

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010590			Issued on Date	10/02/2022
Assessment Reference	B08-TY-12	Prop Type Ref	8.TY.12		
Property					
SAP Rating	87 B	DER	7.51	TER	20.05
Environmental	94 A	% DER<TER	62.55		
CO ₂ Emissions (t/year)	0.55	DFEE	28.76	TFEE	32.64
General Requirements Compliance	Pass	% DFEE<TFEE	11.89		
Assessor Details	Miss Emma Jolly, Emma Jolly, Tel: 01454806691, emmajolly@hoarelea.com			Assessor ID	T689-0001
Client					

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 88 m²

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:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.05 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 7.51 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)32.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)28.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (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: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, TRVsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.55
Maximum 1.5 OK
MVHR efficiency: 92%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing South West: 2.47 m², No overhang
Windows facing North West: 10.70 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 350.00 kWh/Year

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	88.0000 (1b)	x 2.5000 (2b)	= 220.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 220.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				0 * 10 =	0.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)
Pressure test				Yes	
Measured/design AP50				3.0000	
Infiltration rate				0.1500	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												78.2000 (23c)
Effective ac	0.2572	0.2543	0.2514	0.2369	0.2340	0.2194	0.2194	0.2165	0.2253	0.2340	0.2398	0.2456 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Opening Type 1 (Uw = 1.20)			13.1700	1.1450	15.0802		(27)
External Wall 1	31.6800	13.1700	18.5100	0.1200	2.2212		(29a)
Sheltered Corridor	4.1300		4.1300	0.1842	0.7606		(29a)
Sheltered Unheated	16.9300		16.9300	0.1842	3.1179		(29a)
Total net area of external elements Aum(A, m2)			52.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.1798		(33)
Party Wall 1			39.7000	0.0000	0.0000		(32)
Party Floor 1			88.0000				(32d)
Party Ceilings 1			88.0000				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.3818 (36)
 Total fabric heat loss (33) + (36) = 26.5616 (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
Heat transfer coeff	18.6741	18.4631	18.2521	17.1971	16.9861	15.9312	15.9312	15.7202	16.3532	16.9861	17.4081	17.8301 (38)
Average = Sum(39)m / 12 =	45.2357	45.0247	44.8137	43.7587	43.5477	42.4928	42.4928	42.2818	42.9148	43.5477	43.9697	44.3917 (39)
												43.7060 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.5140	0.5116	0.5092	0.4973	0.4949	0.4829	0.4829	0.4805	0.4877	0.4949	0.4997	0.5045 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.5973 (42)
 Average daily hot water use (litres/day) 95.8869 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	105.4756	101.6401	97.8046	93.9692	90.1337	86.2982	86.2982	90.1337	93.9692	97.8046	101.6401	105.4756 (44)
Energy content (annual)	156.4173	136.8035	141.1690	123.0746	118.0930	101.9052	94.4302	108.3600	109.6542	127.7914	139.4943	151.4818 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1508.6744 (45)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:	23.4626	20.5205	21.1753	18.4612	17.7139	15.2858	14.1645	16.2540	16.4481	19.1687	20.9241	22.7223 (46)
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	211.6941	186.7310	196.4458	176.5682	173.3698	155.3989	149.7070	163.6368	163.1479	183.0682	192.9880	206.7586 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	211.6941	186.7310	196.4458	176.5682	173.3698	155.3989	149.7070	163.6368	163.1479	183.0682	192.9880	206.7586 (64)
Heat gains from water heating, kWh/month	96.2302	85.4291	91.1601	83.7172	83.4874	76.6784	75.6195	80.2512	79.2550	86.7121	89.1768	94.5891 (65)
											Solar input (sum of months) = Sum(63)m =	0.0000 (63)
											Total per year (kWh/year) = Sum(64)m =	2159.5142 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1902	19.7091	16.0285	12.1346	9.0708	7.6579	8.2747	10.7557	14.4363	18.3302	21.3941	22.8069 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	235.3498	237.7919	231.6377	218.5360	201.9975	186.4537	176.0694	173.6272	179.7815	192.8831	209.4216	224.9655 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937 (71)
Water heating gains (Table 5)	129.3416	127.1267	122.5271	116.2739	112.2142	106.4978	101.6391	107.8644	110.0763	116.5485	123.8567	127.1359 (72)
Total internal gains	448.8417	446.5879	432.1534	408.9047	385.2426	362.5696	347.9433	354.2075	366.2542	389.7220	416.6325	436.8685 (73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor		W	
			W/m2		or Table 6b		or Table 6c		Table 6d			
Southwest	2.4700		36.7938		0.2900		0.7000		0.7700		12.7850 (79)	
Northwest	10.7000		11.2829		0.2900		0.7000		0.7700		16.9838 (81)	
Solar gains	29.7688	56.3487	92.0831	139.2116	178.8535	187.6440	176.7124	145.5961	108.1605	66.3175	36.6835	24.8112 (83)
Total gains	478.6105	502.9365	524.2366	548.1163	564.0961	550.2135	524.6557	499.8036	474.4147	456.0394	453.3160	461.6796 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	135.0949	135.7280	136.3670	139.6547	140.3313	143.8153	143.8153	144.5330	142.4012	140.3313	138.9845	137.6633
alpha	10.0063	10.0485	10.0911	10.3103	10.3554	10.5877	10.5877	10.6355	10.4934	10.3554	10.2656	10.1776
util living area	0.9962	0.9921	0.9756	0.8950	0.7112	0.4941	0.3564	0.3891	0.6225	0.9087	0.9875	0.9971 (86)
MIT	20.6636	20.7271	20.8328	20.9529	20.9954	20.9999	21.0000	21.0000	20.9990	20.9534	20.8021	20.6548 (87)
Th 2	20.5080	20.5102	20.5124	20.5233	20.5255	20.5366	20.5366	20.5388	20.5322	20.5255	20.5211	20.5168 (88)
util rest of house	0.9951	0.9899	0.9691	0.8738	0.6772	0.4584	0.3188	0.3501	0.5810	0.8855	0.9837	0.9963 (89)
MIT 2	20.0538	20.1476	20.3002	20.4707	20.5214	20.5365	20.5366	20.5388	20.5315	20.4751	20.2655	20.0485 (90)
Living area fraction												FLA = Living area / (4) =
MIT	20.2818	20.3643	20.4993	20.6509	20.6986	20.7097	20.7098	20.7112	20.7063	20.6539	20.4661	20.2751 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2818	20.3643	20.4993	20.6509	20.6986	20.7097	20.7098	20.7112	20.7063	20.6539	20.4661	20.2751 (93)

8. Space heating requirement

Utilisation	0.9945	0.9891	0.9689	0.8797	0.6897	0.4718	0.3329	0.3647	0.5965	0.8922	0.9832	0.9958 (94)
Useful gains	475.9733	497.4710	507.9407	482.1910	389.0736	259.5718	174.6366	182.2826	282.9908	406.8797	445.6946	459.7263 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	722.9469	696.2740	627.3615	514.2061	391.8696	259.6201	174.6376	182.2851	283.5062	437.8261	587.7027	713.6027 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	183.7484	133.5956	88.8490	23.0509	2.0802	0.0000	0.0000	0.0000	0.0000	23.0241	102.2459	188.8840 (98)
Space heating												745.4781 (98)
Space heating per m2												(98) / (4) =
											8.4713 (99)	

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	1.0000 (303a)
Fraction of total space heat from community Heat pump	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	745.4781 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	782.7520 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2159.5142 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2267.4899 (310a)
Electricity used for heat distribution	30.5024 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6875)	
mechanical ventilation fans (SFP = 0.6875)	184.5250 (330a)
Total electricity for the above, kWh/year	184.5250 (331)
Electricity for lighting (calculated in Appendix L)	391.8852 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3626.6520 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			300.0000 (367a)
Space heating from Heat pump	1016.7473	0.5190	527.6918 (367)
Electrical energy for heat distribution	30.5024	0.5190	15.8308 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			543.5226 (373)
Space and water heating			543.5226 (376)
Pumps and fans	184.5250	0.5190	95.7685 (378)
Energy for lighting	391.8852	0.5190	203.3884 (379)
Energy saving/generation technologies			
PV Unit	-350.0000	0.5190	-181.6500 (380)
Total CO2, kg/year			661.0295 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			7.5100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			7.5100 ZC1
Total Floor Area		TFA	88.0000
Assumed number of occupants		N	2.5973
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.8481 ZC2
CO2 emissions from cooking, equation (L16)			2.0606 ZC3
Total CO2 emissions			25.4187 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			25.4187 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	88.0000 (1b)	2.5000 (2b)	220.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	220.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1364 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3864	(18)
Number of sides sheltered				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2994 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3818	0.3743	0.3668	0.3294	0.3219	0.2845	0.2845	0.2770	0.2994	0.3219	0.3369	0.3518 (22b)
Effective ac	0.5729	0.5700	0.5673	0.5542	0.5518	0.5405	0.5405	0.5384	0.5448	0.5518	0.5567	0.5619 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opening Type (Uw = 1.40)			13.1700	1.3258	17.4602		(27)					
External Wall 1	31.6800	13.1700	18.5100	0.1800	3.3318		(29a)					
Sheltered Corridor	4.1300		4.1300	0.1800	0.7434		(29a)					
Sheltered Unheated	16.9300		16.9300	0.1800	3.0474		(29a)					
Total net area of external elements Aum(A, m2)			52.7400				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 24.5828		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.8390 (36)					
Total fabric heat loss							(33) + (36) = 28.4218 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	41.5908	41.3854	41.1840	40.2381	40.0611	39.2373	39.2373	39.0847	39.5546	40.0611	40.4191	40.7934 (38)
Heat transfer coeff	70.0126	69.8072	69.6058	68.6599	68.4830	67.6591	67.6591	67.5066	67.9765	68.4830	68.8410	69.2153 (39)
Average = Sum(39)m / 12 =												68.6591 (39)
HLP	0.7956	0.7933	0.7910	0.7802	0.7782	0.7689	0.7689	0.7671	0.7725	0.7782	0.7823	0.7865 (40)
HLP (average)												0.7802 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.5973 (42)
Average daily hot water use (litres/day)												95.8869 (43)
Daily hot water use	105.4756	101.6401	97.8046	93.9692	90.1337	86.2982	86.2982	90.1337	93.9692	97.8046	101.6401	105.4756 (44)
Energy conte	156.4173	136.8035	141.1690	123.0746	118.0930	101.9052	94.4302	108.3600	109.6542	127.7914	139.4943	151.4818 (45)
Energy content (annual)												Total = Sum(45)m = 1508.6744 (45)
Distribution loss (46)m = 0.15 x (45)m	23.4626	20.5205	21.1753	18.4612	17.7139	15.2858	14.1645	16.2540	16.4481	19.1687	20.9241	22.7223 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Solar input	203.0122	178.8893	187.7639	168.1664	164.6879	146.9971	141.0251	154.9549	154.7460	174.3863	184.5861	198.0767	(62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
	203.0122	178.8893	187.7639	168.1664	164.6879	146.9971	141.0251	154.9549	154.7460	174.3863	184.5861	198.0767	(64)
	Total per year (kWh/year) = Sum(64)m = 2057.2918 (64)												
	89.2847	79.1558	84.2146	76.9958	76.5418	69.9570	68.6740	73.3056	72.5335	79.7666	82.4553	87.6436	(65)

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)
(66)m	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	129.8672	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.1902	19.7091	16.0285	12.1346	9.0708	7.6579	8.2747	10.7557	14.4363	18.3302	21.3941	22.8069	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	235.3498	237.7919	231.6377	218.5360	201.9975	186.4537	176.0694	173.6272	179.7815	192.8831	209.4216	224.9655	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	35.9867	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	-103.8937	(71)
Water heating gains (Table 5)	120.0063	117.7913	113.1917	106.9386	102.8788	97.1625	92.3037	98.5291	100.7410	107.2131	114.5213	117.8005	(72)
Total internal gains	442.5063	440.2525	425.8181	402.5694	378.9073	356.2342	341.6079	347.8722	359.9189	383.3866	410.2971	430.5331	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
Southwest	2.4700	36.7938	0.6300	0.7000	0.7700	27.7743 (79)							
Northwest	10.7000	11.2829	0.6300	0.7000	0.7700	36.8959 (81)							
Solar gains	64.6702	122.4126	200.0427	302.4252	388.5437	407.6403	383.8924	316.2950	234.9693	144.0690	79.6918	53.9001	(83)
Total gains	507.1766	562.6651	625.8607	704.9946	767.4510	763.8745	725.5003	664.1672	594.8881	527.4556	489.9890	484.4332	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	87.2858	87.5427	87.7960	89.0055	89.2355	90.3220	90.3220	90.5262	89.9004	89.2355	88.7714	88.2914	
alpha	6.8191	6.8362	6.8531	6.9337	6.9490	7.0215	7.0215	7.0351	6.9934	6.9490	6.9181	6.8861	
util living area	0.9981	0.9956	0.9853	0.9334	0.7799	0.5623	0.4099	0.4664	0.7512	0.9646	0.9952	0.9986	(86)
MIT	20.2436	20.3566	20.5517	20.8023	20.9561	20.9960	20.9996	20.9991	20.9746	20.7671	20.4633	20.2239	(87)
Th 2	20.2571	20.2592	20.2612	20.2705	20.2723	20.2804	20.2804	20.2819	20.2773	20.2723	20.2687	20.2650	(88)
util rest of house	0.9975	0.9942	0.9806	0.9138	0.7332	0.5011	0.3431	0.3942	0.6865	0.9500	0.9934	0.9981	(89)
MIT 2	19.2357	19.4019	19.6855	20.0418	20.2315	20.2778	20.2803	20.2815	20.2579	20.0018	19.5655	19.2131	(90)
Living area fraction	19.6125	19.7588	20.0094	20.3261	20.5024	20.5463	20.5492	20.5498	20.5259	20.2879	19.9011	19.5910	(92)
Temperature adjustment	19.6125	19.7588	20.0094	20.3261	20.5024	20.5463	20.5492	20.5498	20.5259	20.2879	19.9011	19.5910	(93)
adjusted MIT	19.6125	19.7588	20.0094	20.3261	20.5024	20.5463	20.5492	20.5498	20.5259	20.2879	19.9011	19.5910	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9968	0.9930	0.9786	0.9155	0.7486	0.5239	0.3681	0.4212	0.7097	0.9504	0.9923	0.9976	(94)
Ext temp.	505.5490	558.6990	612.4557	645.4199	574.5102	400.1979	267.0474	279.7655	422.1855	501.2688	486.2023	483.2689	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1072.0693	1037.2533	940.3296	784.5179	602.8125	402.3219	267.1993	280.1391	436.8085	663.4567	881.2413	1065.2927	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	421.4911	321.5885	243.9381	100.1506	21.0569	0.0000	0.0000	0.0000	0.0000	120.6678	284.4280	433.0257	(98)
Space heating per m2												1946.3467 (98)	
												(98) / (4) = 22.1176 (99)	

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2081.6542 (211)
Space heating requirement	421.4911	321.5885	243.9381	100.1506	21.0569	0.0000	0.0000	0.0000	0.0000	120.6678	284.4280	433.0257	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	450.7926	343.9449	260.8964	107.1129	22.5208	0.0000	0.0000	0.0000	0.0000	129.0565	304.2011	463.1290	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	203.0122	178.8893	187.7639	168.1664	164.6879	146.9971	141.0251	154.9549	154.7460	174.3863	184.5861	198.0767	(64)
Efficiency of water heater (217)m	86.7200	86.3610	85.5130	83.4842	80.8841	79.8000	79.8000	79.8000	79.8000	83.8546	85.9636	86.8452	(216)
Fuel for water heating, kWh/month	234.1006	207.1413	219.5736	201.4350	203.6096	184.2069	176.7232	194.1791	193.9173	207.9626	214.7259	228.0801	(219)
Water heating fuel used													2465.6551 (219)
Annual totals kWh/year													
Space heating fuel - main system													2081.6542 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													391.8852 (232)
Total delivered energy for all uses													5014.1945 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2081.6542	0.2160	449.6373 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2465.6551	0.2160	532.5815 (264)
Space and water heating			982.2188 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	391.8852	0.5190	203.3884 (268)
Total CO2, kg/m2/year			1224.5322 (272)
Emissions per m2 for space and water heating			11.1616 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3112 (272b)
Emissions per m2 for pumps and fans			0.4423 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.1616 * 1.55) + 2.3112 + 0.4423, rounded to 2 d.p.			20.0500 (273)