 69 Scales Road, LONDON, N17 9EY

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	51.46	(1a) x	2.66	(2a) =	137.15
First floor	38.44	(1b) x	2.66	(2b) =	102.45
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	89.9	(4)			
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	239.59
					(5)

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							2	x 10 =	20
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) =	20	÷ (5) =	0.08	(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)			0.33	(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			1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.31	(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)=	4.3	4	4.1	3.7	3.8	3.2	3.4	3.7	3.5	3.7	3.6	4
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EPC Costs WorkSheet: New dwelling design stage

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.08	1	1.02	0.92	0.95	0.8	0.85	0.92	0.88	0.92	0.9	1
---------	------	---	------	------	------	-----	------	------	------	------	-----	---

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

	0.33	0.31	0.32	0.29	0.29	0.25	0.26	0.29	0.27	0.29	0.28	0.31
--	------	------	------	------	------	------	------	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 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 (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= 0.55 0.55 0.55 0.54 0.54 0.53 0.53 0.54 0.54 0.54 0.54 0.55 (24d)

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

(25)m= 0.55 0.55 0.55 0.54 0.54 0.53 0.53 0.54 0.54 0.54 0.54 0.55 (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			2.11	x 1.6	= 3.376		(26)
Windows Type 1			3.47	x1/[1/(1.4)+ 0.04] =	4.6		(27)
Windows Type 2			1.77	x1/[1/(1.4)+ 0.04] =	2.35		(27)
Windows Type 3			1.18	x1/[1/(1.4)+ 0.04] =	1.56		(27)
Windows Type 4			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 5			3.07	x1/[1/(1.4)+ 0.04] =	4.07		(27)
Windows Type 6			1.26	x1/[1/(1.4)+ 0.04] =	1.67		(27)
Windows Type 7			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 8			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Floor			51.462	x 0.1	= 5.1462		(28)
Walls	168.92	18.38	150.54	x 0.16	= 24.09		(29)
Roof Type1	38.44	0	38.44	x 0.1	= 3.84		(30)
Roof Type2	14.6	0	14.6	x 0.1	= 1.46		(30)
Total area of elements, m²			273.43				(31)
Party wall			39.52	x 0	= 0		(32)
Internal wall **			49.35				(32c)
Internal floor			51.46				(32d)

EPC Costs WorkSheet: New dwelling design stage

Internal ceiling

51.46

(32e)

* 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) =

59.48

(33)

Heat capacity Cm = S(A x k)

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

42108.34

(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

Indicative Value: Medium

250

(35)

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

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

15

(36)

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

Total fabric heat loss

(33) + (36) =

74.48

(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
43.88	43.29	43.48	42.75	42.93	41.94	42.25	42.75	42.41	42.75	42.58	43.29

(38)

Heat transfer coefficient, W/K

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

(39)m=

118.36	117.78	117.97	117.23	117.41	116.42	116.73	117.23	116.9	117.23	117.06	117.78
--------	--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------

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

117.34

(39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.32	1.31	1.31	1.3	1.31	1.29	1.3	1.3	1.3	1.3	1.3	1.31
------	------	------	-----	------	------	-----	-----	-----	-----	-----	------

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

1.31

(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

2.62

(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

96.53

(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)

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

(44)m=

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

106.18	102.32	98.46	94.6	90.74	86.88	86.88	90.74	94.6	98.46	102.32	106.18
--------	--------	-------	------	-------	-------	-------	-------	------	-------	--------	--------

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

1158.35

(44)

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

(45)m=

157.47	137.72	142.11	123.9	118.88	102.59	95.06	109.09	110.39	128.65	140.43	152.5
--------	--------	--------	-------	--------	--------	-------	--------	--------	--------	--------	-------

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

1518.78

(45)

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

(46)m=

23.62	20.66	21.32	18.58	17.83	15.39	14.26	16.36	16.56	19.3	21.06	22.87
-------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------

(46)

Water storage loss:

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

210

(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)

EPC Costs WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	210	(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		0.83	(52)											
Temperature factor from Table 2b		0.54	(53)											
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1.09	(54)											
Enter (50) or (54) in (55)		1.09	(55)											
Water storage loss calculated for each month	((56)m = (55) x (41)m													
(56)m=	33.69	30.43	33.69	32.6	33.69	32.6	33.69	33.69	32.6	33.69	32.6	33.69	(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=	33.69	30.43	33.69	32.6	33.69	32.6	33.69	33.69	32.6	33.69	32.6	33.69	(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=	214.41	189.16	199.06	179.01	175.83	157.7	152.01	166.03	165.5	185.6	195.54	209.45	(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)	
FGHRs	127.44	116.69	116.65	89.35	32.61	12.58	11.71	13.32	13.46	86.69	116.46	125.71	(63) (G2)	
Output from water heater														
(64)m=	84.47	70.2	79.91	87.24	140.72	142.69	137.8	150.21	149.62	96.4	76.65	81.23		
												Output from water heater (annual) _{1...12}	1297.13	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]														
(65)m=	97.92	86.94	92.81	85.29	85.09	78.2	77.17	81.83	80.79	88.33	90.78	96.26	(65)	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating														

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	157.46	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	53.51	47.52	38.65	29.26	21.87	18.47	19.95	25.93	34.81	44.2	51.59	54.99	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	356.57	360.27	350.94	331.09	306.04	282.49	266.75	263.05	272.38	292.23	317.28	340.83	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	53.37	(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=	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	(71)

EPC Costs WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=

131.61	129.38	124.75	118.45	114.37	108.61	103.72	109.99	112.21	118.73	126.09	129.39
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (72)

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

(73)m=

647.54	643.03	620.2	584.66	548.13	515.42	496.28	504.83	525.26	561.01	600.81	631.07
--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (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	Area			Flux			g_		FF		Gains							
	Table 6d		m²		Table 6a		Table 6b		Table 6c		(W)								
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>11.58</td></tr></table>	11.58	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>6.27</td></tr></table>	6.27	(74)
0.77																			
1.77																			
11.58																			
0.63																			
0.7																			
6.27																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>11.58</td></tr></table>	11.58	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>4.18</td></tr></table>	4.18	(74)
0.77																			
1.18																			
11.58																			
0.63																			
0.7																			
4.18																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>20.04</td></tr></table>	20.04	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>10.84</td></tr></table>	10.84	(74)
0.77																			
1.77																			
20.04																			
0.63																			
0.7																			
10.84																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>20.04</td></tr></table>	20.04	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>7.23</td></tr></table>	7.23	(74)
0.77																			
1.18																			
20.04																			
0.63																			
0.7																			
7.23																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>34.53</td></tr></table>	34.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>18.68</td></tr></table>	18.68	(74)
0.77																			
1.77																			
34.53																			
0.63																			
0.7																			
18.68																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>34.53</td></tr></table>	34.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>12.45</td></tr></table>	12.45	(74)
0.77																			
1.18																			
34.53																			
0.63																			
0.7																			
12.45																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>57.86</td></tr></table>	57.86	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>31.3</td></tr></table>	31.3	(74)
0.77																			
1.77																			
57.86																			
0.63																			
0.7																			
31.3																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>57.86</td></tr></table>	57.86	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>20.86</td></tr></table>	20.86	(74)
0.77																			
1.18																			
57.86																			
0.63																			
0.7																			
20.86																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>75.62</td></tr></table>	75.62	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.91</td></tr></table>	40.91	(74)
0.77																			
1.77																			
75.62																			
0.63																			
0.7																			
40.91																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>75.62</td></tr></table>	75.62	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>27.27</td></tr></table>	27.27	(74)
0.77																			
1.18																			
75.62																			
0.63																			
0.7																			
27.27																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>87.02</td></tr></table>	87.02	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>47.07</td></tr></table>	47.07	(74)
0.77																			
1.77																			
87.02																			
0.63																			
0.7																			
47.07																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>87.02</td></tr></table>	87.02	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>31.38</td></tr></table>	31.38	(74)
0.77																			
1.18																			
87.02																			
0.63																			
0.7																			
31.38																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>81.59</td></tr></table>	81.59	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>44.13</td></tr></table>	44.13	(74)
0.77																			
1.77																			
81.59																			
0.63																			
0.7																			
44.13																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>81.59</td></tr></table>	81.59	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>29.42</td></tr></table>	29.42	(74)
0.77																			
1.18																			
81.59																			
0.63																			
0.7																			
29.42																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>66.39</td></tr></table>	66.39	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>35.91</td></tr></table>	35.91	(74)
0.77																			
1.77																			
66.39																			
0.63																			
0.7																			
35.91																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>66.39</td></tr></table>	66.39	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>23.94</td></tr></table>	23.94	(74)
0.77																			
1.18																			
66.39																			
0.63																			
0.7																			
23.94																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>46.43</td></tr></table>	46.43	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>25.11</td></tr></table>	25.11	(74)
0.77																			
1.77																			
46.43																			
0.63																			
0.7																			
25.11																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>46.43</td></tr></table>	46.43	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>16.74</td></tr></table>	16.74	(74)
0.77																			
1.18																			
46.43																			
0.63																			
0.7																			
16.74																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>26.53</td></tr></table>	26.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>14.35</td></tr></table>	14.35	(74)
0.77																			
1.77																			
26.53																			
0.63																			
0.7																			
14.35																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>26.53</td></tr></table>	26.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>9.57</td></tr></table>	9.57	(74)
0.77																			
1.18																			
26.53																			
0.63																			
0.7																			
9.57																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>15.18</td></tr></table>	15.18	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>8.21</td></tr></table>	8.21	(74)
0.77																			
1.77																			
15.18																			
0.63																			
0.7																			
8.21																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>15.18</td></tr></table>	15.18	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>5.47</td></tr></table>	5.47	(74)
0.77																			
1.18																			
15.18																			
0.63																			
0.7																			
5.47																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>9.87</td></tr></table>	9.87	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>5.34</td></tr></table>	5.34	(74)
0.77																			
1.77																			
9.87																			
0.63																			
0.7																			
5.34																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>9.87</td></tr></table>	9.87	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>3.56</td></tr></table>	3.56	(74)
0.77																			
1.18																			
9.87																			
0.63																			
0.7																			
3.56																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>21.59</td></tr></table>	21.59	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>22.89</td></tr></table>	22.89	(76)
0.77																			
3.47																			
21.59																			
0.63																			
0.7																			
22.89																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>21.59</td></tr></table>	21.59	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>18.21</td></tr></table>	18.21	(76)
0.77																			
1.38																			
21.59																			
0.63																			
0.7																			
18.21																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>21.59</td></tr></table>	21.59	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>9.1</td></tr></table>	9.1	(76)
0.77																			
1.38																			
21.59																			
0.63																			
0.7																			
9.1																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>37.89</td></tr></table>	37.89	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.18</td></tr></table>	40.18	(76)
0.77																			
3.47																			
37.89																			
0.63																			
0.7																			
40.18																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>37.89</td></tr></table>	37.89	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>31.96</td></tr></table>	31.96	(76)
0.77																			
1.38																			
37.89																			
0.63																			
0.7																			
31.96																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>37.89</td></tr></table>	37.89	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>15.98</td></tr></table>	15.98	(76)
0.77																			
1.38																			
37.89																			
0.63																			
0.7																			
15.98																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>62.51</td></tr></table>	62.51	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>66.29</td></tr></table>	66.29	(76)
0.77																			
3.47																			
62.51																			
0.63																			
0.7																			
66.29																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>62.51</td></tr></table>	62.51	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>52.72</td></tr></table>	52.72	(76)
0.77																			
1.38																			
62.51																			
0.63																			
0.7																			
52.72																			

EPC Costs WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.38	x	62.51	x	0.63	x	0.7	=	26.36	(76)
East	0.9x	0.77	x	3.47	x	94.41	x	0.63	x	0.7	=	100.12	(76)
East	0.9x	0.77	x	1.38	x	94.41	x	0.63	x	0.7	=	79.64	(76)
East	0.9x	0.77	x	1.38	x	94.41	x	0.63	x	0.7	=	39.82	(76)
East	0.9x	0.77	x	3.47	x	112.19	x	0.63	x	0.7	=	118.98	(76)
East	0.9x	0.77	x	1.38	x	112.19	x	0.63	x	0.7	=	94.64	(76)
East	0.9x	0.77	x	1.38	x	112.19	x	0.63	x	0.7	=	47.32	(76)
East	0.9x	0.77	x	3.47	x	123.59	x	0.63	x	0.7	=	131.06	(76)
East	0.9x	0.77	x	1.38	x	123.59	x	0.63	x	0.7	=	104.24	(76)
East	0.9x	0.77	x	1.38	x	123.59	x	0.63	x	0.7	=	52.12	(76)
East	0.9x	0.77	x	3.47	x	118.09	x	0.63	x	0.7	=	125.23	(76)
East	0.9x	0.77	x	1.38	x	118.09	x	0.63	x	0.7	=	99.6	(76)
East	0.9x	0.77	x	1.38	x	118.09	x	0.63	x	0.7	=	49.8	(76)
East	0.9x	0.77	x	3.47	x	103.98	x	0.63	x	0.7	=	110.26	(76)
East	0.9x	0.77	x	1.38	x	103.98	x	0.63	x	0.7	=	87.7	(76)
East	0.9x	0.77	x	1.38	x	103.98	x	0.63	x	0.7	=	43.85	(76)
East	0.9x	0.77	x	3.47	x	80.98	x	0.63	x	0.7	=	85.88	(76)
East	0.9x	0.77	x	1.38	x	80.98	x	0.63	x	0.7	=	68.31	(76)
East	0.9x	0.77	x	1.38	x	80.98	x	0.63	x	0.7	=	34.16	(76)
East	0.9x	0.77	x	3.47	x	49.76	x	0.63	x	0.7	=	52.77	(76)
East	0.9x	0.77	x	1.38	x	49.76	x	0.63	x	0.7	=	41.97	(76)
East	0.9x	0.77	x	1.38	x	49.76	x	0.63	x	0.7	=	20.99	(76)
East	0.9x	0.77	x	3.47	x	28.53	x	0.63	x	0.7	=	30.25	(76)
East	0.9x	0.77	x	1.38	x	28.53	x	0.63	x	0.7	=	24.06	(76)
East	0.9x	0.77	x	1.38	x	28.53	x	0.63	x	0.7	=	12.03	(76)
East	0.9x	0.77	x	3.47	x	18.19	x	0.63	x	0.7	=	19.29	(76)
East	0.9x	0.77	x	1.38	x	18.19	x	0.63	x	0.7	=	15.34	(76)
East	0.9x	0.77	x	1.38	x	18.19	x	0.63	x	0.7	=	7.67	(76)
South	0.9x	0.77	x	1.26	x	49.29	x	0.63	x	0.7	=	18.98	(78)
South	0.9x	0.77	x	1.26	x	72.26	x	0.63	x	0.7	=	27.83	(78)
South	0.9x	0.77	x	1.26	x	92.22	x	0.63	x	0.7	=	35.51	(78)
South	0.9x	0.77	x	1.26	x	108.63	x	0.63	x	0.7	=	41.83	(78)
South	0.9x	0.77	x	1.26	x	110.74	x	0.63	x	0.7	=	42.64	(78)
South	0.9x	0.77	x	1.26	x	115.24	x	0.63	x	0.7	=	44.38	(78)
South	0.9x	0.77	x	1.26	x	112.76	x	0.63	x	0.7	=	43.42	(78)
South	0.9x	0.77	x	1.26	x	111.35	x	0.63	x	0.7	=	42.88	(78)
South	0.9x	0.77	x	1.26	x	107.5	x	0.63	x	0.7	=	41.4	(78)
South	0.9x	0.77	x	1.26	x	86.21	x	0.63	x	0.7	=	33.2	(78)
South	0.9x	0.77	x	1.26	x	61.86	x	0.63	x	0.7	=	23.82	(78)
South	0.9x	0.77	x	1.26	x	43.67	x	0.63	x	0.7	=	16.82	(78)
West	0.9x	0.77	x	3.07	x	21.59	x	0.63	x	0.7	=	20.25	(80)

EPC Costs WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.38	x	21.59	x	0.63	x	0.7	=	9.1	(80)
West	0.9x	0.77	x	3.07	x	37.89	x	0.63	x	0.7	=	35.55	(80)
West	0.9x	0.77	x	1.38	x	37.89	x	0.63	x	0.7	=	15.98	(80)
West	0.9x	0.77	x	3.07	x	62.51	x	0.63	x	0.7	=	58.65	(80)
West	0.9x	0.77	x	1.38	x	62.51	x	0.63	x	0.7	=	26.36	(80)
West	0.9x	0.77	x	3.07	x	94.41	x	0.63	x	0.7	=	88.58	(80)
West	0.9x	0.77	x	1.38	x	94.41	x	0.63	x	0.7	=	39.82	(80)
West	0.9x	0.77	x	3.07	x	112.19	x	0.63	x	0.7	=	105.26	(80)
West	0.9x	0.77	x	1.38	x	112.19	x	0.63	x	0.7	=	47.32	(80)
West	0.9x	0.77	x	3.07	x	123.59	x	0.63	x	0.7	=	115.95	(80)
West	0.9x	0.77	x	1.38	x	123.59	x	0.63	x	0.7	=	52.12	(80)
West	0.9x	0.77	x	3.07	x	118.09	x	0.63	x	0.7	=	110.79	(80)
West	0.9x	0.77	x	1.38	x	118.09	x	0.63	x	0.7	=	49.8	(80)
West	0.9x	0.77	x	3.07	x	103.98	x	0.63	x	0.7	=	97.55	(80)
West	0.9x	0.77	x	1.38	x	103.98	x	0.63	x	0.7	=	43.85	(80)
West	0.9x	0.77	x	3.07	x	80.98	x	0.63	x	0.7	=	75.98	(80)
West	0.9x	0.77	x	1.38	x	80.98	x	0.63	x	0.7	=	34.16	(80)
West	0.9x	0.77	x	3.07	x	49.76	x	0.63	x	0.7	=	46.68	(80)
West	0.9x	0.77	x	1.38	x	49.76	x	0.63	x	0.7	=	20.99	(80)
West	0.9x	0.77	x	3.07	x	28.53	x	0.63	x	0.7	=	26.76	(80)
West	0.9x	0.77	x	1.38	x	28.53	x	0.63	x	0.7	=	12.03	(80)
West	0.9x	0.77	x	3.07	x	18.19	x	0.63	x	0.7	=	17.06	(80)
West	0.9x	0.77	x	1.38	x	18.19	x	0.63	x	0.7	=	7.67	(80)

Solar gains in watts, calculated for each month

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

(83)m=	108.98	185.55	297.02	441.97	524.34	578.34	552.2	485.96	381.74	240.51	142.64	92.74	(83)
--------	--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	-------	------

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

(84)m=	756.52	828.58	917.22	1026.63	1072.47	1093.76	1048.49	990.79	907	801.53	743.46	723.81	(84)
--------	--------	--------	--------	---------	---------	---------	---------	--------	-----	--------	--------	--------	------

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.89	0.72	0.46	0.27	0.29	0.63	0.91	0.98	0.99	(86)

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

(87)m=	19.91	20.03	20.34	20.67	20.91	20.99	21	21	20.96	20.69	20.24	19.88	(87)
--------	-------	-------	-------	-------	-------	-------	----	----	-------	-------	-------	-------	------

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

(88)m=	19.83	19.83	19.83	19.84	19.84	19.84	19.84	19.84	19.84	19.84	19.84	19.83	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	0.98	0.98	0.94	0.85	0.64	0.34	0.14	0.16	0.51	0.86	0.97	0.99	(89)
--------	------	------	------	------	------	------	------	------	------	------	------	------	------

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

(90)m=	18.43	18.61	19.04	19.5	19.77	19.84	19.84	19.84	19.82	19.53	18.93	18.39	(90)
--------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.28 (91)

EPC Costs WorkSheet: New dwelling design stage

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

(92)m=	18.84	19.01	19.4	19.82	20.08	20.16	20.16	20.16	20.14	19.85	19.3	18.8	(92)
--------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	------	------	------

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

(93)m=	18.84	19.01	19.4	19.82	20.08	20.16	20.16	20.16	20.14	19.85	19.3	18.8	(93)
--------	-------	-------	------	-------	-------	-------	-------	-------	-------	-------	------	------	------

8. Space heating requirement

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

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

Utilisation factor for gains, hm :

(94)m=	0.98	0.97	0.94	0.84	0.66	0.38	0.17	0.2	0.54	0.86	0.96	0.98	(94)
--------	------	------	------	------	------	------	------	-----	------	------	------	------	------

Useful gains, hmG_m , $W = (94)m \times (84)m$

(95)m=	741.68	804.33	858.63	867.08	706.55	411.57	182.49	194.57	490.85	691.61	714.66	711.89	(95)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

(96)m=	5.6	6	8	10.5	13.6	16.6	18.6	18.5	15.8	12.2	8.5	5.5	(96)
--------	-----	---	---	------	------	------	------	------	------	------	-----	-----	------

Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times ((93)m - (96)m)]$

(97)m=	1567.69	1532.08	1345.14	1093.21	761.25	414.62	182.54	194.66	507.3	897.43	1264.02	1566.51	(97)
--------	---------	---------	---------	---------	--------	--------	--------	--------	-------	--------	---------	---------	------

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

(98)m=	614.55	489.05	361.96	162.81	40.7	0	0	0	0	153.13	395.54	635.83	
Total per year ($kWh/year$) = $Sum(98)_{1...5,9...12} =$												2853.57	(98)

Space heating requirement in $kWh/m^2/year$

31.74 (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) = $(202) \times [1 - (203)] =$ 1 (204)

Efficiency of main space heating system 1 245.39 (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)

614.55	489.05	361.96	162.81	40.7	0	0	0	0	153.13	395.54	635.83
--------	--------	--------	--------	------	---	---	---	---	--------	--------	--------

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

250.44	199.29	147.5	66.35	16.58	0	0	0	0	62.4	161.19	259.11		
Total (kWh/year) =Sum(211) _{1,...,5,10,...,12} =												1162.87	(211)

Space heating fuel (secondary), $kWh/month$

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

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

Water heating

Output from water heater (calculated above)

84.47	70.2	79.91	87.24	140.72	142.69	137.8	150.21	149.62	96.4	76.65	81.23
-------	------	-------	-------	--------	--------	-------	--------	--------	------	-------	-------

Efficiency of water heater 172.8 (216)

(217)m= (217)

172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Fuel for water heating, $kWh/month$

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

(219)m=	48.88	40.63	46.24	50.48	81.43	82.58	79.74	86.93	86.58	55.79	44.36	47.01	
Total = $Sum(219a)_{1...12} =$												750.65	(219)

EPC Costs WorkSheet: New dwelling design stage

Annual totals

	kWh/year	kWh/year
Space heating fuel used, main system 1		1162.87
Water heating fuel used		750.65
Electricity for pumps, fans and electric keep-hot		
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0 (231)
Electricity for lighting		377.97 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2291.49 (338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	20.43	x 0.01 = 237.57 (240)
Space heating - main system 2	(213) x	0	x 0.01 = 0 (241)
Space heating - secondary	(215) x	20.43	x 0.01 = 0 (242)
Water heating cost (other fuel)	(219)	20.43	x 0.01 = 153.36 (247)
Pumps, fans and electric keep-hot	(231)	0	x 0.01 = 0 (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 = 77.22 (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) =		468.15 (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] =	0.94 (257)
SAP rating (Section 12)		86.87 (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	= 603.53 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating	(219) x	0.519	= 389.59 (264)
Space and water heating	(261) + (262) + (263) + (264) =		993.12 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= 0 (267)
Electricity for lighting	(232) x	0.519	= 196.17 (268)
Total CO2, kg/year		sum of (265)...(271) =	1189.28 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	13.23 (273)
El rating (section 14)			88 (274)

EPC Costs WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year	Primary factor		P. Energy kWh/year
Space heating (main system 1)	(211) x	3.07	=	3570 (261)
Space heating (secondary)	(215) x	3.07	=	0 (263)
Energy for water heating	(219) x	3.07	=	2304.5 (264)
Space and water heating	(261) + (262) + (263) + (264) =			5874.5 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	0 (267)
Electricity for lighting	(232) x	0	=	1160.38 (268)
'Total Primary Energy		sum of (265)...(271) =		7034.87 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =		78.25 (273)

TFEE WorkSheet: New dwelling design stage

User Details:

Assessor Name:	George Achilleos	Stroma Number:	STRO009373
Software Name:	Stroma FSAP 2012	Software Version:	Version: 1.0.5.56

Property Address: HOUSE 1 - ASHP

Address : Development, 69 Scales Road, LONDON, N17 9EY

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	51.46	(1a) x	2.66	(2a) =	137.15 (3a)
First floor	38.44	(1b) x	2.66	(2b) =	102.45 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	89.9	(4)			
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	239.59 (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) =	0.13 (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)			0.38 (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			1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.92 (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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TFEE 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

	0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Doors			2.11	x 1.2	= 2.532		(26)
Windows Type 1			3.47	x1/[1/(1.4)+ 0.04] =	4.6		(27)
Windows Type 2			1.77	x1/[1/(1.4)+ 0.04] =	2.35		(27)
Windows Type 3			1.18	x1/[1/(1.4)+ 0.04] =	1.56		(27)
Windows Type 4			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 5			3.07	x1/[1/(1.4)+ 0.04] =	4.07		(27)
Windows Type 6			1.26	x1/[1/(1.4)+ 0.04] =	1.67		(27)
Windows Type 7			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 8			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Floor			51.462	x 0.13	= 6.69006		(28)
Walls	168.92	18.38	150.54	x 0.18	= 27.1		(29)
Roof Type1	38.44	0	38.44	x 0.13	= 5		(30)
Roof Type2	14.6	0	14.6	x 0.13	= 1.9		(30)
Total area of elements, m²			273.43				(31)
Party wall			39.52	x 0	= 0		(32)
Internal wall **			49.35				(32c)
Internal floor			51.46				(32d)

TFEE WorkSheet: New dwelling design stage

Internal ceiling 51.46 (32e)

* 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 = $S(A \times U)$ (26)...(30) + (32) = 64.79 (33)

Heat capacity $C_m = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) = 42108.34 (34)

Thermal mass parameter (TMP = $C_m \div TFA$) in kJ/m²K Indicative Value: Medium 250 (35)

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

Thermal bridges : $S(L \times Y)$ calculated using Appendix K 0 (36)

if details of thermal bridging are not known (36) = $0.05 \times (31)$

Total fabric heat loss (33) + (36) = 64.79 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	47.27	46.97	46.68	45.29	45.04	43.83	43.83	43.61	44.29	45.04	45.56	46.11	(38)

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

(39)m=	112.06	111.76	111.46	110.08	109.82	108.62	108.62	108.39	109.08	109.82	110.35	110.89	
	Average = Sum(39) _{1...12} /12=											110.08	(39)

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

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

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.62 (42)

if $TFA > 13.9$, $N = 1 + 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9)^2)] + 0.0013 \times (TFA - 13.9)$

if $TFA \leq 13.9$, $N = 1$

Annual average hot water usage in litres per day $V_{d,average} = (25 \times N) + 36$ 96.53 (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	
(44)m=	106.18	102.32	98.46	94.6	90.74	86.88	86.88	90.74	94.6	98.46	102.32	106.18	
	Total = Sum(44) _{1...12} =											1158.35	(44)

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=	157.47	137.72	142.11	123.9	118.88	102.59	95.06	109.09	110.39	128.65	140.43	152.5	
	Total = Sum(45) _{1...12} =											1518.78	(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)
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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)

TFEE WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)																								
b) If manufacturer's declared cylinder loss factor is not known:																											
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)																								
If community heating see section 4.3																											
Volume factor from Table 2a		0	(52)																								
Temperature factor from Table 2b		0	(53)																								
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)																								
Enter (50) or (54) in (55)		0	(55)																								
Water storage loss calculated for each month	((56)m = (55) 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=		133.85 117.06 120.8 105.31 101.05 87.2 80.8 92.72 93.83 109.35 119.36 129.62	(62)																								
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)																											
(add additional lines if FGHRs and/or WWHRs applies, see Appendix G)																											
(63)m=		0 0 0 0 0 0 0 0 0 0 0 0	(63)																								
FGHRs		0 0 0 0 0 0 0 0 0 0 0 0	(63) (G2)																								
Output from water heater																											
(64)m=		133.85 117.06 120.8 105.31 101.05 87.2 80.8 92.72 93.83 109.35 119.36 129.62																									
Output from water heater (annual) ^{1...12}			1290.96																								
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]																											
(65)m=		33.46 29.27 30.2 26.33 25.26 21.8 20.2 23.18 23.46 27.34 29.84 32.41	(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=		<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th> </tr> <tr> <td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td><td>131.22</td> </tr> </table>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	(66)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec																
131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22																
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5																											
(67)m=		21.4 19.01 15.46 11.7 8.75 7.39 7.98 10.37 13.92 17.68 20.63 22	(67)																								
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5																											
(68)m=		238.9 241.38 235.13 221.83 205.04 189.27 178.72 176.25 182.49 195.79 212.58 228.36	(68)																								
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5																											
(69)m=		36.12 36.12 36.12 36.12 36.12 36.12 36.12 36.12 36.12 36.12 36.12 36.12	(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=		-104.98 -104.98 -104.98 -104.98 -104.98 -104.98 -104.98 -104.98 -104.98 -104.98 -104.98 -104.98	(71)																								

TFEE WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=

44.97	43.55	40.59	36.57	33.96	30.28	27.15	31.16	32.58	36.74	41.45	43.56
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 (72)

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

(73)m=

367.64	366.3	353.55	332.47	310.11	289.3	276.22	280.14	291.36	312.58	337.03	356.28
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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.

Orientation:	Access Factor	Area			Flux			g_			FF			Gains		
	Table 6d		m²		Table 6a		Table 6b		Table 6c				(W)			
North	0.9x	0.77	x	1.77	x	10.63	x	0.63	x	0.7	=	5.75	(74)			
North	0.9x	0.77	x	1.18	x	10.63	x	0.63	x	0.7	=	3.83	(74)			
North	0.9x	0.77	x	1.77	x	20.32	x	0.63	x	0.7	=	10.99	(74)			
North	0.9x	0.77	x	1.18	x	20.32	x	0.63	x	0.7	=	7.33	(74)			
North	0.9x	0.77	x	1.77	x	34.53	x	0.63	x	0.7	=	18.68	(74)			
North	0.9x	0.77	x	1.18	x	34.53	x	0.63	x	0.7	=	12.45	(74)			
North	0.9x	0.77	x	1.77	x	55.46	x	0.63	x	0.7	=	30	(74)			
North	0.9x	0.77	x	1.18	x	55.46	x	0.63	x	0.7	=	20	(74)			
North	0.9x	0.77	x	1.77	x	74.72	x	0.63	x	0.7	=	40.42	(74)			
North	0.9x	0.77	x	1.18	x	74.72	x	0.63	x	0.7	=	26.94	(74)			
North	0.9x	0.77	x	1.77	x	79.99	x	0.63	x	0.7	=	43.27	(74)			
North	0.9x	0.77	x	1.18	x	79.99	x	0.63	x	0.7	=	28.84	(74)			
North	0.9x	0.77	x	1.77	x	74.68	x	0.63	x	0.7	=	40.4	(74)			
North	0.9x	0.77	x	1.18	x	74.68	x	0.63	x	0.7	=	26.93	(74)			
North	0.9x	0.77	x	1.77	x	59.25	x	0.63	x	0.7	=	32.05	(74)			
North	0.9x	0.77	x	1.18	x	59.25	x	0.63	x	0.7	=	21.37	(74)			
North	0.9x	0.77	x	1.77	x	41.52	x	0.63	x	0.7	=	22.46	(74)			
North	0.9x	0.77	x	1.18	x	41.52	x	0.63	x	0.7	=	14.97	(74)			
North	0.9x	0.77	x	1.77	x	24.19	x	0.63	x	0.7	=	13.08	(74)			
North	0.9x	0.77	x	1.18	x	24.19	x	0.63	x	0.7	=	8.72	(74)			
North	0.9x	0.77	x	1.77	x	13.12	x	0.63	x	0.7	=	7.1	(74)			
North	0.9x	0.77	x	1.18	x	13.12	x	0.63	x	0.7	=	4.73	(74)			
North	0.9x	0.77	x	1.77	x	8.86	x	0.63	x	0.7	=	4.8	(74)			
North	0.9x	0.77	x	1.18	x	8.86	x	0.63	x	0.7	=	3.2	(74)			
East	0.9x	0.77	x	3.47	x	19.64	x	0.63	x	0.7	=	20.83	(76)			
East	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	16.57	(76)			
East	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	8.28	(76)			
East	0.9x	0.77	x	3.47	x	38.42	x	0.63	x	0.7	=	40.74	(76)			
East	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	32.41	(76)			
East	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	16.2	(76)			
East	0.9x	0.77	x	3.47	x	63.27	x	0.63	x	0.7	=	67.1	(76)			
East	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	53.37	(76)			

TFEE WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(76)
East	0.9x	0.77	x	3.47	x	92.28	x	0.63	x	0.7	=	97.86	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	77.84	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(76)
East	0.9x	0.77	x	3.47	x	113.09	x	0.63	x	0.7	=	119.93	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	95.39	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(76)
East	0.9x	0.77	x	3.47	x	115.77	x	0.63	x	0.7	=	122.77	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	97.65	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(76)
East	0.9x	0.77	x	3.47	x	110.22	x	0.63	x	0.7	=	116.88	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	92.97	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(76)
East	0.9x	0.77	x	3.47	x	94.68	x	0.63	x	0.7	=	100.4	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	79.86	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(76)
East	0.9x	0.77	x	3.47	x	73.59	x	0.63	x	0.7	=	78.04	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	62.07	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(76)
East	0.9x	0.77	x	3.47	x	45.59	x	0.63	x	0.7	=	48.35	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	38.45	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	3.47	x	24.49	x	0.63	x	0.7	=	25.97	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	20.66	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(76)
East	0.9x	0.77	x	3.47	x	16.15	x	0.63	x	0.7	=	17.13	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	13.62	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(76)
South	0.9x	0.77	x	1.26	x	46.75	x	0.63	x	0.7	=	18	(78)
South	0.9x	0.77	x	1.26	x	76.57	x	0.63	x	0.7	=	29.48	(78)
South	0.9x	0.77	x	1.26	x	97.53	x	0.63	x	0.7	=	37.56	(78)
South	0.9x	0.77	x	1.26	x	110.23	x	0.63	x	0.7	=	42.45	(78)
South	0.9x	0.77	x	1.26	x	114.87	x	0.63	x	0.7	=	44.23	(78)
South	0.9x	0.77	x	1.26	x	110.55	x	0.63	x	0.7	=	42.57	(78)
South	0.9x	0.77	x	1.26	x	108.01	x	0.63	x	0.7	=	41.59	(78)
South	0.9x	0.77	x	1.26	x	104.89	x	0.63	x	0.7	=	40.39	(78)
South	0.9x	0.77	x	1.26	x	101.89	x	0.63	x	0.7	=	39.23	(78)
South	0.9x	0.77	x	1.26	x	82.59	x	0.63	x	0.7	=	31.8	(78)
South	0.9x	0.77	x	1.26	x	55.42	x	0.63	x	0.7	=	21.34	(78)
South	0.9x	0.77	x	1.26	x	40.4	x	0.63	x	0.7	=	15.56	(78)
West	0.9x	0.77	x	3.07	x	19.64	x	0.63	x	0.7	=	18.43	(80)

TFEE WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	8.28	(80)
West	0.9x	0.77	x	3.07	x	38.42	x	0.63	x	0.7	=	36.05	(80)
West	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	16.2	(80)
West	0.9x	0.77	x	3.07	x	63.27	x	0.63	x	0.7	=	59.36	(80)
West	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(80)
West	0.9x	0.77	x	3.07	x	92.28	x	0.63	x	0.7	=	86.58	(80)
West	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(80)
West	0.9x	0.77	x	3.07	x	113.09	x	0.63	x	0.7	=	106.11	(80)
West	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(80)
West	0.9x	0.77	x	3.07	x	115.77	x	0.63	x	0.7	=	108.62	(80)
West	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(80)
West	0.9x	0.77	x	3.07	x	110.22	x	0.63	x	0.7	=	103.41	(80)
West	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(80)
West	0.9x	0.77	x	3.07	x	94.68	x	0.63	x	0.7	=	88.83	(80)
West	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(80)
West	0.9x	0.77	x	3.07	x	73.59	x	0.63	x	0.7	=	69.04	(80)
West	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(80)
West	0.9x	0.77	x	3.07	x	45.59	x	0.63	x	0.7	=	42.77	(80)
West	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(80)
West	0.9x	0.77	x	3.07	x	24.49	x	0.63	x	0.7	=	22.98	(80)
West	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(80)
West	0.9x	0.77	x	3.07	x	16.15	x	0.63	x	0.7	=	15.15	(80)
West	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(80)

Solar gains in watts, calculated for each month

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

(83)m=

99.98	189.41	301.89	432.57	528.42	541.37	515.15	442.75	347.89	221.64	123.43	83.08
-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------

 (83)

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

(84)m=

467.62	555.71	655.44	765.04	838.53	830.67	791.37	722.89	639.25	534.22	460.45	439.35
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (84)

7. Mean internal temperature (heating season)

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

21

 (85)

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

(86)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	0.99	0.97	0.9	0.75	0.58	0.65	0.89	0.99	1	1

 (86)

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

(87)m=

19.56	19.72	20.01	20.39	20.72	20.92	20.98	20.97	20.81	20.37	19.89	19.53
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (87)

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

(88)m=

19.88	19.89	19.89	19.9	19.9	19.91	19.91	19.92	19.91	19.9	19.9	19.89
-------	-------	-------	------	------	-------	-------	-------	-------	------	------	-------

 (88)

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

(89)m=

1	1	0.99	0.96	0.86	0.65	0.45	0.52	0.82	0.98	1	1
---	---	------	------	------	------	------	------	------	------	---	---

 (89)

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

(90)m=

18.57	18.73	19.02	19.41	19.71	19.88	19.91	19.91	19.8	19.39	18.92	18.55
-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------

 (90)

fLA = Living area ÷ (4) =

0.28

 (91)

TFEE WorkSheet: New dwelling design stage

Mean internal temperature (for the whole dwelling) = $f_{LA} \times T_1 + (1 - f_{LA}) \times T_2$

(92)m=	18.84	19.01	19.29	19.68	19.99	20.17	20.21	20.2	20.08	19.66	19.19	18.83	(92)
--------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	------

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

(93)m=	18.84	19.01	19.29	19.68	19.99	20.17	20.21	20.2	20.08	19.66	19.19	18.83	(93)
--------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	------

8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ 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, h_m :

(94)m=	1	1	0.99	0.95	0.86	0.68	0.49	0.55	0.84	0.98	1	1	(94)
--------	---	---	------	------	------	------	------	------	------	------	---	---	------

Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=	466.69	553.1	646.41	728.85	720.84	562.71	385.06	400.01	534.61	521.29	458.56	438.71	(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, L_m , $W = [(39)m \times ((93)m - (96)m)]$

(97)m=	1629.85	1576.74	1426.14	1186.65	910.88	604.82	391.79	412.15	652.28	994.95	1333.83	1622	(97)
--------	---------	---------	---------	---------	--------	--------	--------	--------	--------	--------	---------	------	------

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

(98)m=	865.39	687.89	580.12	329.62	141.39	0	0	0	0	352.41	630.19	880.37	
--------	--------	--------	--------	--------	--------	---	---	---	---	--------	--------	--------	--

Total per year ($kWh/year$) = $Sum(98)_{1...5,9...12} =$ 4467.37 (98)

Space heating requirement in $kWh/m^2/year$

49.69 (99)

8c. Space cooling requirement

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

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

Heat loss rate L_m (calculated using $25^\circ C$ internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	1020.99	803.76	823.79	0	0	0	0	(100)
---------	---	---	---	---	---	---------	--------	--------	---	---	---	---	-------

Utilisation factor for loss h_m

(101)m=	0	0	0	0	0	0.85	0.91	0.88	0	0	0	0	(101)
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Useful loss, $h_m L_m$ (Watts) = $(100)m \times (101)m$

(102)m=	0	0	0	0	0	865.09	732.38	724.74	0	0	0	0	(102)
---------	---	---	---	---	---	--------	--------	--------	---	---	---	---	-------

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

(103)m=	0	0	0	0	0	1069.86	1021.84	943.51	0	0	0	0	(103)
---------	---	---	---	---	---	---------	---------	--------	---	---	---	---	-------

Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$

set (104)m to zero if $(104)m < 3 \times (98)m$

(104)m=	0	0	0	0	0	147.43	215.35	162.76	0	0	0	0	
---------	---	---	---	---	---	--------	--------	--------	---	---	---	---	--

Total = $Sum(104) =$ 525.55 (104)

Cooled fraction

$f_C = \text{cooled area} \div (4) =$ 1 (105)

Intermittency factor (Table 10b)

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

Total = $Sum(104) =$ 0 (106)

Space cooling requirement for month = $(104)m \times (105) \times (106)m$

(107)m=	0	0	0	0	0	36.86	53.84	40.69	0	0	0	0	
---------	---	---	---	---	---	-------	-------	-------	---	---	---	---	--

Total = $Sum(107) =$ 131.39 (107)

Space cooling requirement in $kWh/m^2/year$

(107) $\div$ (4) = 1.46 (108)

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

Fabric Energy Efficiency (99) + (108) = 51.15 (109)

TFEE WorkSheet: New dwelling design stage

Target Fabric Energy Efficiency (TFEE)

58.83

(109)

DFEE WorkSheet: New dwelling design stage

User Details:

Assessor Name: George Achilleos **Stroma Number:** STRO009373
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.56

Property Address: HOUSE 1 - ASHP

Address : Development, 69 Scales Road, LONDON, N17 9EY

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	51.46 (1a)	x	2.66 (2a)	=	137.15 (3a)
First floor	38.44 (1b)	x	2.66 (2b)	=	102.45 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	89.9 (4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	239.59 (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) =	0.13 (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)			0.38 (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			1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.92 (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

	0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41
--	------	------	------	------	------	------	------	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Doors			2.11	x 1.6	= 3.376		(26)
Windows Type 1			3.47	x1/[1/(1.4)+ 0.04] =	4.6		(27)
Windows Type 2			1.77	x1/[1/(1.4)+ 0.04] =	2.35		(27)
Windows Type 3			1.18	x1/[1/(1.4)+ 0.04] =	1.56		(27)
Windows Type 4			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 5			3.07	x1/[1/(1.4)+ 0.04] =	4.07		(27)
Windows Type 6			1.26	x1/[1/(1.4)+ 0.04] =	1.67		(27)
Windows Type 7			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 8			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Floor			51.462	x 0.1	= 5.1462		(28)
Walls	168.92	18.38	150.54	x 0.16	= 24.09		(29)
Roof Type1	38.44	0	38.44	x 0.1	= 3.84		(30)
Roof Type2	14.6	0	14.6	x 0.1	= 1.46		(30)
Total area of elements, m²			273.43				(31)
Party wall			39.52	x 0	= 0		(32)
Internal wall **			49.35				(32c)
Internal floor			51.46				(32d)

DFEE WorkSheet: New dwelling design stage

Internal ceiling

51.46

(32e)

* 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) =

59.48

(33)

Heat capacity Cm = S(A x k)

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

42108.34

(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

Indicative Value: Medium

250

(35)

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

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

15

(36)

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

Total fabric heat loss

(33) + (36) =

74.48

(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
47.27	46.97	46.68	45.29	45.04	43.83	43.83	43.61	44.29	45.04	45.56	46.11

(38)

Heat transfer coefficient, W/K

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

(39)m=

121.76	121.46	121.16	119.78	119.52	118.31	118.31	118.09	118.78	119.52	120.04	120.59
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

119.78

(39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.35	1.35	1.35	1.33	1.33	1.32	1.32	1.31	1.32	1.33	1.34	1.34
------	------	------	------	------	------	------	------	------	------	------	------

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

1.33

(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

2.62

(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

96.53

(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=

106.18	102.32	98.46	94.6	90.74	86.88	86.88	90.74	94.6	98.46	102.32	106.18
--------	--------	-------	------	-------	-------	-------	-------	------	-------	--------	--------

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

1158.35

(44)

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

(45)m=

157.47	137.72	142.11	123.9	118.88	102.59	95.06	109.09	110.39	128.65	140.43	152.5
--------	--------	--------	-------	--------	--------	-------	--------	--------	--------	--------	-------

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

1518.78

(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

210

(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)

DFEE WorkSheet: New dwelling design stage

Energy lost from water storage, kWh/year	(48) x (49) =	0	(50)												
b) If manufacturer's declared cylinder loss factor is not known:															
Hot water storage loss factor from Table 2 (kWh/litre/day)		0	(51)												
If community heating see section 4.3															
Volume factor from Table 2a		0	(52)												
Temperature factor from Table 2b		0	(53)												
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)												
Enter (50) or (54) in (55)		0	(55)												
Water storage loss calculated for each month	((56)m = (55) x (41)m														
(56)m=		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>	0	0	0	0	0	0	0	0	0	0	0	0	(56)
0	0	0	0	0	0	0	0	0	0	0	0				
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=		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>	0	0	0	0	0	0	0	0	0	0	0	0	(57)
0	0	0	0	0	0	0	0	0	0	0	0				
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=		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>	0	0	0	0	0	0	0	0	0	0	0	0	(59)
0	0	0	0	0	0	0	0	0	0	0	0				
Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m															
(61)m=		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>	0	0	0	0	0	0	0	0	0	0	0	0	(61)
0	0	0	0	0	0	0	0	0	0	0	0				
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=		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>133.85</td><td>117.06</td><td>120.8</td><td>105.31</td><td>101.05</td><td>87.2</td><td>80.8</td><td>92.72</td><td>93.83</td><td>109.35</td><td>119.36</td><td>129.62</td></tr> </table>	133.85	117.06	120.8	105.31	101.05	87.2	80.8	92.72	93.83	109.35	119.36	129.62	(62)
133.85	117.06	120.8	105.31	101.05	87.2	80.8	92.72	93.83	109.35	119.36	129.62				
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=		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>	0	0	0	0	0	0	0	0	0	0	0	0	(63)
0	0	0	0	0	0	0	0	0	0	0	0				
FGHRs		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table>	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)
0	0	0	0	0	0	0	0	0	0	0	0				
Output from water heater															
(64)m=		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>133.85</td><td>117.06</td><td>120.8</td><td>105.31</td><td>101.05</td><td>87.2</td><td>80.8</td><td>92.72</td><td>93.83</td><td>109.35</td><td>119.36</td><td>129.62</td></tr> </table>	133.85	117.06	120.8	105.31	101.05	87.2	80.8	92.72	93.83	109.35	119.36	129.62	
133.85	117.06	120.8	105.31	101.05	87.2	80.8	92.72	93.83	109.35	119.36	129.62				
Output from water heater (annual) _{1...12}											1290.96	(64)			
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]															
(65)m=		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td>33.46</td><td>29.27</td><td>30.2</td><td>26.33</td><td>25.26</td><td>21.8</td><td>20.2</td><td>23.18</td><td>23.46</td><td>27.34</td><td>29.84</td><td>32.41</td></tr> </table>	33.46	29.27	30.2	26.33	25.26	21.8	20.2	23.18	23.46	27.34	29.84	32.41	(65)
33.46	29.27	30.2	26.33	25.26	21.8	20.2	23.18	23.46	27.34	29.84	32.41				
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=	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	21.4	19.01	15.46	11.7	8.75	7.39	7.98	10.37	13.92	17.68	20.63	22	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	238.9	241.38	235.13	221.83	205.04	189.27	178.72	176.25	182.49	195.79	212.58	228.36	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	(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=	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	(71)

DFEE WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=

44.97	43.55	40.59	36.57	33.96	30.28	27.15	31.16	32.58	36.74	41.45	43.56
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 (72)

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

(73)m=

367.64	366.3	353.55	332.47	310.11	289.3	276.22	280.14	291.36	312.58	337.03	356.28
--------	-------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------

 (73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m ²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.77	x	10.63	x	0.63	x	0.7	=	5.75 (74)
North	0.9x	0.77	x	1.18	x	10.63	x	0.63	x	0.7	=	3.83 (74)
North	0.9x	0.77	x	1.77	x	20.32	x	0.63	x	0.7	=	10.99 (74)
North	0.9x	0.77	x	1.18	x	20.32	x	0.63	x	0.7	=	7.33 (74)
North	0.9x	0.77	x	1.77	x	34.53	x	0.63	x	0.7	=	18.68 (74)
North	0.9x	0.77	x	1.18	x	34.53	x	0.63	x	0.7	=	12.45 (74)
North	0.9x	0.77	x	1.77	x	55.46	x	0.63	x	0.7	=	30 (74)
North	0.9x	0.77	x	1.18	x	55.46	x	0.63	x	0.7	=	20 (74)
North	0.9x	0.77	x	1.77	x	74.72	x	0.63	x	0.7	=	40.42 (74)
North	0.9x	0.77	x	1.18	x	74.72	x	0.63	x	0.7	=	26.94 (74)
North	0.9x	0.77	x	1.77	x	79.99	x	0.63	x	0.7	=	43.27 (74)
North	0.9x	0.77	x	1.18	x	79.99	x	0.63	x	0.7	=	28.84 (74)
North	0.9x	0.77	x	1.77	x	74.68	x	0.63	x	0.7	=	40.4 (74)
North	0.9x	0.77	x	1.18	x	74.68	x	0.63	x	0.7	=	26.93 (74)
North	0.9x	0.77	x	1.77	x	59.25	x	0.63	x	0.7	=	32.05 (74)
North	0.9x	0.77	x	1.18	x	59.25	x	0.63	x	0.7	=	21.37 (74)
North	0.9x	0.77	x	1.77	x	41.52	x	0.63	x	0.7	=	22.46 (74)
North	0.9x	0.77	x	1.18	x	41.52	x	0.63	x	0.7	=	14.97 (74)
North	0.9x	0.77	x	1.77	x	24.19	x	0.63	x	0.7	=	13.08 (74)
North	0.9x	0.77	x	1.18	x	24.19	x	0.63	x	0.7	=	8.72 (74)
North	0.9x	0.77	x	1.77	x	13.12	x	0.63	x	0.7	=	7.1 (74)
North	0.9x	0.77	x	1.18	x	13.12	x	0.63	x	0.7	=	4.73 (74)
North	0.9x	0.77	x	1.77	x	8.86	x	0.63	x	0.7	=	4.8 (74)
North	0.9x	0.77	x	1.18	x	8.86	x	0.63	x	0.7	=	3.2 (74)
East	0.9x	0.77	x	3.47	x	19.64	x	0.63	x	0.7	=	20.83 (76)
East	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	16.57 (76)
East	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	8.28 (76)
East	0.9x	0.77	x	3.47	x	38.42	x	0.63	x	0.7	=	40.74 (76)
East	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	32.41 (76)
East	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	16.2 (76)
East	0.9x	0.77	x	3.47	x	63.27	x	0.63	x	0.7	=	67.1 (76)
East	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	53.37 (76)

DFEE WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(76)
East	0.9x	0.77	x	3.47	x	92.28	x	0.63	x	0.7	=	97.86	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	77.84	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(76)
East	0.9x	0.77	x	3.47	x	113.09	x	0.63	x	0.7	=	119.93	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	95.39	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(76)
East	0.9x	0.77	x	3.47	x	115.77	x	0.63	x	0.7	=	122.77	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	97.65	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(76)
East	0.9x	0.77	x	3.47	x	110.22	x	0.63	x	0.7	=	116.88	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	92.97	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(76)
East	0.9x	0.77	x	3.47	x	94.68	x	0.63	x	0.7	=	100.4	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	79.86	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(76)
East	0.9x	0.77	x	3.47	x	73.59	x	0.63	x	0.7	=	78.04	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	62.07	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(76)
East	0.9x	0.77	x	3.47	x	45.59	x	0.63	x	0.7	=	48.35	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	38.45	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	3.47	x	24.49	x	0.63	x	0.7	=	25.97	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	20.66	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(76)
East	0.9x	0.77	x	3.47	x	16.15	x	0.63	x	0.7	=	17.13	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	13.62	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(76)
South	0.9x	0.77	x	1.26	x	46.75	x	0.63	x	0.7	=	18	(78)
South	0.9x	0.77	x	1.26	x	76.57	x	0.63	x	0.7	=	29.48	(78)
South	0.9x	0.77	x	1.26	x	97.53	x	0.63	x	0.7	=	37.56	(78)
South	0.9x	0.77	x	1.26	x	110.23	x	0.63	x	0.7	=	42.45	(78)
South	0.9x	0.77	x	1.26	x	114.87	x	0.63	x	0.7	=	44.23	(78)
South	0.9x	0.77	x	1.26	x	110.55	x	0.63	x	0.7	=	42.57	(78)
South	0.9x	0.77	x	1.26	x	108.01	x	0.63	x	0.7	=	41.59	(78)
South	0.9x	0.77	x	1.26	x	104.89	x	0.63	x	0.7	=	40.39	(78)
South	0.9x	0.77	x	1.26	x	101.89	x	0.63	x	0.7	=	39.23	(78)
South	0.9x	0.77	x	1.26	x	82.59	x	0.63	x	0.7	=	31.8	(78)
South	0.9x	0.77	x	1.26	x	55.42	x	0.63	x	0.7	=	21.34	(78)
South	0.9x	0.77	x	1.26	x	40.4	x	0.63	x	0.7	=	15.56	(78)
West	0.9x	0.77	x	3.07	x	19.64	x	0.63	x	0.7	=	18.43	(80)

DFEE WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	8.28	(80)
West	0.9x	0.77	x	3.07	x	38.42	x	0.63	x	0.7	=	36.05	(80)
West	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	16.2	(80)
West	0.9x	0.77	x	3.07	x	63.27	x	0.63	x	0.7	=	59.36	(80)
West	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(80)
West	0.9x	0.77	x	3.07	x	92.28	x	0.63	x	0.7	=	86.58	(80)
West	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(80)
West	0.9x	0.77	x	3.07	x	113.09	x	0.63	x	0.7	=	106.11	(80)
West	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(80)
West	0.9x	0.77	x	3.07	x	115.77	x	0.63	x	0.7	=	108.62	(80)
West	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(80)
West	0.9x	0.77	x	3.07	x	110.22	x	0.63	x	0.7	=	103.41	(80)
West	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(80)
West	0.9x	0.77	x	3.07	x	94.68	x	0.63	x	0.7	=	88.83	(80)
West	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(80)
West	0.9x	0.77	x	3.07	x	73.59	x	0.63	x	0.7	=	69.04	(80)
West	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(80)
West	0.9x	0.77	x	3.07	x	45.59	x	0.63	x	0.7	=	42.77	(80)
West	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(80)
West	0.9x	0.77	x	3.07	x	24.49	x	0.63	x	0.7	=	22.98	(80)
West	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(80)
West	0.9x	0.77	x	3.07	x	16.15	x	0.63	x	0.7	=	15.15	(80)
West	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(80)

Solar gains in watts, calculated for each month

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

(83)m=	99.98	189.41	301.89	432.57	528.42	541.37	515.15	442.75	347.89	221.64	123.43	83.08	(83)
--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	------

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

(84)m=	467.62	555.71	655.44	765.04	838.53	830.67	791.37	722.89	639.25	534.22	460.45	439.35	(84)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	1	0.99	0.97	0.91	0.78	0.62	0.69	0.9	0.99	1	1	(86)

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

(87)m=	19.42	19.59	19.88	20.29	20.65	20.89	20.97	20.95	20.75	20.28	19.78	19.4	(87)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------	------

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

(88)m=	19.8	19.8	19.8	19.82	19.82	19.83	19.83	19.83	19.82	19.82	19.81	19.81	(88)
--------	------	------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	1	1	0.99	0.96	0.87	0.68	0.47	0.54	0.84	0.98	1	1	(89)
--------	---	---	------	------	------	------	------	------	------	------	---	---	------

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

(90)m=	18.37	18.54	18.83	19.24	19.58	19.78	19.82	19.82	19.68	19.23	18.73	18.35	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) = 0.28 (91)

DFEE WorkSheet: New dwelling design stage

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

(92)m=	18.66	18.83	19.12	19.53	19.87	20.08	20.14	20.13	19.98	19.52	19.02	18.64	(92)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(93)m=	18.66	18.83	19.12	19.53	19.87	20.08	20.14	20.13	19.98	19.52	19.02	18.64	(93)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

8. Space heating requirement

Set T_i to the mean internal temperature obtained at step 11 of Table 9b, so that $T_{i,m}=(76)m$ 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, h_m :

(94)m=	1	1	0.99	0.96	0.87	0.71	0.51	0.58	0.85	0.98	1	1	(94)
--------	---	---	------	------	------	------	------	------	------	------	---	---	------

Useful gains, $h_m G_m$, $W = (94)m \times (84)m$

(95)m=	466.61	553.01	646.62	731.72	732.94	586.39	407.37	421.14	544.99	521.91	458.48	438.64	(95)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

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

Heat loss rate for mean internal temperature, L_m , $W = [(39)m \times ((93)m - (96)m)]$

(97)m=	1748.59	1691.62	1529.6	1273.04	976.97	648.94	418.84	440.75	698.37	1066.43	1431.49	1741.62	(97)
--------	---------	---------	--------	---------	--------	--------	--------	--------	--------	---------	---------	---------	------

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

(98)m=	953.79	765.15	656.94	389.75	181.55	0	0	0	0	405.12	700.57	969.42	
Total per year ($kWh/year$) = $Sum(98)_{1...5,9...12} =$												5022.28	(98)

Space heating requirement in $kWh/m^2/year$

55.86	(99)
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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 L_m (calculated using $25^\circ C$ internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	1112.15	875.53	897.49	0	0	0	0	(100)
---------	---	---	---	---	---	---------	--------	--------	---	---	---	---	-------

Utilisation factor for loss h_m

(101)m=	0	0	0	0	0	0.8	0.88	0.84	0	0	0	0	(101)
---------	---	---	---	---	---	-----	------	------	---	---	---	---	-------

Useful loss, $h_m L_m$ (Watts) = $(100)m \times (101)m$

(102)m=	0	0	0	0	0	892.56	766.82	752.86	0	0	0	0	(102)
---------	---	---	---	---	---	--------	--------	--------	---	---	---	---	-------

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

(103)m=	0	0	0	0	0	1069.86	1021.84	943.51	0	0	0	0	(103)
---------	---	---	---	---	---	---------	---------	--------	---	---	---	---	-------

Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$

set (104)m to zero if $(104)m < 3 \times (98)m$

(104)m=	0	0	0	0	0	127.66	189.73	141.84	0	0	0	0	
Total = $Sum(104) =$												459.23	(104)
Cooled fraction $f_C = \text{cooled area} \div (4) =$												1	(105)

Intermittency factor (Table 10b)

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

Space cooling requirement for month = $(104)m \times (105) \times (106)m$

(107)m=	0	0	0	0	0	31.91	47.43	35.46	0	0	0	0	
Total = $Sum(107) =$												114.81	(107)

Space cooling requirement in $kWh/m^2/year$

$(107) \div (4) =$	1.28	(108)
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8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency	$(99) + (108) =$	57.14	(109)
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DFEE WorkSheet: New dwelling design stage

DER WorkSheet: New dwelling design stage

User Details:

Assessor Name: George Achilleos
Software Name: Stroma FSAP 2012

Stroma Number: STRO009373
Software Version: Version: 1.0.5.56

Property Address: HOUSE 1 - ASHP

Address : Development, 69 Scales Road, LONDON, N17 9EY

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	51.46	(1a) x	2.66	(2a) =	137.15
First floor	38.44	(1b) x	2.66	(2b) =	102.45
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	89.9	(4)			
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	239.59

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							2	x 10 =	20
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) =	20	÷ (5) =	0.08
<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)			0.33
<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			1
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.92
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =		0.31

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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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

	0.39	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36
--	------	------	------	------	------	------	------	------	------	------	------	------

Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

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

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

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

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=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57
---------	------	------	------	------	------	------	------	------	------	------	------	------

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

(25)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57
--------	------	------	------	------	------	------	------	------	------	------	------	------

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			2.11	x 1.6	= 3.376		(26)
Windows Type 1			3.47	x1/[1/(1.4)+ 0.04] =	4.6		(27)
Windows Type 2			1.77	x1/[1/(1.4)+ 0.04] =	2.35		(27)
Windows Type 3			1.18	x1/[1/(1.4)+ 0.04] =	1.56		(27)
Windows Type 4			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 5			3.07	x1/[1/(1.4)+ 0.04] =	4.07		(27)
Windows Type 6			1.26	x1/[1/(1.4)+ 0.04] =	1.67		(27)
Windows Type 7			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 8			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Floor			51.462	x 0.1	= 5.1462		(28)
Walls	168.92	18.38	150.54	x 0.16	= 24.09		(29)
Roof Type1	38.44	0	38.44	x 0.1	= 3.84		(30)
Roof Type2	14.6	0	14.6	x 0.1	= 1.46		(30)
Total area of elements, m²			273.43				(31)
Party wall			39.52	x 0	= 0		(32)
Internal wall **			49.35				(32c)
Internal floor			51.46				(32d)

DER WorkSheet: New dwelling design stage

Internal ceiling

51.46

(32e)

* 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) =

59.48

(33)

Heat capacity Cm = S(A x k)

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

42108.34

(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

Indicative Value: Medium

250

(35)

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

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

15

(36)

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

Total fabric heat loss

(33) + (36) =

74.48

(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
45.65	45.41	45.18	44.08	43.88	42.93	42.93	42.75	43.29	43.88	44.29	44.73

(38)

Heat transfer coefficient, W/K

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

(39)m=

120.13	119.89	119.66	118.57	118.36	117.41	117.41	117.23	117.78	118.36	118.78	119.21
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

118.57

(39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.34	1.33	1.33	1.32	1.32	1.31	1.31	1.3	1.31	1.32	1.32	1.33
------	------	------	------	------	------	------	-----	------	------	------	------

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

1.32

(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

2.62

(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

96.53

(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=

106.18	102.32	98.46	94.6	90.74	86.88	86.88	90.74	94.6	98.46	102.32	106.18
--------	--------	-------	------	-------	-------	-------	-------	------	-------	--------	--------

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

1158.35

(44)

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

(45)m=

157.47	137.72	142.11	123.9	118.88	102.59	95.06	109.09	110.39	128.65	140.43	152.5
--------	--------	--------	-------	--------	--------	-------	--------	--------	--------	--------	-------

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

1518.78

(45)

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

(46)m=

23.62	20.66	21.32	18.58	17.83	15.39	14.26	16.36	16.56	19.3	21.06	22.87
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(46)

Water storage loss:

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

210

(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)

DER WorkSheet: New dwelling design stage

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

210

(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

0.83

(52)

Temperature factor from Table 2b

0.54

(53)

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

1.09

(54)

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

1.09

(55)

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

(56)m=

33.69	30.43	33.69	32.6	33.69	32.6	33.69	33.69	32.6	33.69	32.6	33.69
-------	-------	-------	------	-------	------	-------	-------	------	-------	------	-------

(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=

33.69	30.43	33.69	32.6	33.69	32.6	33.69	33.69	32.6	33.69	32.6	33.69
-------	-------	-------	------	-------	------	-------	-------	------	-------	------	-------

(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=

214.41	189.16	199.06	179.01	175.83	157.7	152.01	166.03	165.5	185.6	195.54	209.45
--------	--------	--------	--------	--------	-------	--------	--------	-------	-------	--------	--------

(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)

FHRS

131.8	119.45	119.95	107.95	79.6	12.58	11.71	13.32	13.46	110.35	119.82	129.77
-------	--------	--------	--------	------	-------	-------	-------	-------	--------	--------	--------

(63) (G2)

Output from water heater

(64)m=

80.11	67.44	76.61	68.63	93.72	142.69	137.8	150.21	149.62	72.74	73.29	77.17
-------	-------	-------	-------	-------	--------	-------	--------	--------	-------	-------	-------

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

1190.03

(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=

97.92	86.94	92.81	85.29	85.09	78.2	77.17	81.83	80.79	88.33	90.78	96.26
-------	-------	-------	-------	-------	------	-------	-------	-------	-------	-------	-------

(65)

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

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

Metabolic gains (Table 5), Watts

(66)m=

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22

(66)

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

(67)m=

21.4	19.01	15.46	11.7	8.75	7.39	7.98	10.37	13.92	17.68	20.63	22
------	-------	-------	------	------	------	------	-------	-------	-------	-------	----

(67)

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

(68)m=

238.9	241.38	235.13	221.83	205.04	189.27	178.72	176.25	182.49	195.79	212.58	228.36
-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(68)

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

(69)m=

36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(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=

-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------

(71)

DER WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=

131.61	129.38	124.75	118.45	114.37	108.61	103.72	109.99	112.21	118.73	126.09	129.39
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (72)

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

(73)m=

454.28	452.13	437.7	414.35	390.52	367.63	352.79	358.97	371	394.57	421.67	442.11
--------	--------	-------	--------	--------	--------	--------	--------	-----	--------	--------	--------

 (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	Area			Flux			g_		FF		Gains							
	Table 6d		m²		Table 6a		Table 6b		Table 6c		(W)								
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>10.63</td></tr></table>	10.63	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>5.75</td></tr></table>	5.75	(74)
0.77																			
1.77																			
10.63																			
0.63																			
0.7																			
5.75																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>10.63</td></tr></table>	10.63	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>3.83</td></tr></table>	3.83	(74)
0.77																			
1.18																			
10.63																			
0.63																			
0.7																			
3.83																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>20.32</td></tr></table>	20.32	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>10.99</td></tr></table>	10.99	(74)
0.77																			
1.77																			
20.32																			
0.63																			
0.7																			
10.99																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>20.32</td></tr></table>	20.32	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>7.33</td></tr></table>	7.33	(74)
0.77																			
1.18																			
20.32																			
0.63																			
0.7																			
7.33																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>34.53</td></tr></table>	34.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>18.68</td></tr></table>	18.68	(74)
0.77																			
1.77																			
34.53																			
0.63																			
0.7																			
18.68																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>34.53</td></tr></table>	34.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>12.45</td></tr></table>	12.45	(74)
0.77																			
1.18																			
34.53																			
0.63																			
0.7																			
12.45																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>55.46</td></tr></table>	55.46	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>30</td></tr></table>	30	(74)
0.77																			
1.77																			
55.46																			
0.63																			
0.7																			
30																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>55.46</td></tr></table>	55.46	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>20</td></tr></table>	20	(74)
0.77																			
1.18																			
55.46																			
0.63																			
0.7																			
20																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>74.72</td></tr></table>	74.72	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.42</td></tr></table>	40.42	(74)
0.77																			
1.77																			
74.72																			
0.63																			
0.7																			
40.42																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>74.72</td></tr></table>	74.72	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>26.94</td></tr></table>	26.94	(74)
0.77																			
1.18																			
74.72																			
0.63																			
0.7																			
26.94																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>79.99</td></tr></table>	79.99	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>43.27</td></tr></table>	43.27	(74)
0.77																			
1.77																			
79.99																			
0.63																			
0.7																			
43.27																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>79.99</td></tr></table>	79.99	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>28.84</td></tr></table>	28.84	(74)
0.77																			
1.18																			
79.99																			
0.63																			
0.7																			
28.84																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>74.68</td></tr></table>	74.68	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.4</td></tr></table>	40.4	(74)
0.77																			
1.77																			
74.68																			
0.63																			
0.7																			
40.4																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>74.68</td></tr></table>	74.68	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>26.93</td></tr></table>	26.93	(74)
0.77																			
1.18																			
74.68																			
0.63																			
0.7																			
26.93																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>59.25</td></tr></table>	59.25	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>32.05</td></tr></table>	32.05	(74)
0.77																			
1.77																			
59.25																			
0.63																			
0.7																			
32.05																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>59.25</td></tr></table>	59.25	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>21.37</td></tr></table>	21.37	(74)
0.77																			
1.18																			
59.25																			
0.63																			
0.7																			
21.37																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>41.52</td></tr></table>	41.52	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>22.46</td></tr></table>	22.46	(74)
0.77																			
1.77																			
41.52																			
0.63																			
0.7																			
22.46																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>41.52</td></tr></table>	41.52	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>14.97</td></tr></table>	14.97	(74)
0.77																			
1.18																			
41.52																			
0.63																			
0.7																			
14.97																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>24.19</td></tr></table>	24.19	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>13.08</td></tr></table>	13.08	(74)
0.77																			
1.77																			
24.19																			
0.63																			
0.7																			
13.08																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>24.19</td></tr></table>	24.19	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>8.72</td></tr></table>	8.72	(74)
0.77																			
1.18																			
24.19																			
0.63																			
0.7																			
8.72																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>13.12</td></tr></table>	13.12	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>7.1</td></tr></table>	7.1	(74)
0.77																			
1.77																			
13.12																			
0.63																			
0.7																			
7.1																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>13.12</td></tr></table>	13.12	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>4.73</td></tr></table>	4.73	(74)
0.77																			
1.18																			
13.12																			
0.63																			
0.7																			
4.73																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>8.86</td></tr></table>	8.86	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>4.8</td></tr></table>	4.8	(74)
0.77																			
1.77																			
8.86																			
0.63																			
0.7																			
4.8																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>8.86</td></tr></table>	8.86	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>3.2</td></tr></table>	3.2	(74)
0.77																			
1.18																			
8.86																			
0.63																			
0.7																			
3.2																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>20.83</td></tr></table>	20.83	(76)
0.77																			
3.47																			
19.64																			
0.63																			
0.7																			
20.83																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>16.57</td></tr></table>	16.57	(76)
0.77																			
1.38																			
19.64																			
0.63																			
0.7																			
16.57																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>8.28</td></tr></table>	8.28	(76)
0.77																			
1.38																			
19.64																			
0.63																			
0.7																			
8.28																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.74</td></tr></table>	40.74	(76)
0.77																			
3.47																			
38.42																			
0.63																			
0.7																			
40.74																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>32.41</td></tr></table>	32.41	(76)
0.77																			
1.38																			
38.42																			
0.63																			
0.7																			
32.41																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>16.2</td></tr></table>	16.2	(76)
0.77																			
1.38																			
38.42																			
0.63																			
0.7																			
16.2																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>63.27</td></tr></table>	63.27	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>67.1</td></tr></table>	67.1	(76)
0.77																			
3.47																			
63.27																			
0.63																			
0.7																			
67.1																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>63.27</td></tr></table>	63.27	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>53.37</td></tr></table>	53.37	(76)
0.77																			
1.38																			
63.27																			
0.63																			
0.7																			
53.37																			

DER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(76)
East	0.9x	0.77	x	3.47	x	92.28	x	0.63	x	0.7	=	97.86	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	77.84	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(76)
East	0.9x	0.77	x	3.47	x	113.09	x	0.63	x	0.7	=	119.93	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	95.39	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(76)
East	0.9x	0.77	x	3.47	x	115.77	x	0.63	x	0.7	=	122.77	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	97.65	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(76)
East	0.9x	0.77	x	3.47	x	110.22	x	0.63	x	0.7	=	116.88	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	92.97	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(76)
East	0.9x	0.77	x	3.47	x	94.68	x	0.63	x	0.7	=	100.4	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	79.86	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(76)
East	0.9x	0.77	x	3.47	x	73.59	x	0.63	x	0.7	=	78.04	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	62.07	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(76)
East	0.9x	0.77	x	3.47	x	45.59	x	0.63	x	0.7	=	48.35	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	38.45	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	3.47	x	24.49	x	0.63	x	0.7	=	25.97	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	20.66	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(76)
East	0.9x	0.77	x	3.47	x	16.15	x	0.63	x	0.7	=	17.13	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	13.62	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(76)
South	0.9x	0.77	x	1.26	x	46.75	x	0.63	x	0.7	=	18	(78)
South	0.9x	0.77	x	1.26	x	76.57	x	0.63	x	0.7	=	29.48	(78)
South	0.9x	0.77	x	1.26	x	97.53	x	0.63	x	0.7	=	37.56	(78)
South	0.9x	0.77	x	1.26	x	110.23	x	0.63	x	0.7	=	42.45	(78)
South	0.9x	0.77	x	1.26	x	114.87	x	0.63	x	0.7	=	44.23	(78)
South	0.9x	0.77	x	1.26	x	110.55	x	0.63	x	0.7	=	42.57	(78)
South	0.9x	0.77	x	1.26	x	108.01	x	0.63	x	0.7	=	41.59	(78)
South	0.9x	0.77	x	1.26	x	104.89	x	0.63	x	0.7	=	40.39	(78)
South	0.9x	0.77	x	1.26	x	101.89	x	0.63	x	0.7	=	39.23	(78)
South	0.9x	0.77	x	1.26	x	82.59	x	0.63	x	0.7	=	31.8	(78)
South	0.9x	0.77	x	1.26	x	55.42	x	0.63	x	0.7	=	21.34	(78)
South	0.9x	0.77	x	1.26	x	40.4	x	0.63	x	0.7	=	15.56	(78)
West	0.9x	0.77	x	3.07	x	19.64	x	0.63	x	0.7	=	18.43	(80)

DER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	8.28	(80)
West	0.9x	0.77	x	3.07	x	38.42	x	0.63	x	0.7	=	36.05	(80)
West	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	16.2	(80)
West	0.9x	0.77	x	3.07	x	63.27	x	0.63	x	0.7	=	59.36	(80)
West	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(80)
West	0.9x	0.77	x	3.07	x	92.28	x	0.63	x	0.7	=	86.58	(80)
West	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(80)
West	0.9x	0.77	x	3.07	x	113.09	x	0.63	x	0.7	=	106.11	(80)
West	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(80)
West	0.9x	0.77	x	3.07	x	115.77	x	0.63	x	0.7	=	108.62	(80)
West	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(80)
West	0.9x	0.77	x	3.07	x	110.22	x	0.63	x	0.7	=	103.41	(80)
West	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(80)
West	0.9x	0.77	x	3.07	x	94.68	x	0.63	x	0.7	=	88.83	(80)
West	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(80)
West	0.9x	0.77	x	3.07	x	73.59	x	0.63	x	0.7	=	69.04	(80)
West	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(80)
West	0.9x	0.77	x	3.07	x	45.59	x	0.63	x	0.7	=	42.77	(80)
West	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(80)
West	0.9x	0.77	x	3.07	x	24.49	x	0.63	x	0.7	=	22.98	(80)
West	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(80)
West	0.9x	0.77	x	3.07	x	16.15	x	0.63	x	0.7	=	15.15	(80)
West	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(80)

Solar gains in watts, calculated for each month

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

(83)m=	99.98	189.41	301.89	432.57	528.42	541.37	515.15	442.75	347.89	221.64	123.43	83.08	(83)
--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	------

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

(84)m=	554.25	641.54	739.6	846.92	918.94	909	867.94	801.72	718.89	616.2	545.09	525.19	(84)
--------	--------	--------	-------	--------	--------	-----	--------	--------	--------	-------	--------	--------	------

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	1	0.99	0.96	0.88	0.73	0.57	0.63	0.87	0.98	1	1	(86)

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

(87)m=	19.54	19.69	19.99	20.36	20.71	20.92	20.98	20.97	20.8	20.36	19.87	19.51	(87)
--------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------	-------	------

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

(88)m=	19.81	19.81	19.82	19.83	19.83	19.84	19.84	19.84	19.83	19.83	19.82	19.82	(88)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

(89)m=	1	0.99	0.98	0.94	0.84	0.63	0.43	0.49	0.79	0.97	0.99	1	(89)
--------	---	------	------	------	------	------	------	------	------	------	------	---	------

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

(90)m=	17.87	18.11	18.53	19.09	19.54	19.78	19.83	19.82	19.68	19.09	18.39	17.84	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.28 (91)

DER WorkSheet: New dwelling design stage

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

(92)m=	18.33	18.55	18.94	19.44	19.87	20.1	20.15	20.14	19.99	19.44	18.8	18.3	(92)
--------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	------	------	------

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

(93)m=	18.33	18.55	18.94	19.44	19.87	20.1	20.15	20.14	19.99	19.44	18.8	18.3	(93)
--------	-------	-------	-------	-------	-------	------	-------	-------	-------	-------	------	------	------

8. Space heating requirement

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

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

Utilisation factor for gains, hm :

(94)m=	1	0.99	0.98	0.94	0.84	0.66	0.47	0.53	0.8	0.96	0.99	1	(94)
--------	---	------	------	------	------	------	------	------	-----	------	------	---	------

Useful gains, $hmGm$, $W = (94)m \times (84)m$

(95)m=	551.66	635.59	722.99	793.5	770.77	598.85	408.76	425.43	578.27	591.74	540.17	523.24	(95)
--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	------

Monthly average external temperature from Table 8

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

Heat loss rate for mean internal temperature, Lm , $W = [(39)m \times [(93)m - (96)m]$

(97)m=	1685.99	1636.65	1488.18	1250.14	966.52	645.2	416.61	438.68	693.71	1046.78	1389.33	1680.95	(97)
--------	---------	---------	---------	---------	--------	-------	--------	--------	--------	---------	---------	---------	------

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

(98)m=	843.94	672.71	569.3	328.77	145.64	0	0	0	0	338.55	611.4	861.34	
Total per year ($kWh/year$) = $Sum(98)_{1...5,9...12} =$												4371.66	(98)

Space heating requirement in $kWh/m^2/year$

48.63	(99)
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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

$$(204) = (202) \times [1 - (203)] =$$

1	(204)
---	-------

Efficiency of main space heating system 1

245.06	(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)

843.94	672.71	569.3	328.77	145.64	0	0	0	0	338.55	611.4	861.34
--------	--------	-------	--------	--------	---	---	---	---	--------	-------	--------

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

344.38	274.51	232.31	134.16	59.43	0	0	0	0	138.15	249.49	351.48
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

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

1783.93	(211)
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Space heating fuel (secondary), $kWh/month$

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

(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)

80.11	67.44	76.61	68.63	93.72	142.69	137.8	150.21	149.62	72.74	73.29	77.17
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Efficiency of water heater

172.8	(216)
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(217)m=	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	172.8	(217)
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Fuel for water heating, $kWh/month$

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

(219)m=	46.36	39.03	44.34	39.72	54.24	82.58	79.74	86.93	86.58	42.09	42.41	44.66
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$$Total = Sum(219a)_{1...12} =$$

688.67	(219)
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DER WorkSheet: New dwelling design stage

Annual totals

	kWh/year	kWh/year
Space heating fuel used, main system 1		1783.93
Water heating fuel used		688.67
Electricity for pumps, fans and electric keep-hot		
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	0 (231)
Electricity for lighting		377.97 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2850.57 (338)

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

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.519	=	925.86 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	357.42 (264)
Space and water heating	(261) + (262) + (263) + (264) =			1283.28 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0 (267)
Electricity for lighting	(232) x	0.519	=	196.17 (268)
Total CO2, kg/year		sum of (265)...(271) =		1479.45 (272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		16.46 (273)
El rating (section 14)				85 (274)

TER WorkSheet: New dwelling design stage

User Details:

Assessor Name: George Achilleos **Stroma Number:** STRO009373
Software Name: Stroma FSAP 2012 **Software Version:** Version: 1.0.5.56

Property Address: HOUSE 1 - ASHP

Address : Development, 69 Scales Road, LONDON, N17 9EY

1. Overall dwelling dimensions:

	Area(m ²)		Av. Height(m)		Volume(m ³)
Ground floor	51.46 (1a)	x	2.66 (2a)	=	137.15 (3a)
First floor	38.44 (1b)	x	2.66 (2b)	=	102.45 (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	89.9 (4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	239.59 (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) =	0.13 (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)			0.38 (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			1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.92 (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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TER 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

	0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41
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Calculate effective air change rate for the applicable case

If mechanical ventilation:

0 (23a)

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

0 (23b)

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

0 (23c)

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m²K	A X U (W/K)	k-value kJ/m²·K	A X k kJ/K
Doors			2.11	x 1.2	= 2.532		(26)
Windows Type 1			3.47	x1/[1/(1.4)+ 0.04] =	4.6		(27)
Windows Type 2			1.77	x1/[1/(1.4)+ 0.04] =	2.35		(27)
Windows Type 3			1.18	x1/[1/(1.4)+ 0.04] =	1.56		(27)
Windows Type 4			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 5			3.07	x1/[1/(1.4)+ 0.04] =	4.07		(27)
Windows Type 6			1.26	x1/[1/(1.4)+ 0.04] =	1.67		(27)
Windows Type 7			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Windows Type 8			1.38	x1/[1/(1.4)+ 0.04] =	1.83		(27)
Floor			51.462	x 0.13	= 6.69006		(28)
Walls	168.92	18.38	150.54	x 0.18	= 27.1		(29)
Roof Type1	38.44	0	38.44	x 0.13	= 5		(30)
Roof Type2	14.6	0	14.6	x 0.13	= 1.9		(30)
Total area of elements, m²			273.43				(31)
Party wall			39.52	x 0	= 0		(32)
Internal wall **			49.35				(32c)
Internal floor			51.46				(32d)

TER WorkSheet: New dwelling design stage

Internal ceiling

51.46

(32e)

* 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) =

64.79

(33)

Heat capacity Cm = S(A x k)

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

42108.34

(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

Indicative Value: Medium

250

(35)

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

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

0

(36)

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

Total fabric heat loss

(33) + (36) =

64.79

(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
47.27	46.97	46.68	45.29	45.04	43.83	43.83	43.61	44.29	45.04	45.56	46.11

(38)

Heat transfer coefficient, W/K

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

(39)m=

112.06	111.76	111.46	110.08	109.82	108.62	108.62	108.39	109.08	109.82	110.35	110.89
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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

110.08

(39)

Heat loss parameter (HLP), W/m²K

(40)m = (39)m ÷ (4)

(40)m=

1.25	1.24	1.24	1.22	1.22	1.21	1.21	1.21	1.21	1.22	1.23	1.23
------	------	------	------	------	------	------	------	------	------	------	------

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

1.22

(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

2.62

(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

96.53

(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=

106.18	102.32	98.46	94.6	90.74	86.88	86.88	90.74	94.6	98.46	102.32	106.18
--------	--------	-------	------	-------	-------	-------	-------	------	-------	--------	--------

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

1158.35

(44)

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

(45)m=

157.47	137.72	142.11	123.9	118.88	102.59	95.06	109.09	110.39	128.65	140.43	152.5
--------	--------	--------	-------	--------	--------	-------	--------	--------	--------	--------	-------

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

1518.78

(45)

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

(46)m=

23.62	20.66	21.32	18.58	17.83	15.39	14.26	16.36	16.56	19.3	21.06	22.87
-------	-------	-------	-------	-------	-------	-------	-------	-------	------	-------	-------

(46)

Water storage loss:

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

150

(47)

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

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

Water storage loss:

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

1.7

(48)

Temperature factor from Table 2b

0.54

(49)

TER WorkSheet: New dwelling design stage

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

0.92

 (50)

b) If manufacturer's declared cylinder loss factor is not known:
Hot water storage loss factor from Table 2 (kWh/litre/day)

0

 (51)

If community heating see section 4.3
Volume factor from Table 2a

0

 (52)

Temperature factor from Table 2b

0

 (53)

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

0

 (54)

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

0.92

 (55)

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

(56)m=

28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (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=

28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (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=

209.21	184.46	193.86	173.98	170.63	152.67	146.81	160.83	160.47	180.39	190.51	204.24
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (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)

FHRS

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

 (63) (G2)

Output from water heater

(64)m=

209.21	184.46	193.86	173.98	170.63	152.67	146.81	160.83	160.47	180.39	190.51	204.24
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Output from water heater (annual) _{1...12}	2128.06
---	---------

 (64)

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

(65)m=

93.75	83.18	88.65	81.26	80.93	74.17	73.01	77.67	76.77	84.17	86.75	92.1
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

 (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
131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22	131.22

 (66)

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

(67)m=

21.4	19.01	15.46	11.7	8.75	7.39	7.98	10.37	13.92	17.68	20.63	22
------	-------	-------	------	------	------	------	-------	-------	-------	-------	----

 (67)

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

(68)m=

238.9	241.38	235.13	221.83	205.04	189.27	178.72	176.25	182.49	195.79	212.58	228.36
-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (68)

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

(69)m=

36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12	36.12
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (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=

-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98	-104.98
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------

 (71)

TER WorkSheet: New dwelling design stage

Water heating gains (Table 5)

(72)m=

126.01	123.78	119.15	112.86	108.77	103.02	98.13	104.39	106.62	113.14	120.49	123.79
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

 (72)

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

(73)m=

451.68	449.54	435.11	411.76	387.93	365.03	350.2	356.38	368.4	391.97	419.07	439.51
--------	--------	--------	--------	--------	--------	-------	--------	-------	--------	--------	--------

 (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	Area			Flux			g_		FF		Gains							
	Table 6d		m²		Table 6a		Table 6b		Table 6c		(W)								
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>10.63</td></tr></table>	10.63	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>5.75</td></tr></table>	5.75	(74)
0.77																			
1.77																			
10.63																			
0.63																			
0.7																			
5.75																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>10.63</td></tr></table>	10.63	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>3.83</td></tr></table>	3.83	(74)
0.77																			
1.18																			
10.63																			
0.63																			
0.7																			
3.83																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>20.32</td></tr></table>	20.32	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>10.99</td></tr></table>	10.99	(74)
0.77																			
1.77																			
20.32																			
0.63																			
0.7																			
10.99																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>20.32</td></tr></table>	20.32	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>7.33</td></tr></table>	7.33	(74)
0.77																			
1.18																			
20.32																			
0.63																			
0.7																			
7.33																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>34.53</td></tr></table>	34.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>18.68</td></tr></table>	18.68	(74)
0.77																			
1.77																			
34.53																			
0.63																			
0.7																			
18.68																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>34.53</td></tr></table>	34.53	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>12.45</td></tr></table>	12.45	(74)
0.77																			
1.18																			
34.53																			
0.63																			
0.7																			
12.45																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>55.46</td></tr></table>	55.46	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>30</td></tr></table>	30	(74)
0.77																			
1.77																			
55.46																			
0.63																			
0.7																			
30																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>55.46</td></tr></table>	55.46	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>20</td></tr></table>	20	(74)
0.77																			
1.18																			
55.46																			
0.63																			
0.7																			
20																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>74.72</td></tr></table>	74.72	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.42</td></tr></table>	40.42	(74)
0.77																			
1.77																			
74.72																			
0.63																			
0.7																			
40.42																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>74.72</td></tr></table>	74.72	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>26.94</td></tr></table>	26.94	(74)
0.77																			
1.18																			
74.72																			
0.63																			
0.7																			
26.94																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>79.99</td></tr></table>	79.99	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>43.27</td></tr></table>	43.27	(74)
0.77																			
1.77																			
79.99																			
0.63																			
0.7																			
43.27																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>79.99</td></tr></table>	79.99	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>28.84</td></tr></table>	28.84	(74)
0.77																			
1.18																			
79.99																			
0.63																			
0.7																			
28.84																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>74.68</td></tr></table>	74.68	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.4</td></tr></table>	40.4	(74)
0.77																			
1.77																			
74.68																			
0.63																			
0.7																			
40.4																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>74.68</td></tr></table>	74.68	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>26.93</td></tr></table>	26.93	(74)
0.77																			
1.18																			
74.68																			
0.63																			
0.7																			
26.93																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>59.25</td></tr></table>	59.25	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>32.05</td></tr></table>	32.05	(74)
0.77																			
1.77																			
59.25																			
0.63																			
0.7																			
32.05																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>59.25</td></tr></table>	59.25	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>21.37</td></tr></table>	21.37	(74)
0.77																			
1.18																			
59.25																			
0.63																			
0.7																			
21.37																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>41.52</td></tr></table>	41.52	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>22.46</td></tr></table>	22.46	(74)
0.77																			
1.77																			
41.52																			
0.63																			
0.7																			
22.46																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>41.52</td></tr></table>	41.52	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>14.97</td></tr></table>	14.97	(74)
0.77																			
1.18																			
41.52																			
0.63																			
0.7																			
14.97																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>24.19</td></tr></table>	24.19	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>13.08</td></tr></table>	13.08	(74)
0.77																			
1.77																			
24.19																			
0.63																			
0.7																			
13.08																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>24.19</td></tr></table>	24.19	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>8.72</td></tr></table>	8.72	(74)
0.77																			
1.18																			
24.19																			
0.63																			
0.7																			
8.72																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>13.12</td></tr></table>	13.12	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>7.1</td></tr></table>	7.1	(74)
0.77																			
1.77																			
13.12																			
0.63																			
0.7																			
7.1																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>13.12</td></tr></table>	13.12	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>4.73</td></tr></table>	4.73	(74)
0.77																			
1.18																			
13.12																			
0.63																			
0.7																			
4.73																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.77</td></tr></table>	1.77	x	<table><tr><td>8.86</td></tr></table>	8.86	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>4.8</td></tr></table>	4.8	(74)
0.77																			
1.77																			
8.86																			
0.63																			
0.7																			
4.8																			
North	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.18</td></tr></table>	1.18	x	<table><tr><td>8.86</td></tr></table>	8.86	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>3.2</td></tr></table>	3.2	(74)
0.77																			
1.18																			
8.86																			
0.63																			
0.7																			
3.2																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>20.83</td></tr></table>	20.83	(76)
0.77																			
3.47																			
19.64																			
0.63																			
0.7																			
20.83																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>16.57</td></tr></table>	16.57	(76)
0.77																			
1.38																			
19.64																			
0.63																			
0.7																			
16.57																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>19.64</td></tr></table>	19.64	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>8.28</td></tr></table>	8.28	(76)
0.77																			
1.38																			
19.64																			
0.63																			
0.7																			
8.28																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>40.74</td></tr></table>	40.74	(76)
0.77																			
3.47																			
38.42																			
0.63																			
0.7																			
40.74																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>32.41</td></tr></table>	32.41	(76)
0.77																			
1.38																			
38.42																			
0.63																			
0.7																			
32.41																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>38.42</td></tr></table>	38.42	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>16.2</td></tr></table>	16.2	(76)
0.77																			
1.38																			
38.42																			
0.63																			
0.7																			
16.2																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>3.47</td></tr></table>	3.47	x	<table><tr><td>63.27</td></tr></table>	63.27	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>67.1</td></tr></table>	67.1	(76)
0.77																			
3.47																			
63.27																			
0.63																			
0.7																			
67.1																			
East	0.9x	<table><tr><td>0.77</td></tr></table>	0.77	x	<table><tr><td>1.38</td></tr></table>	1.38	x	<table><tr><td>63.27</td></tr></table>	63.27	x	<table><tr><td>0.63</td></tr></table>	0.63	x	<table><tr><td>0.7</td></tr></table>	0.7	=	<table><tr><td>53.37</td></tr></table>	53.37	(76)
0.77																			
1.38																			
63.27																			
0.63																			
0.7																			
53.37																			

TER WorkSheet: New dwelling design stage

East	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(76)
East	0.9x	0.77	x	3.47	x	92.28	x	0.63	x	0.7	=	97.86	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	77.84	(76)
East	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(76)
East	0.9x	0.77	x	3.47	x	113.09	x	0.63	x	0.7	=	119.93	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	95.39	(76)
East	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(76)
East	0.9x	0.77	x	3.47	x	115.77	x	0.63	x	0.7	=	122.77	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	97.65	(76)
East	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(76)
East	0.9x	0.77	x	3.47	x	110.22	x	0.63	x	0.7	=	116.88	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	92.97	(76)
East	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(76)
East	0.9x	0.77	x	3.47	x	94.68	x	0.63	x	0.7	=	100.4	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	79.86	(76)
East	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(76)
East	0.9x	0.77	x	3.47	x	73.59	x	0.63	x	0.7	=	78.04	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	62.07	(76)
East	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(76)
East	0.9x	0.77	x	3.47	x	45.59	x	0.63	x	0.7	=	48.35	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	38.45	(76)
East	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(76)
East	0.9x	0.77	x	3.47	x	24.49	x	0.63	x	0.7	=	25.97	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	20.66	(76)
East	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(76)
East	0.9x	0.77	x	3.47	x	16.15	x	0.63	x	0.7	=	17.13	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	13.62	(76)
East	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(76)
South	0.9x	0.77	x	1.26	x	46.75	x	0.63	x	0.7	=	18	(78)
South	0.9x	0.77	x	1.26	x	76.57	x	0.63	x	0.7	=	29.48	(78)
South	0.9x	0.77	x	1.26	x	97.53	x	0.63	x	0.7	=	37.56	(78)
South	0.9x	0.77	x	1.26	x	110.23	x	0.63	x	0.7	=	42.45	(78)
South	0.9x	0.77	x	1.26	x	114.87	x	0.63	x	0.7	=	44.23	(78)
South	0.9x	0.77	x	1.26	x	110.55	x	0.63	x	0.7	=	42.57	(78)
South	0.9x	0.77	x	1.26	x	108.01	x	0.63	x	0.7	=	41.59	(78)
South	0.9x	0.77	x	1.26	x	104.89	x	0.63	x	0.7	=	40.39	(78)
South	0.9x	0.77	x	1.26	x	101.89	x	0.63	x	0.7	=	39.23	(78)
South	0.9x	0.77	x	1.26	x	82.59	x	0.63	x	0.7	=	31.8	(78)
South	0.9x	0.77	x	1.26	x	55.42	x	0.63	x	0.7	=	21.34	(78)
South	0.9x	0.77	x	1.26	x	40.4	x	0.63	x	0.7	=	15.56	(78)
West	0.9x	0.77	x	3.07	x	19.64	x	0.63	x	0.7	=	18.43	(80)

TER WorkSheet: New dwelling design stage

West	0.9x	0.77	x	1.38	x	19.64	x	0.63	x	0.7	=	8.28	(80)
West	0.9x	0.77	x	3.07	x	38.42	x	0.63	x	0.7	=	36.05	(80)
West	0.9x	0.77	x	1.38	x	38.42	x	0.63	x	0.7	=	16.2	(80)
West	0.9x	0.77	x	3.07	x	63.27	x	0.63	x	0.7	=	59.36	(80)
West	0.9x	0.77	x	1.38	x	63.27	x	0.63	x	0.7	=	26.69	(80)
West	0.9x	0.77	x	3.07	x	92.28	x	0.63	x	0.7	=	86.58	(80)
West	0.9x	0.77	x	1.38	x	92.28	x	0.63	x	0.7	=	38.92	(80)
West	0.9x	0.77	x	3.07	x	113.09	x	0.63	x	0.7	=	106.11	(80)
West	0.9x	0.77	x	1.38	x	113.09	x	0.63	x	0.7	=	47.7	(80)
West	0.9x	0.77	x	3.07	x	115.77	x	0.63	x	0.7	=	108.62	(80)
West	0.9x	0.77	x	1.38	x	115.77	x	0.63	x	0.7	=	48.83	(80)
West	0.9x	0.77	x	3.07	x	110.22	x	0.63	x	0.7	=	103.41	(80)
West	0.9x	0.77	x	1.38	x	110.22	x	0.63	x	0.7	=	46.48	(80)
West	0.9x	0.77	x	3.07	x	94.68	x	0.63	x	0.7	=	88.83	(80)
West	0.9x	0.77	x	1.38	x	94.68	x	0.63	x	0.7	=	39.93	(80)
West	0.9x	0.77	x	3.07	x	73.59	x	0.63	x	0.7	=	69.04	(80)
West	0.9x	0.77	x	1.38	x	73.59	x	0.63	x	0.7	=	31.04	(80)
West	0.9x	0.77	x	3.07	x	45.59	x	0.63	x	0.7	=	42.77	(80)
West	0.9x	0.77	x	1.38	x	45.59	x	0.63	x	0.7	=	19.23	(80)
West	0.9x	0.77	x	3.07	x	24.49	x	0.63	x	0.7	=	22.98	(80)
West	0.9x	0.77	x	1.38	x	24.49	x	0.63	x	0.7	=	10.33	(80)
West	0.9x	0.77	x	3.07	x	16.15	x	0.63	x	0.7	=	15.15	(80)
West	0.9x	0.77	x	1.38	x	16.15	x	0.63	x	0.7	=	6.81	(80)

Solar gains in watts, calculated for each month

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

(83)m=	99.98	189.41	301.89	432.57	528.42	541.37	515.15	442.75	347.89	221.64	123.43	83.08	(83)
--------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------	------

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

(84)m=	551.66	638.95	737	844.33	916.35	906.41	865.35	799.13	716.29	613.61	542.5	522.59	(84)
--------	--------	--------	-----	--------	--------	--------	--------	--------	--------	--------	-------	--------	------

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	1	0.99	0.96	0.87	0.7	0.54	0.6	0.85	0.98	1	1	(86)

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

(87)m=	19.64	19.8	20.09	20.46	20.77	20.94	20.99	20.98	20.85	20.44	19.98	19.62	(87)
--------	-------	------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

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

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

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

(89)m=	1	0.99	0.98	0.94	0.82	0.61	0.41	0.47	0.77	0.96	0.99	1	(89)
--------	---	------	------	------	------	------	------	------	------	------	------	---	------

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

(90)m=	18.08	18.32	18.73	19.27	19.68	19.87	19.91	19.91	19.79	19.25	18.58	18.06	(90)
--------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

fLA = Living area ÷ (4) =

0.28 (91)

TER WorkSheet: New dwelling design stage

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

(92)m=	18.52	18.73	19.11	19.6	19.98	20.17	20.21	20.2	20.08	19.58	18.97	18.49	(92)
--------	-------	-------	-------	------	-------	-------	-------	------	-------	-------	-------	-------	------

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

(93)m=	18.52	18.73	19.11	19.6	19.98	20.17	20.21	20.2	20.08	19.58	18.97	18.49	(93)
--------	-------	-------	-------	------	-------	-------	-------	------	-------	-------	-------	-------	------

8. Space heating requirement

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

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

Utilisation factor for gains, hm :

(94)m=	1	0.99	0.98	0.93	0.82	0.63	0.45	0.51	0.79	0.96	0.99	1	(94)
--------	---	------	------	------	------	------	------	------	------	------	------	---	------

Useful gains, $hmGm$, $W = (94)m \times (84)m$

(95)m=	549.22	633.14	720.08	787.32	755.17	573.58	387.23	404.12	564.05	588.12	537.73	520.79	(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 , $W = [(39)m \times ((93)m - (96)m)]$

(97)m=	1593.24	1546	1405.3	1177.78	909.37	605.12	391.94	412.42	652.73	986.47	1309.64	1584.76	(97)
--------	---------	------	--------	---------	--------	--------	--------	--------	--------	--------	---------	---------	------

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

(98)m=	776.75	613.44	509.81	281.13	114.72	0	0	0	0	296.37	555.78	791.59	
Total per year ($kWh/year$) = $Sum(98)_{1...5,9...12} =$												3939.59	(98)

Space heating requirement in $kWh/m^2/year$

43.82	(99)
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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) = $(202) \times [1 - (203)] =$ 1 (204)

Efficiency of main space heating system 1 93.5 (206)

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

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

Space heating requirement (calculated above)

776.75	613.44	509.81	281.13	114.72	0	0	0	0	296.37	555.78	791.59
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(211)m = $\{[(98)m \times (204)]\} \times 100 \div (206)$ (211)

830.75	656.09	545.25	300.67	122.7	0	0	0	0	316.98	594.41	846.62		
Total (kWh/year) =Sum(211) _{1_5,10...12} =												4213.46	(211)

Space heating fuel (secondary), $kWh/month$

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

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

Water heating

Output from water heater (calculated above)

209.21	184.46	193.86	173.98	170.63	152.67	146.81	160.83	160.47	180.39	190.51	204.24
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Efficiency of water heater 79.8 (216)

(217)m= (217)

88	87.78	87.28	86.09	83.78	79.8	79.8	79.8	79.8	86.13	87.5	88.08
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Fuel for water heating, $kWh/month$

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

(219)m=	237.75	210.14	222.12	202.09	203.66	191.31	183.97	201.54	201.09	209.44	217.71	231.89	
Total = $Sum(219a)_{1...12} =$												2512.72	(219)

TER WorkSheet: New dwelling design stage

Annual totals

	kWh/year	kWh/year
Space heating fuel used, main system 1		4213.46
Water heating fuel used		2512.72
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75 (231)
Electricity for lighting		377.97 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		7179.16 (338)

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

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	=	910.11 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.216	=	542.75 (264)
Space and water heating	(261) + (262) + (263) + (264) =			1452.86 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93 (267)
Electricity for lighting	(232) x	0.519	=	196.17 (268)
Total CO2, kg/year		sum of (265)...(271) =		1687.95 (272)
TER =				27.66 (273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 26 September 2022

Property Details: HOUSE 1 - ASHP

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

Overheating Details:

Summer ventilation heat loss coefficient:	316.26	(P1)
Transmission heat loss coefficient:	74.5	
Summer heat loss coefficient:	390.74	(P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
East (W001)	0	1
North (W002)	0	1
North (W003)	0	1
East (W004/W005)	0	1
West (W006)	0	1
South (W007)	0	1
East (W008)	0	1
West (W009)	0	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
East (W001)	0.8	0.9	1	0.72	(P8)
North (W002)	0.8	0.9	1	0.72	(P8)
North (W003)	0.8	0.9	1	0.72	(P8)
East (W004/W005)	0.8	0.9	1	0.72	(P8)
West (W006)	0.8	0.9	1	0.72	(P8)
South (W007)	0.8	0.9	1	0.72	(P8)
East (W008)	0.8	0.9	1	0.72	(P8)
West (W009)	0.8	0.9	1	0.72	(P8)

Solar gains:

Orientation		Area	Flux	g_	FF	Shading	Gains
East (W001)	0.9 x	3.47	117.51	0.63	0.7	0.72	116.52
North (W002)	0.9 x	1.77	81.19	0.63	0.7	0.72	41.06
North (W003)	0.9 x	1.18	81.19	0.63	0.7	0.72	27.38
East (W004/W005)	0.9 x	2.76	117.51	0.63	0.7	0.72	92.68
West (W006)	0.9 x	3.07	117.51	0.63	0.7	0.72	103.09
South (W007)	0.9 x	1.26	112.21	0.63	0.7	0.72	40.4
East (W008)	0.9 x	1.38	117.51	0.63	0.7	0.72	46.34
West (W009)	0.9 x	1.38	117.51	0.63	0.7	0.72	46.34

SAP 2012 Overheating Assessment

Total 513.81 **(P3/P4)**

Internal gains:

	June	July	August
Internal gains	515.42	496.28	504.83
Total summer gains	1061.23	1010.1	956.62 (P5)
Summer gain/loss ratio	2.72	2.59	2.45 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	18.97	20.74	20.5 (P7)
Likelihood of high internal temperature	Not significant	Slight	Not significant

Assessment of likelihood of high internal temperature: Slight