Northwest 0.9x	0.77	x	10.43	x	97.38	x	0.72	x	0.7	=	354.76	(81)
Northwest 0.9x	0.77	x	1.01	x	97.38	x	0.72	x	0.7	=	34.35	(81)
Northwest 0.9x	0.77	x	10.43	x	91.1	x	0.72	x	0.7	=	331.87	(81)
Northwest 0.9x	0.77	x	1.01	x	91.1	x	0.72	x	0.7	=	32.14	(81)
Northwest 0.9x	0.77	x	10.43	x	72.63	x	0.72	x	0.7	=	264.57	(81)
Northwest 0.9x	0.77	x	1.01	x	72.63	x	0.72	x	0.7	=	25.62	(81)
Northwest 0.9x	0.77	x	10.43	x	50.42	x	0.72	x	0.7	=	183.68	(81)
Northwest 0.9x	0.77	x	1.01	x	50.42	x	0.72	x	0.7	=	17.79	(81)
Northwest 0.9x	0.77	x	10.43	x	28.07	x	0.72	x	0.7	=	102.25	(81)
Northwest 0.9x	0.77	x	1.01	x	28.07	x	0.72	x	0.7	=	9.9	(81)
Northwest 0.9x	0.77	x	10.43	x	14.2	x	0.72	x	0.7	=	51.72	(81)
Northwest 0.9x	0.77	x	1.01	x	14.2	x	0.72	x	0.7	=	5.01	(81)
Northwest 0.9x	0.77	x	10.43	x	9.21	x	0.72	x	0.7	=	33.57	(81)
Northwest 0.9x	0.77	x	1.01	x	9.21	x	0.72	x	0.7	=	3.25	(81)
Rooflights 0.9x	1	x	2.93	x	26	x	0.72	x	0.8	=	78.98	(82)
Rooflights 0.9x	1	x	7.56	x	26	x	0.72	x	0.8	=	101.9	(82)
Rooflights 0.9x	1	x	2.93	x	54	x	0.72	x	0.8	=	164.04	(82)
Rooflights 0.9x	1	x	7.56	x	54	x	0.72	x	0.8	=	211.63	(82)
Rooflights 0.9x	1	x	2.93	x	96	x	0.72	x	0.8	=	291.63	(82)
Rooflights 0.9x	1	x	7.56	x	96	x	0.72	x	0.8	=	376.23	(82)
Rooflights 0.9x	1	x	2.93	x	150	x	0.72	x	0.8	=	455.67	(82)
Rooflights 0.9x	1	x	7.56	x	150	x	0.72	x	0.8	=	587.87	(82)
Rooflights 0.9x	1	x	2.93	x	192	x	0.72	x	0.8	=	583.26	(82)
Rooflights 0.9x	1	x	7.56	x	192	x	0.72	x	0.8	=	752.47	(82)
Rooflights 0.9x	1	x	2.93	x	200	x	0.72	x	0.8	=	607.56	(82)
Rooflights 0.9x	1	x	7.56	x	200	x	0.72	x	0.8	=	783.82	(82)
Rooflights 0.9x	1	x	2.93	x	189	x	0.72	x	0.8	=	574.15	(82)
Rooflights 0.9x	1	x	7.56	x	189	x	0.72	x	0.8	=	740.71	(82)
Rooflights 0.9x	1	x	2.93	x	157	x	0.72	x	0.8	=	476.94	(82)
Rooflights 0.9x	1	x	7.56	x	157	x	0.72	x	0.8	=	615.3	(82)
Rooflights 0.9x	1	x	2.93	x	115	x	0.72	x	0.8	=	349.35	(82)
Rooflights 0.9x	1	x	7.56	x	115	x	0.72	x	0.8	=	450.7	(82)
Rooflights 0.9x	1	x	2.93	x	66	x	0.72	x	0.8	=	200.5	(82)
Rooflights 0.9x	1	x	7.56	x	66	x	0.72	x	0.8	=	258.66	(82)
Rooflights 0.9x	1	x	2.93	x	33	x	0.72	x	0.8	=	100.25	(82)
Rooflights 0.9x	1	x	7.56	x	33	x	0.72	x	0.8	=	129.33	(82)
Rooflights 0.9x	1	x	2.93	x	21	x	0.72	x	0.8	=	63.79	(82)
Rooflights 0.9x	1	x	7.56	x	21	x	0.72	x	0.8	=	82.3	(82)

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

(83)m=	1214.2	2155.89	3157	4217.15	4972.09	5037.37	4815.03	4241.69	3525.36	2441.06	1470.91	1028.03	(83)

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

(84)m=	2494.79	3428.63	4382.06	5366.89	6041.59	6037.41	5776.18	5215.39	4543.94	3535.23	2649.13	2272.84	(84)

SAP WorkSheet: Existing dwelling (SAP)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	1	0.99	0.98	0.94	0.86	0.73	0.59	0.65	0.86	0.97	0.99	1	(86)

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

(87)m=	19.17	19.38	19.71	20.14	20.51	20.77	20.87	20.85	20.63	20.13	19.57	19.15	(87)

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

(88)m=	19.27	19.28	19.29	19.31	19.32	19.35	19.35	19.35	19.34	19.32	19.31	19.3	(88)

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

(89)m=	1	0.99	0.97	0.92	0.8	0.6	0.39	0.46	0.76	0.95	0.99	1	(89)

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

(90)m=	17.66	17.87	18.2	18.65	18.99	19.2	19.25	19.25	19.11	18.65	18.09	17.66	(90)

fLA = Living area ÷ (4) = | 0.16 | (91)

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

(92)m=	17.9	18.12	18.45	18.89	19.24	19.46	19.52	19.51	19.36	18.89	18.33	17.9	(92)

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

(93)m=	17.9	18.12	18.45	18.89	19.24	19.46	19.52	19.51	19.36	18.89	18.33	17.9	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	1	0.99	0.97	0.91	0.8	0.61	0.42	0.48	0.77	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	2482.81	3383.37	4232.2	4885.48	4811.52	3679.2	2397.11	2499.74	3478.39	3352.81	2622.64	2264.89	(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=	12208.09	11808.5	10629.26	8703.14	6538.26	4137.65	2484.18	2640.77	4509.56	7189.76	9823.7	12084.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	7235.61	5661.69	4759.41	2748.72	1284.7	0	0	0	0	2854.69	5184.77	7305.82	

Total per year (kWh/year) = Sum(98)$_{1...5,10...12}$ = | 37035.4 | (98)

Space heating requirement in kWh/m²/year | 86.21 | (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	8004.68	6301.56	6449.17	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.69	0.77	0.72	0	0	0	0	(101)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(102)m=	0	0	0	0	0	5548.85	4869.21	4662.1	0	0	0	0		(102)

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

(103)m=	0	0	0	0	0	6642.97	6357.11	5737.11	0	0	0	0		(103)

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

(104)m=	0	0	0	0	0	0	1107	799.81	0	0	0	0		
									Total = Sum(104)			=	1906.81	(104)
Cooled fraction									f C = cooled area ÷ (4) =				0.7	(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 × (105) × (106)m

(107)m=	0	0	0	0	0	0	193.25	139.63	0	0	0	0		
									Total = Sum(107)			=	332.88	(107)
Space cooling requirement in kWh/m²/year									(107) ÷ (4) =				0.77	(108)

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		89	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)
Cooling System Energy Efficiency Ratio		4.32	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	7235.61	5661.69	4759.41	2748.72	1284.7	0	0	0	0	2854.69	5184.77	7305.82		
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)														(211)
	8129.9	6361.45	5347.66	3088.45	1443.48	0	0	0	0	3207.52	5825.58	8208.79		
									Total (kWh/year) =Sum(211)$_{1...5,10...12}$=				41612.81	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] + (214) m } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
									Total (kWh/year) =Sum(215)$_{1...5,10...12}$=				0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)														
	285.97	253.04	268.07	243.52	240.98	218.67	213.19	229.55	227.77	252.36	262.8	280.18		
Efficiency of water heater													78.3	(216)
(217)m=	88.54	88.48	88.36	88.02	87.12	78.3	78.3	78.3	78.3	88.02	88.42	88.55		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	322.99	285.98	303.4	276.67	276.6	279.27	272.28	293.17	290.89	286.7	297.23	316.4		
									Total = Sum(219a)$_{1...12}$ =				3501.57	(219)

Space cooling fuel, kWh/month.

(221)m = (107)m÷ (209)

(221)m=	0	0	0	0	0	0	44.73	32.32	0	0	0	0		
									Total = Sum(221)$_{6...8}$ =				77.06	(221)

SAP WorkSheet: Existing dwelling (SAP)

Annual totals		kWh/year	kWh/year	
Space heating fuel used, main system 1			41612.81	
Water heating fuel used			3501.57	
Space cooling fuel used			77.06	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		120		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =		165	(231)
Electricity for lighting			875.95	(232)

10a. Fuel costs - individual heating systems

	Fuel kWh/year	Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x	3.48	x 0.01 =	1448.1257	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48	x 0.01 =	121.85	(247)
Space cooling	(221)	13.19	x 0.01 =	10.16	(248)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	21.76	(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 =	115.54	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)...(254) =			1837.44	(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] =	1.63	(257)
SAP rating (Section 12)		77.32	(258)

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

	Energy kWh/year	Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x	0.216	=	8988.37	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	756.34	(264)
Space and water heating	(261) + (262) + (263) + (264) =			9744.71	(265)
Space cooling	(221) x	0.519	=	39.99	(266)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	85.64	(267)

SAP WorkSheet: Existing dwelling (SAP)

Electricity for lighting	(232) x	0.519	=	454.62	(268)
Total CO2, kg/year		sum of (265)...(271) =		10324.95	(272)
CO2 emissions per m²		(272) ÷ (4) =		24.03	(273)
El rating (section 14)				71	(274)

13a. Primary Energy

	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	50767.63	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	4271.91	(264)
Space and water heating	(261) + (262) + (263) + (264) =			55039.54	(265)
Space cooling	(221) x	3.07	=	236.56	(266)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	506.55	(267)
Electricity for lighting	(232) x	0	=	2689.16	(268)
'Total Primary Energy		sum of (265)...(271) =		58471.81	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		136.11	(273)

APPENDIX (iv)

SAP L1A 2010 REGULATIONS COMPLIANCE REPORT
(SAP PROPOSED HOUSE CHECKLIST)

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.1.8
Printed on 22 September 2014 at 21:02:19

Project Information:

Assessed By: Ondrej Gajdos (STRO006629) **Building Type:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 599.4m²

Site Reference : 17 Branch Hill **Plot Reference:** Proposed House

Address : 17, Branch Hill, LONDON, NW3 7NA

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c), Mains gas (c)		
Fuel factor: 1.00 (mains gas (c), mains gas (c))		
Target Carbon Dioxide Emission Rate (TER)	13.12 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	8.27 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.38 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.82 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	**OK**
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	**OK**
Roof	0.15 (max. 0.20)	0.15 (max. 0.35)	**OK**
Openings	1.30 (max. 2.00)	1.30 (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:	Community heating schemes - mains gas
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Nominal cylinder loss: 3.50 kWh/day Permitted by DBSCG: 3.92 kWh/day	
Primary pipework insulated:	Yes	**OK**

6 Controls

Space heating controls	Charging system linked to use of community heating, programmer and at least two room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Not applicable		
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: East	4.17m²,	
Windows facing: North	1.61m²,	
Windows facing: South	1.61m²,	
Windows facing: East	2.7m²,	
Windows facing: North	0.72m²,	
Windows facing: North	1.6m²,	
Windows facing: North	1.28m²,	
Windows facing: North	14.11m²,	
Windows facing: West	8.18m²,	
Windows facing: West	9.63m²,	
Windows facing: West	11.5m²,	
Windows facing: West	5.75m²,	
Windows facing: West	5.7m²,	
Windows facing: West	2.45m²,	
Windows facing: West	9.52m²,	
Windows facing: West	10.42m²,	
Windows facing: West	11.33m²,	
Windows facing: South	8.72m²,	
Windows facing: South	30.79m²,	
Windows facing: South	3.97m²,	
Windows facing: South	2.66m²,	
Windows facing: South	6.08m²,	
Windows facing: South	8.39m²,	
Windows facing: West	2.8m²,	
Windows facing: East	2.8m²,	
Windows facing: South	0.25m²,	
Windows facing: South	1.28m²,	
Windows facing: South	0.72m²,	
Roof windows facing: Horizontal	21.7m²	
Roof windows facing: Horizontal	4.42m²	
Roof windows facing: Horizontal	2.38m²	
Roof windows facing: Horizontal	1.08m²	
Ventilation rate:	4.00	
Blinds/curtains:	Closed 100% of daylight hours	
10 Key features		
Doors U-value	1 W/m²K	
Community heating, heat from boilers – mains gas		
Fixed cooling system		

APPENDIX (v)

SAP L1A 2010 REGULATIONS COMPLIANCE REPORT (PROPOSED HOUSE WORKSHEETS)

SAP WorkSheet: New dwelling design stage

User Details

Assessor Name:	Ondrej Gajdos	**Stroma Number:**	STRO006629
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.1.8

Property Address: Proposed House

Address : 17, Branch Hill, LONDON, NW3 7NA

1. Overall dwelling dimensions:

	Area(m^2)		Av. Height(m)		Volume(m^3)	
Basement	65.6	(1a) x	2.7	(2a) =	177.12	(3a)
Ground floor	162.6	(1b) x	3	(2b) =	487.8	(3b)
First floor	69.4	(1c) x	4	(2c) =	277.6	(3c)
Second floor	135.4	(1d) x	3.1	(2d) =	419.74	(3d)
Third floor	166.4	(1e) x	2.8	(2e) =	465.92	(3e)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	599.4	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	1828.18	(5)

2. Ventilation rate:

	main heating		secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							11	x 10 =	110	(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) =	110	÷ (5) =	0.06	(8)

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

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

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

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.31	(18)

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

Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.78	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.24	(21)

SAP WorkSheet: New dwelling design stage

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average wind speed from Table 7													
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	
Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m													
	0.31	0.3	0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28	

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]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(24d)m=	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54	(24d)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(25)m=	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2	x	1	=	2			(26)
Windows Type 1			1.39	x1/[1/(1.3)+ 0.04]		=	1.72			(27)
Windows Type 2			1.61	x1/[1/(1.3)+ 0.04]		=	1.99			(27)
Windows Type 3			1.61	x1/[1/(1.3)+ 0.04]		=	1.99			(27)
Windows Type 4			2.7	x1/[1/(1.3)+ 0.04]		=	3.34			(27)
Windows Type 5			0.36	x1/[1/(1.3)+ 0.04]		=	0.44			(27)
Windows Type 6			0.8	x1/[1/(1.3)+ 0.04]		=	0.99			(27)
Windows Type 7			0.64	x1/[1/(1.3)+ 0.04]		=	0.79			(27)
Windows Type 8			14.11	x1/[1/(1.3)+ 0.04]		=	17.44			(27)
Windows Type 9			8.18	x1/[1/(1.3)+ 0.04]		=	10.11			(27)
Windows Type 10			9.63	x1/[1/(1.3)+ 0.04]		=	11.9			(27)
Windows Type 11			11.5	x1/[1/(1.3)+ 0.04]		=	14.21			(27)
Windows Type 12			5.75	x1/[1/(1.3)+ 0.04]		=	7.11			(27)

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Windows Type 13			5.7	x1/[1/(1.3)+ 0.04]		=	7.04			(27)
Windows Type 14			2.45	x1/[1/(1.3)+ 0.04]		=	3.03			(27)
Windows Type 15			9.52	x1/[1/(1.3)+ 0.04]		=	11.76			(27)
Windows Type 16			10.42	x1/[1/(1.3)+ 0.04]		=	12.88			(27)
Windows Type 17			11.33	x1/[1/(1.3)+ 0.04]		=	14			(27)
Windows Type 18			8.72	x1/[1/(1.3)+ 0.04]		=	10.78			(27)
Windows Type 19			30.79	x1/[1/(1.3)+ 0.04]		=	38.05			(27)
Windows Type 20			3.97	x1/[1/(1.3)+ 0.04]		=	4.91			(27)
Windows Type 21			2.66	x1/[1/(1.3)+ 0.04]		=	3.29			(27)
Windows Type 22			6.08	x1/[1/(1.3)+ 0.04]		=	7.51			(27)
Windows Type 23			8.39	x1/[1/(1.3)+ 0.04]		=	10.37			(27)
Windows Type 24			2.8	x1/[1/(1.3)+ 0.04]		=	3.46			(27)
Windows Type 25			2.8	x1/[1/(1.3)+ 0.04]		=	3.46			(27)
Windows Type 26			0.25	x1/[1/(1.3)+ 0.04]		=	0.31			(27)
Windows Type 27			0.64	x1/[1/(1.3)+ 0.04]		=	0.79			(27)
Windows Type 28			0.72	x1/[1/(1.3)+ 0.04]		=	0.89			(27)
Rooflights Type 1			21.7	x1/[1/(1.3) + 0.04]		=	28.21			(27b)
Rooflights Type 2			4.42	x1/[1/(1.3) + 0.04]		=	5.746			(27b)
Rooflights Type 3			2.38	x1/[1/(1.3) + 0.04]		=	3.094			(27b)
Rooflights Type 4			1.08	x1/[1/(1.3) + 0.04]		=	1.404			(27b)
Floor Type 1			234	x	0.13	=	30.42			(28)
Floor Type 2			1.3	x	0.13	=	0.169			(28)
Walls Type1	219	2	217	x	0.16	=	34.72			(29)
Walls Type2	569.42	170.74	398.68	x	0.16	=	63.79			(29)
Roof Type1	57	6.8	50.2	x	0.15	=	7.53			(30)
Roof Type2	8	0	8	x	0.15	=	1.2			(30)
Roof Type3	165	22.78	142.22	x	0.15	=	21.33			(30)
Total area of elements, m²			1253.71							(31)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*
*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U)	(26)...(30) + (32) =	408.7	(33)
Heat capacity Cm = S(A x k)	((28)...(30) + (32) + (32a)...(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	Indicative Value: Medium	250	(35)

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

Thermal bridges : S (L x Y) calculated using Appendix K		63.27	(36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss	(33) + (36) =	471.97	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	330	328.92	327.83	322.77	321.8	317.4	317.4	316.55	319.09	321.8	323.73	325.72	(38)

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

(39)m=	801.98	800.89	799.8	794.74	793.77	789.37	789.37	788.52	791.06	793.77	795.7	797.69	

Average = $\text{Sum}(39)_{1...12}$ /12= 794.72 (39)

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

(40)m=	1.34	1.34	1.33	1.33	1.32	1.32	1.32	1.32	1.32	1.32	1.33	1.33

Average = Sum(40)₁…₁₂ /12= 1.33 (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 3.52 (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) + 36 117.83 (43)

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

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

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

(44)m=	129.61	124.9	120.18	115.47	110.76	106.04	106.04	110.76	115.47	120.18	124.9	129.61

Total = Sum(44)₁…₁₂ = 1413.91 (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=	192.21	168.1	173.47	151.23	145.11	125.22	116.04	133.15	134.74	157.03	171.41	186.14

Total = Sum(45)₁…₁₂ = 1853.86 (45)

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

(46)m=	28.83	25.22	26.02	22.69	21.77	18.78	17.41	19.97	20.21	23.55	25.71	27.92	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 500 (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): 3.5 (48)

Temperature factor from Table 2b 0.6 (49)

Energy lost from water storage, kWh/year (48) x (49) = 2.1 (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) 2.1 (55)

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

(56)m=	65.1	58.8	65.1	63	65.1	63	65.1	65.1	63	65.1	63	65.1	(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=	65.1	58.8	65.1	63	65.1	63	65.1	65.1	63	65.1	63	65.1	(57)

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

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

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

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

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

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

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

(62)m=	280.57	247.92	261.83	236.75	233.48	210.73	204.4	221.52	220.26	245.39	256.92	274.5	(62)

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

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

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

Output from water heater

(64)m=	280.57	247.92	261.83	236.75	233.48	210.73	204.4	221.52	220.26	245.39	256.92	274.5	

Output from water heater (annual)₁…₁₂ 2894.26 (64)

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

(65)m=	134.6	119.74	128.37	118.7	118.94	110.05	109.27	114.96	113.21	122.9	125.4	132.58	(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=	211.27	211.27	211.27	211.27	211.27	211.27	211.27	211.27	211.27	211.27	211.27	211.27	(66)

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

(67)m=	149.58	132.85	108.04	81.79	61.14	51.62	55.78	72.5	97.31	123.56	144.21	153.73	(67)

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

(68)m=	1001.66	1012.05	985.86	930.1	859.71	793.56	749.36	738.97	765.16	820.92	891.31	957.46	(68)

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

(69)m=	59.65	59.65	59.65	59.65	59.65	59.65	59.65	59.65	59.65	59.65	59.65	59.65	(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=	-140.84	-140.84	-140.84	-140.84	-140.84	-140.84	-140.84	-140.84	-140.84	-140.84	-140.84	-140.84	(71)

Water heating gains (Table 5)

(72)m=	180.91	178.19	172.54	164.85	159.87	152.84	146.87	154.52	157.24	165.19	174.17	178.2	(72)

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

(73)m=	1462.22	1453.17	1396.51	1306.82	1210.79	1128.09	1082.08	1096.06	1149.78	1239.74	1339.76	1419.47	(73)

6. Solar gains

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

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	1.61	x	10.63	x	0.63	x	0.7	=	5.23	(74)
North	0.9x	0.77	x	0.36	x	10.63	x	0.63	x	0.7	=	2.34	(74)
North	0.9x	0.77	x	0.8	x	10.63	x	0.63	x	0.7	=	5.2	(74)
North	0.9x	0.77	x	0.64	x	10.63	x	0.63	x	0.7	=	4.16	(74)
North	0.9x	0.77	x	14.11	x	10.63	x	0.63	x	0.7	=	45.85	(74)

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North	0.9x	0.77	x	1.61	x	20.32	x	0.63	x	0.7	=	10	(74)
North	0.9x	0.77	x	0.36	x	20.32	x	0.63	x	0.7	=	4.47	(74)
North	0.9x	0.77	x	0.8	x	20.32	x	0.63	x	0.7	=	9.94	(74)
North	0.9x	0.77	x	0.64	x	20.32	x	0.63	x	0.7	=	7.95	(74)
North	0.9x	0.77	x	14.11	x	20.32	x	0.63	x	0.7	=	87.63	(74)
North	0.9x	0.77	x	1.61	x	34.53	x	0.63	x	0.7	=	16.99	(74)
North	0.9x	0.77	x	0.36	x	34.53	x	0.63	x	0.7	=	7.6	(74)
North	0.9x	0.77	x	0.8	x	34.53	x	0.63	x	0.7	=	16.88	(74)
North	0.9x	0.77	x	0.64	x	34.53	x	0.63	x	0.7	=	13.51	(74)
North	0.9x	0.77	x	14.11	x	34.53	x	0.63	x	0.7	=	148.9	(74)
North	0.9x	0.77	x	1.61	x	55.46	x	0.63	x	0.7	=	27.29	(74)
North	0.9x	0.77	x	0.36	x	55.46	x	0.63	x	0.7	=	12.2	(74)
North	0.9x	0.77	x	0.8	x	55.46	x	0.63	x	0.7	=	27.12	(74)
North	0.9x	0.77	x	0.64	x	55.46	x	0.63	x	0.7	=	21.7	(74)
North	0.9x	0.77	x	14.11	x	55.46	x	0.63	x	0.7	=	239.17	(74)
North	0.9x	0.77	x	1.61	x	74.72	x	0.63	x	0.7	=	36.76	(74)
North	0.9x	0.77	x	0.36	x	74.72	x	0.63	x	0.7	=	16.44	(74)
North	0.9x	0.77	x	0.8	x	74.72	x	0.63	x	0.7	=	36.53	(74)
North	0.9x	0.77	x	0.64	x	74.72	x	0.63	x	0.7	=	29.23	(74)
North	0.9x	0.77	x	14.11	x	74.72	x	0.63	x	0.7	=	322.19	(74)
North	0.9x	0.77	x	1.61	x	79.99	x	0.63	x	0.7	=	39.36	(74)
North	0.9x	0.77	x	0.36	x	79.99	x	0.63	x	0.7	=	17.6	(74)
North	0.9x	0.77	x	0.8	x	79.99	x	0.63	x	0.7	=	39.11	(74)
North	0.9x	0.77	x	0.64	x	79.99	x	0.63	x	0.7	=	31.29	(74)
North	0.9x	0.77	x	14.11	x	79.99	x	0.63	x	0.7	=	344.91	(74)
North	0.9x	0.77	x	1.61	x	74.68	x	0.63	x	0.7	=	36.74	(74)
North	0.9x	0.77	x	0.36	x	74.68	x	0.63	x	0.7	=	16.43	(74)
North	0.9x	0.77	x	0.8	x	74.68	x	0.63	x	0.7	=	36.52	(74)
North	0.9x	0.77	x	0.64	x	74.68	x	0.63	x	0.7	=	29.21	(74)
North	0.9x	0.77	x	14.11	x	74.68	x	0.63	x	0.7	=	322.02	(74)
North	0.9x	0.77	x	1.61	x	59.25	x	0.63	x	0.7	=	29.15	(74)
North	0.9x	0.77	x	0.36	x	59.25	x	0.63	x	0.7	=	13.04	(74)
North	0.9x	0.77	x	0.8	x	59.25	x	0.63	x	0.7	=	28.97	(74)
North	0.9x	0.77	x	0.64	x	59.25	x	0.63	x	0.7	=	23.18	(74)
North	0.9x	0.77	x	14.11	x	59.25	x	0.63	x	0.7	=	255.48	(74)
North	0.9x	0.77	x	1.61	x	41.52	x	0.63	x	0.7	=	20.43	(74)
North	0.9x	0.77	x	0.36	x	41.52	x	0.63	x	0.7	=	9.14	(74)
North	0.9x	0.77	x	0.8	x	41.52	x	0.63	x	0.7	=	20.3	(74)
North	0.9x	0.77	x	0.64	x	41.52	x	0.63	x	0.7	=	16.24	(74)
North	0.9x	0.77	x	14.11	x	41.52	x	0.63	x	0.7	=	179.03	(74)
North	0.9x	0.77	x	1.61	x	24.19	x	0.63	x	0.7	=	11.9	(74)