

Full SAP Calculation Printout



Property Reference	UNIT 42				Issued on Date	28/06/2023
Assessment Reference	UNIT 42			Prop Type Ref		
Property	Alexander House, UNIT 42, 205-207 King's Road, RG1 4LS					
SAP Rating	80 C	DER	6.42	TER	17.51	
Environmental	96 A	% DER < TER				63.34
CO ₂ Emissions (t/year)	0.25	DFEE	48.58	TFEE	47.35	
Compliance Check	See BREL	% DFEE < TFEE				-2.60
% DPER < TPER	26.97	DPER	67.61	TPER	92.58	
Assessor Details	Mr. Ondrej Gajdos				Assessor ID	W452-0001
Client						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	41.2000 (1b)	x 2.5000 (2b)	= 103.0000 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.2000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 103.0000 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract 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)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour
Pressure test	0.0000 / (5) = 0.0000 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	4.0000 (17)
Number of sides sheltered	0.2000 (18)
	3 (19)

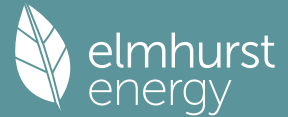
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1550 (21)

	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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	28.5000	13.0000	15.5000	0.1800	2.7900	18.0000	279.0000 (29a)

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corridor new	31.5000	2.1000	29.4000	0.2400	7.0560	60.0000	1764.0000 (29a)
flat roof new	22.1000		22.1000	0.1300	2.8730	9.0000	198.9000 (30)
roof terrace new	17.6000		17.6000	0.1300	2.2880	9.0000	158.4000 (30)
Total net area of external elements Aum(A, m2)			99.7000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	33.1716			(33)
pw			10.7500	0.0000	0.0000	20.0000	215.0000 (32)
pf			39.7000			30.0000	1191.0000 (32d)
iw			56.5000			9.0000	508.5000 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 4314.8000 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 104.7282 (35)

List of Thermal Bridges							
K1 Element	Length	Psi-value	Total				
E2 Other lintels (including other steel lintels)	6.2000	0.0500	0.3100				
E3 Sill	5.2000	0.0500	0.2600				
E4 Jamb	14.2000	0.0500	0.7100				
E20 Exposed floor (normal)	2.9000	0.3200	0.9280				
E7 Party floor between dwellings (in blocks of flats)	9.3000	0.0700	0.6510				
E14 Flat roof	13.4000	0.0800	1.0720				
E15 Flat roof with parapet	10.7000	0.1500	1.6050				
E16 Corner (normal)	7.5000	0.0900	0.6750				
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250				
E18 Party wall between dwellings	5.0000	0.0600	0.3000				
E24 Eaves (insulation at ceiling level - inverted)	3.1000	0.2400	0.7440				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.0300 (36)				
Point Thermal bridges			0.0000 (36a) =				
Total fabric heat loss			(33) + (36) + (36a) = 40.2016 (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	(38)
Heat transfer coeff	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	
Average = Sum(39)m / 12 =	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.4386 (42)
Hot water usage for mixer showers	48.3397	47.6133	46.5547	44.5293	43.0346	41.3677	40.4203	41.4708	42.6224	44.4122	46.4811	48.1545	(42a)
Hot water usage for baths	20.9109	20.6003	20.1630	19.3567	18.7529	18.0834	17.7217	18.1560	18.6288	19.3452	20.1682	20.8402	(42b)
Hot water usage for other uses	29.3625	28.2948	27.2271	26.1593	25.0916	24.0239	24.0239	25.0916	26.1593	27.2271	28.2948	29.3625	(42c)
Average daily hot water use (litres/day)													90.6485 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	98.6132	96.5084	93.9448	90.0453	86.8791	83.4750	82.1659	84.7184	87.4106	90.9845	94.9441	98.3573	(44)
Energy content (annual)	156.1791	137.4267	144.3896	123.2675	116.9559	102.6422	99.3725	104.8991	107.7861	123.4651	135.2652	154.0037	(45)
Distribution loss (46)m = 0.15 x (45)m	23.4269	20.6140	21.6584	18.4901	17.5434	15.3963	14.9059	15.7349	16.1679	18.5198	20.2898	23.1006	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6210 (55)
Total storage loss	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)
If cylinder contains dedicated solar storage	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)
Heat gains from water heating, kWh/month	85.9403	76.4137	82.0203	73.9000	72.8986	67.0421	67.0521	68.8897	68.7525	75.0629	77.8893	85.2169	(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	

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(66)m	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.9142	13.2467	10.7729	8.1558	6.0966	5.1470	5.5615	7.2290	9.7028	12.3199	14.3792	15.3288	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.9147	187.8439	182.9824	172.6327	159.5681	147.2892	139.0862	137.1570	142.0185	152.3682	165.4328	177.7117	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	(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)	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	(71)
Water heating gains (Table 5)	115.5111	113.7109	110.2423	102.6389	97.9819	93.1141	90.1238	92.5937	95.4895	100.8909	108.1796	114.5389	(72)
Total internal gains	390.1818	388.6433	377.8394	357.2692	337.4884	319.3920	308.6132	310.8214	321.0526	339.4208	361.8333	381.4211	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			

West				6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (80)			
West				6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (80)			

Solar gains	89.1773	174.4498	287.2939	419.0010	513.5015	525.6602	500.4499	429.8791	334.1347	206.9993	111.1936	73.3351 (83)
Total gains	479.3592	563.0931	665.1333	776.2703	850.9899	845.0522	809.0631	740.7005	655.1873	546.4201	473.0269	454.7562 (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	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	
alpha	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	
util living area	0.8944	0.8528	0.7788	0.6641	0.5298	0.3981	0.2978	0.3355	0.5158	0.7349	0.8592	0.9048	(86)
Living	18.6547	19.0369	19.6129	20.2136	20.6387	20.8679	20.9521	20.9348	20.7474	20.1390	19.2687	18.5523	
Non living	17.1236	17.5915	18.2869	18.9872	19.4536	19.6809	19.7498	19.7396	19.5811	18.9321	17.8917	16.9975	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.8002	19.0369	19.6129	20.2136	20.6387	20.8679	20.9521	20.9348	20.7474	20.1390	19.2687	18.8947	(87)
Th 2	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	(88)
util rest of house	0.8796	0.8332	0.7507	0.6242	0.4770	0.3312	0.2194	0.2527	0.4441	0.6911	0.8368	0.8912	(89)
MIT 2	18.7164	17.5915	18.2869	18.9872	19.4536	19.6809	19.7498	19.7396	19.5811	18.9321	17.8917	17.4975	(90)
Living area fraction									flA = Living area / (4) =			0.5413	(91)
MIT	19.3030	18.3738	19.0046	19.6510	20.0951	20.3234	20.4006	20.3865	20.2124	19.5854	18.6370	18.2537	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3030	18.3738	19.0046	19.6510	20.0951	20.3234	20.4006	20.3865	20.2124	19.5854	18.6370	18.2537	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.8731	0.8064	0.7308	0.6199	0.4915	0.3619	0.2602	0.2950	0.4710	0.6837	0.8118	0.8704	(94)
Ext temp.	418.5501	454.0591	486.0659	481.2157	418.2255	305.8469	210.4895	218.4728	308.5681	373.5902	383.9805	395.8323	(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)
Space heating kWh	858.1233	770.6566	715.2227	614.9199	480.1687	327.3580	217.3798	228.0160	349.6077	513.9332	659.8788	803.8267	(97)
Space heating requirement - total per year (kWh/year)	327.0425	212.7535	170.4926	96.2670	46.0857	0.0000	0.0000	0.0000	0.0000	104.4152	198.6468	303.5478	(98a)
Solar heating kWh												1459.2511	
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	327.0425	212.7535	170.4926	96.2670	46.0857	0.0000	0.0000	0.0000	0.0000	104.4152	198.6468	303.5478	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1459.2511	
Space heating per m2										(98c) / (4) =		35.4187	(99)

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

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 %)													234.5298 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)

10a. Fuel costs - using Table 12 prices

11a. SAP rating - Individual heating systems

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	622.2028	0.1555	96.7714 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1047.8388	0.1409	147.6018 (264)
Space and water heating			244.3732 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	105.3561	0.1443	15.2061 (268)
Total CO2, kg/year			259.5793 (272)
CO2 emissions per m2			6.3000 (273)
EI value			95.9648
EI rating			96 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	41.2000 (1b)	x 2.5000 (2b)	= 103.0000 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.2000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	103.0000 (5)

2. Ventilation rate

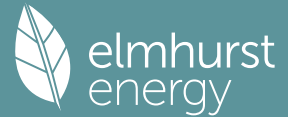
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract 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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (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) = 0.1550 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.1666	0.1589	0.1589	0.1473	0.1511	0.1318	0.1318	0.1279	0.1318	0.1473	0.1434	0.1550 (22b)
Mechanical extract ventilation - centralised												0.5000 (23a)
If mechanical ventilation												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	28.5000	13.0000	15.5000	0.1800	2.7900	18.0000	279.0000 (29a)
corridor new	31.5000	2.1000	29.4000	0.2400	7.0560	60.0000	1764.0000 (29a)
flat roof new	22.1000		22.1000	0.1300	2.8730	9.0000	198.9000 (30)
roof terrace new	17.6000		17.6000	0.1300	2.2880	9.0000	158.4000 (30)
Total net area of external elements Aum(A, m2)			99.7000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 33.1716		(33)

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pw	10.7500	0.0000	0.0000	20.0000	215.0000 (32)
pf	39.7000			30.0000	1191.0000 (32d)
iw	56.5000			9.0000	508.5000 (32c)

Heat capacity $C_m = \text{Sum}(A \times k)$ (28)...(30) + (32) + (32a)...(32e) = 4314.8000 (34)
 Thermal mass parameter (TMP = C_m / TFA) in kJ/m²K 104.7282 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	6.2000	0.0500	0.3100
E2 Other lintels (including other steel lintels)	5.2000	0.0500	0.2600
E3 Sill	14.2000	0.0500	0.7100
E4 Jamb	2.9000	0.3200	0.9280
E20 Exposed floor (normal)	9.3000	0.0700	0.6510
E7 Party floor between dwellings (in blocks of flats)	13.4000	0.0800	1.0720
E14 Flat roof	10.7000	0.1500	1.6050
E15 Flat roof with parapet	7.5000	0.0900	0.6750
E16 Corner (normal)	2.5000	-0.0900	-0.2250
E17 Corner (inverted - internal area greater than external area)	5.0000	0.0600	0.3000
E18 Party wall between dwellings	3.1000	0.2400	0.7440
E24 Eaves (insulation at ceiling level - inverted)			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.0300 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 40.2016 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950 (38)

Heat transfer coeff 57.1966 57.1966 57.1966 57.1966 57.1966 57.1966 57.1966 57.1966 57.1966 57.1966 57.1966 57.1966 57.1966 (39)

Average = Sum(39)m / 12 = 57.1966

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883 (40)
HLP (average)												1.3883
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4386 (42)

Hot water usage for mixer showers 48.3397 47.6133 46.5547 44.5293 43.0346 41.3677 40.4203 41.4708 42.6224 44.4122 46.4811 48.1545 (42a)

Hot water usage for baths 20.9109 20.6003 20.1630 19.3567 18.7529 18.0834 17.7217 18.1560 18.6288 19.3452 20.1682 20.8402 (42b)

Hot water usage for other uses 29.3625 28.2948 27.2271 26.1593 25.0916 24.0239 24.0239 25.0916 26.1593 27.2271 28.2948 29.3625 (42c)

Average daily hot water use (litres/day) 90.6485 (43)

Daily hot water use 98.6132 96.5084 93.9448 90.0453 86.8791 83.4750 82.1659 84.7184 87.4106 90.9845 94.9441 98.3573 (44)

Energy content 156.1791 137.4267 144.3896 123.2675 116.9559 102.6422 99.3725 104.8991 107.7861 123.4651 135.2652 154.0037 (45)

Energy content (annual) Total = Sum(45)m = 1505.6528

Distribution loss (46)m = 0.15 x (45)m 23.4269 20.6140 21.6584 18.4901 17.5434 15.3963 14.9059 15.7349 16.1679 18.5198 20.2898 23.1006 (46)

Water storage loss: 150.0000 (47)

Store volume 1.1500 (48)

a) If manufacturer declared loss factor is known (kWh/day): 0.5400 (49)

Temperature factor from Table 2b 0.6210 (55)

Enter (49) or (54) in (55)

Total storage loss 19.2510 17.3880 19.2510 18.6300 19.2510 18.6300 19.2510 19.2510 18.6300 19.2510 18.6300 19.2510 (56)

If cylinder contains dedicated solar storage 19.2510 17.3880 19.2510 18.6300 19.2510 18.6300 19.2510 19.2510 18.6300 19.2510 18.6300 19.2510 (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)

Combi loss 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)

Total heat required for water heating calculated for each month 198.6925 175.8259 186.9030 164.4095 159.4693 143.7842 141.8859 147.4125 148.9281 165.9785 176.4072 196.5171 (62)

WWHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)

PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)

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 (63c)

FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)

Output from w/h 198.6925 175.8259 186.9030 164.4095 159.4693 143.7842 141.8859 147.4125 148.9281 165.9785 176.4072 196.5171 (64)

Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 85.9403 76.4137 82.0203 73.9000 72.8986 67.0421 67.0521 68.8897 68.7525 75.0629 77.8893 85.2169 (65)

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Heat gains from water heating, kWh/month 85.9403 76.4137 82.0203 73.9000 72.8986 67.0421 67.0521 68.8897 68.7525 75.0629 77.8893 85.2169 (65)

Heat gains from water heating,

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701 (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)	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433 (71)
Water heating gains (Table 5)	115.5111	113.7109	110.2423	102.6389	97.9819	93.1141	90.1238	92.5937	95.4895	100.8909	108.1796	114.5389 (72)
Total internal gains	390.1818	388.6433	377.8394	357.2692	337.4884	319.3920	308.6132	310.8214	321.0526	339.4208	361.8333	381.4211 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
West			6.5000	23.8018	0.6300	0.8000	0.7700	54.0364 (80)				
West			6.5000	23.8018	0.6300	0.8000	0.7700	54.0364 (80)				
Solar gains	108.0728	184.6599	301.3593	445.0487	530.4343	573.9977	541.2251	477.3095	373.2414	235.0507	132.7417	89.3857 (83)
Total gains	498.2546	573.3032	679.1987	802.3179	867.9227	893.3898	849.8382	788.1309	694.2939	574.4715	494.5749	470.8068 (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	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550
alpha	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970
util living area	0.8772	0.8358	0.7518	0.6195	0.4711	0.3166	0.2174	0.2402	0.4435	0.6857	0.8319	0.8886 (86)
Living	18.8957	19.2362	19.8094	20.3859	20.7576	20.9351	20.9821	20.9770	20.8428	20.3343	19.5204	18.8122
Non living	17.4236	17.8373	18.5223	19.1811	19.5748	19.7356	19.7671	19.7652	19.6669	19.1516	18.1987	17.3224
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.9235	19.2362	19.8094	20.3859	20.7576	20.9351	20.9821	20.9770	20.8428	20.3343	19.5204	19.1182 (87)
Th 2	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723 (88)
util rest of house	0.8597	0.8135	0.7200	0.5749	0.4131	0.2471	0.1384	0.1561	0.3666	0.6346	0.8049	0.8722 (89)
MIT 2	18.8360	17.8373	18.5223	19.1811	19.5748	19.7356	19.7671	19.7652	19.6669	19.1516	18.1987	17.7639 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.4246	18.5944	19.2190	19.8332	20.2150	20.3849	20.4248	20.4211	20.3034	19.7918	18.9141	18.4969 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4246	18.5944	19.2190	19.8332	20.2150	20.3849	20.4248	20.4211	20.3034	19.7918	18.9141	18.4969 (93)

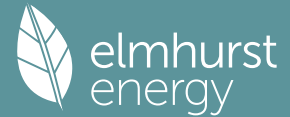
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8541	0.7883	0.7040	0.5772	0.4347	0.2824	0.1808	0.2011	0.4009	0.6355	0.7825	0.8517 (94)
Ext temp.	425.5661	451.9180	478.1273	463.1233	377.2502	252.2724	153.6582	158.4784	278.3675	365.0754	387.0144	400.9751 (95)
Heat loss rate W	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000 (96)
Space heating kWh	819.3194	737.5191	676.0051	568.1468	418.3929	262.2395	155.8479	161.3573	303.3358	474.2603	624.2509	766.2601 (97)
Space heating requirement - total per year (kWh/year)	292.9524	191.9240	147.2211	75.6169	30.6102	0.0000	0.0000	0.0000	0.0000	81.2335	170.8102	271.7720 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Space heating kWh	292.9524	191.9240	147.2211	75.6169	30.6102	0.0000	0.0000	0.0000	0.0000	81.2335	170.8102	271.7720 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	292.9524	191.9240	147.2211	75.6169	30.6102	0.0000	0.0000	0.0000	0.0000	81.2335	170.8102	271.7720 (98c)
Space heating per m2	(98c) / (4) =											

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

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 %)	234.5298 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	292.9524	191.9240	147.2211	75.6169	30.6102	0.0000	0.0000	0.0000	0.0000	81.2335	170.8102	271.7720 (98)
Space heating fuel (main heating system)	234.5298	234.5298	234.5298	234.5298	234.5298	0.0000	0.0000	0.0000	0.0000	234.5298	234.5298	234.5298 (210)

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	124.9105	81.8335	62.7729	32.2419	13.0517	0.0000	0.0000	0.0000	0.0000	34.6368	72.8309	115.8795	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	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													
Water heating requirement	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171	(64)
Efficiency of water heater	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	(216)
Fuel for water heating, kWh/month	103.7764	91.8333	97.6188	85.8705	83.2903	75.0980	74.1065	76.9931	77.7846	86.6900	92.1369	102.6402	(217)
Space cooling fuel 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	(219)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	13.0543	10.4727	9.4295	6.9084	5.3363	4.3598	4.8679	6.3275	8.2188	10.7836	12.1800	13.4172	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												538.1577	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												191.4621	
Water heating fuel used												1047.8388	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												105.3561	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												1691.3526	(238)

10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	538.1577	18.3900	98.9672 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1047.8388	18.3900	192.6976 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	105.3561	18.3900	19.3750 (250)
Additional standing charges			0.0000 (251)
Total energy cost			311.0397 (255)

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	538.1577	0.1561	83.9879 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1047.8388	0.1409	147.6018 (264)
Space and water heating			231.5897 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	105.3561	0.1443	15.2061 (268)
Total CO2, kg/year			246.7958 (272)

13a. Primary energy - Individual heating systems including micro-CHP

Energy Primary energy factor Primary energy

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Space heating - main system 1	kWh/year	kg CO2/kWh	kWh/year
Total CO2 associated with community systems	538.1577	1.5777	849.0683 (275)
Water heating (other fuel)	1047.8388	1.5209	0.0000 (473)
Space and water heating			1593.6148 (278)
Pumps, fans and electric keep-hot	0.0000	0.0000	2442.6831 (279)
Energy for lighting	105.3561	1.5338	0.0000 (281)
Total Primary energy kWh/year			161.5986 (282)
			2604.2817 (286)

SAP 10 EPC IMPROVEMENTS

UNIT 42

Current energy efficiency rating:	C 80
Current environmental impact rating:	A 96

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	C 80
Potential environmental impact rating:	A 96

Fuel prices for cost data on this page from database revision number 521 TEST (19 Jun 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£311	£311	£0
Space heating	£99	£99	£0
Water heating	£193	£193	£0
Lighting	£19	£19	£0
Total cost of fuels	£311	£311	£0
Total cost of uses	£311	£311	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.2 tonnes	0.2 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	63 kWh/m²	63 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	41.2000 (1b)	2.5000 (2b)	103.0000 (1b) -
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 103.0000 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)

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Number of blocked chimneys 0 * 20 = 0.0000 (6f)
 Number of intermittent extract 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)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 4.0000 (17)
 Infiltration rate 0.2000 (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) = 0.1550 (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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Mechanical extract ventilation - centralised												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
1 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323		(27)
1			2.1000	1.0000	2.1000		(26)
top floor exposed new	28.5000	13.0000	15.5000	0.1800	2.7900	18.0000	279.0000 (29a)
corridor new	31.5000	2.1000	29.4000	0.2400	7.0560	60.0000	1764.0000 (29a)
flat roof new	22.1000		22.1000	0.1300	2.8730	9.0000	198.9000 (30)
roof terrace new	17.6000		17.6000	0.1300	2.2880	9.0000	158.4000 (30)
Total net area of external elements Aum(A, m2)			99.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1716		(33)
pw			10.7500	0.0000	0.0000	20.0000	215.0000 (32)
pf			39.7000			30.0000	1191.0000 (32d)
iw			56.5000			9.0000	508.5000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	4314.8000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							104.7282 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	6.2000	0.0500	0.3100
E3 Sill	5.2000	0.0500	0.2600
E4 Jamb	14.2000	0.0500	0.7100
E20 Exposed floor (normal)	2.9000	0.3200	0.9280
E7 Party floor between dwellings (in blocks of flats)	9.3000	0.0700	0.6510
E14 Flat roof	13.4000	0.0800	1.0720
E15 Flat roof with parapet	10.7000	0.1500	1.6050
E16 Corner (normal)	7.5000	0.0900	0.6750
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250
E18 Party wall between dwellings	5.0000	0.0600	0.3000
E24 Eaves (insulation at ceiling level - inverted)	3.1000	0.2400	0.7440
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.0300 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	40.2016 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950 (38)
Heat transfer coeff	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966 (39)
Average = Sum(39)m / 12 =												57.1966

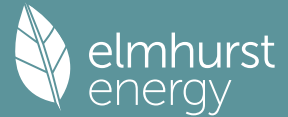
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883 (40)
HLP (average)												1.3883
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.4386 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	48.3397	47.6133	46.5547	44.5293	43.0346	41.3677	40.4203	41.4708	42.6224	44.4122	46.4811	48.1545 (42a)
Hot water usage for baths	20.9109	20.6003	20.1630	19.3567	18.7529	18.0834	17.7217	18.1560	18.6288	19.3452	20.1682	20.8402 (42b)
Hot water usage for other uses	29.3625	28.2948	27.2271	26.1593	25.0916	24.0239	24.0239	25.0916	26.1593	27.2271	28.2948	29.3625 (42c)
Average daily hot water use (litres/day)												90.6485 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.6132	96.5084	93.9448	90.0453	86.8791	83.4750	82.1659	84.7184	87.4106	90.9845	94.9441	98.3573	(44)
Energy conte	156.1791	137.4267	144.3896	123.2675	116.9559	102.6422	99.3725	104.8991	107.7861	123.4651	135.2652	154.0037	(45)
Energy content (annual)	Total = Sum(45)m = 1505.6528												
Distribution loss (46)m = 0.15 x (45)m	23.4269	20.6140	21.6584	18.4901	17.5434	15.3963	14.9059	15.7349	16.1679	18.5198	20.2898	23.1006	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.1500 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6210 (55)
Total storage loss	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(56)
If cylinder contains dedicated solar storage	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510	(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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171	(64)
Total per year (kWh/year) = Sum(64)m = 2006.2138 (64)													
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)													
Heat gains from water heating, kWh/month	85.9403	76.4137	82.0203	73.9000	72.8986	67.0421	67.0521	68.8897	68.7525	75.0629	77.8893	85.2169	(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)m	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.9142	13.2467	10.7729	8.1558	6.0966	5.1470	5.5615	7.2290	9.7028	12.3199	14.3792	15.3288	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.9147	187.8439	182.9824	172.6327	159.5681	147.2892	139.0862	137.1570	142.0185	152.3682	165.4328	177.7117	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	(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)	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	(71)
Water heating gains (Table 5)	115.5111	113.7109	110.2423	102.6389	97.9819	93.1141	90.1238	92.5937	95.4895	100.8909	108.1796	114.5389	(72)
Total internal gains	390.1818	388.6433	377.8394	357.2692	337.4884	319.3920	308.6132	310.8214	321.0526	339.4208	361.8333	381.4211	(73)

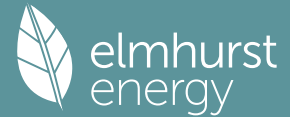
6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
West				6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (80)			
West				6.5000	19.6403	0.6300	0.8000	0.7700	44.5887 (80)			
Solar gains	89.1773	174.4498	287.2939	419.0010	513.5015	525.6602	500.4499	429.8791	334.1347	206.9993	111.1936	73.3351 (83)
Total gains	479.3592	563.0931	665.1333	776.2703	850.9899	845.0522	809.0631	740.7005	655.1873	546.4201	473.0269	454.7562 (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, n11,m (see Table 9a)													
Jan	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	
Feb	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	
Mar	0.8944	0.8528	0.7788	0.6641	0.5298	0.3981	0.2978	0.3355	0.5158	0.7349	0.8592	0.9048	(86)
Living	18.6547	19.0369	19.6129	20.2136	20.6387	20.8679	20.9521	20.9348	20.7474	20.1390	19.2687	18.5523	
Non living	17.1236	17.5915	18.2869	18.9872	19.4536	19.6809	19.7498	19.7396	19.5811	18.9321	17.8917	16.9975	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.8002	19.0369	19.6129	20.2136	20.6387	20.8679	20.9521	20.9348	20.7474	20.1390	19.2687	18.8947	(87)
Th 2	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	(88)
util rest of house	0.8796	0.8332	0.7507	0.6242	0.4770	0.3312	0.2194	0.2527	0.4441	0.6911	0.8368	0.8912	(89)
MIT 2	18.7164	17.5915	18.2869	18.9872	19.4536	19.6809	19.7498	19.7396	19.5811	18.9321	17.8917	17.4975	(90)

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Living area fraction									fLA = Living area / (4) =	0.5413 (91)
MIT 19.3030	18.3738	19.0046	19.6510	20.0951	20.3234	20.4006	20.3865	20.2124	19.5854	18.6370 18.2537 (92)
Temperature adjustment										0.0000
adjusted MIT 19.3030	18.3738	19.0046	19.6510	20.0951	20.3234	20.4006	20.3865	20.2124	19.5854	18.6370 18.2537 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8731	0.8064	0.7308	0.6199	0.4915	0.3619	0.2602	0.2950	0.4710	0.6837	0.8118	0.8704	(94)
Useful gains	418.5501	454.0591	486.0659	481.2157	418.2255	305.8469	210.4895	218.4728	308.5681	373.5902	383.9805	395.8323	(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	858.1233	770.6566	715.2227	614.9199	480.1687	327.3580	217.3798	228.0160	349.6077	513.9332	659.8788	803.8267	(97)
Space heating kWh	327.0425	212.7535	170.4926	96.2670	46.0857	0.0000	0.0000	0.0000	0.0000	104.4152	198.6468	303.5478	(98a)
Space heating requirement - total per year (kWh/year)												1459.2511	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	327.0425	212.7535	170.4926	96.2670	46.0857	0.0000	0.0000	0.0000	0.0000	104.4152	198.6468	303.5478	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1459.2511	
Space heating per m2										(98c) / (4) =		35.4187	(99)

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

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 %)													234.5298 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	327.0425	212.7535	170.4926	96.2670	46.0857	0.0000	0.0000	0.0000	0.0000	104.4152	198.6468	303.5478	(98)
Space heating efficiency (main heating system 1)	234.5298	234.5298	234.5298	234.5298	234.5298	0.0000	0.0000	0.0000	0.0000	234.5298	234.5298	234.5298	(210)
Space heating fuel (main heating system)	139.4460	90.7149	72.6955	41.0468	19.6502	0.0000	0.0000	0.0000	0.0000	44.5211	84.7000	129.4282	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	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													
Water heating requirement	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171	(64)
Efficiency of water heater													191.4621 (216)
(217)m	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	(217)
Fuel for water heating, kWh/month	103.7764	91.8333	97.6188	85.8705	83.2903	75.0980	74.1065	76.9931	77.7846	86.6900	92.1369	102.6402	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	13.0543	10.4727	9.4295	6.9084	5.3363	4.3598	4.8679	6.3275	8.2188	10.7836	12.1800	13.4172	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												622.2028	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												191.4621	
Water heating fuel used												1047.8388	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												105.3561	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)

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Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1775.3976 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	622.2028	16.4900	102.6012 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1047.8388	16.4900	172.7886 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	105.3561	16.4900	17.3732 (250)
Additional standing charges			0.0000 (251)
Total energy cost			292.7631 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.2227 (257)
SAP value	80.1804
SAP rating (Section 12)	80 (258)
SAP band	C

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	622.2028	0.1555	96.7714 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1047.8388	0.1409	147.6018 (264)
Space and water heating			244.3732 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	105.3561	0.1443	15.2061 (268)
Total CO2, kg/year			259.5793 (272)
CO2 emissions per m2			6.3000 (273)
EI value			95.9648
EI rating			96 (274)
EI band			A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

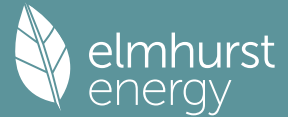
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	41.2000 (1b)	x 2.5000 (2b)	= 103.0000 (1b) - (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	41.2000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	103.0000 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract 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)

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =
 Pressure test
 Pressure Test Method
 Measured/design AP50
 Infiltration rate
 Number of sides sheltered

Air changes per hour
 0.0000 / (5) = 0.0000 (8)
 Yes
 Blower Door
 4.0000 (17)
 0.2000 (18)
 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1550 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000	(22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000	(22a)
Adj infilt rate	0.1666	0.1589	0.1589	0.1473	0.1511	0.1318	0.1318	0.1279	0.1318	0.1473	0.1434	0.1550	(22b)
Mechanical extract ventilation - centralised													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
1 (Uw = 1.30)			6.5000	1.2357	8.0323			(27)
2 (Uw = 1.30)			6.5000	1.2357	8.0323			(27)
1			2.1000	1.0000	2.1000			(26)
top floor exposed new	28.5000	13.0000	15.5000	0.1800	2.7900	18.0000	279.0000	(29a)
corridor new	31.5000	2.1000	29.4000	0.2400	7.0560	60.0000	1764.0000	(29a)
flat roof new	22.1000		22.1000	0.1300	2.8730	9.0000	198.9000	(30)
roof terrace new	17.6000		17.6000	0.1300	2.2880	9.0000	158.4000	(30)
Total net area of external elements Aum(A, m2)			99.7000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.1716			(33)
pw			10.7500	0.0000	0.0000	20.0000	215.0000	(32)
pf			39.7000			30.0000	1191.0000	(32d)
iw			56.5000			9.0000	508.5000	(32c)

Heat capacity Cm = Sum(A x k)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
 List of Thermal Bridges (28)...(30) + (32) + (32a)...(32e) = 4314.8000 (34)
 104.7282 (35)

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	6.2000	0.0500	0.3100	
E3 Sill	5.2000	0.0500	0.2600	
E4 Jamb	14.2000	0.0500	0.7100	
E20 Exposed floor (normal)	2.9000	0.3200	0.9280	
E7 Party floor between dwellings (in blocks of flats)	9.3000	0.0700	0.6510	
E14 Flat roof	13.4000	0.0800	1.0720	
E15 Flat roof with parapet	10.7000	0.1500	1.6050	
E16 Corner (normal)	7.5000	0.0900	0.6750	
E17 Corner (inverted - internal area greater than external area)	2.5000	-0.0900	-0.2250	
E18 Party wall between dwellings	5.0000	0.0600	0.3000	
E24 Eaves (insulation at ceiling level - inverted)	3.1000	0.2400	0.7440	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.0300	(36)
Point Thermal bridges			0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	40.2016 (37)

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

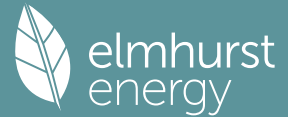
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	16.9950	(38)
Heat transfer coeff	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	57.1966	(39)
Average = Sum(39)m / 12 =													57.1966

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	1.3883	(40)
HLP (average)													1.3883
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.4386 (42)
Hot water usage for mixer showers	48.3397	47.6133	46.5547	44.5293	43.0346	41.3677	40.4203	41.4708	42.6224	44.4122	46.4811	48.1545	(42a)
Hot water usage for baths	20.9109	20.6003	20.1630	19.3567	18.7529	18.0834	17.7217	18.1560	18.6288	19.3452	20.1682	20.8402	(42b)
Hot water usage for other uses	29.3625	28.2948	27.2271	26.1593	25.0916	24.0239	24.0239	25.0916	26.1593	27.2271	28.2948	29.3625	(42c)
Average daily hot water use (litres/day)													90.6485 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.6132	96.5084	93.9448	90.0453	86.8791	83.4750	82.1659	84.7184	87.4106	90.9845	94.9441	98.3573	(44)
Energy conte	156.1791	137.4267	144.3896	123.2675	116.9559	102.6422	99.3725	104.8991	107.7861	123.4651	135.2652	154.0037	(45)
Energy content (annual)										Total = Sum(45)m =			1505.6528

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Distribution loss (46)m = 0.15 x (45)m	23.4269	20.6140	21.6584	18.4901	17.5434	15.3963	14.9059	15.7349	16.1679	18.5198	20.2898	23.1006 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.1500 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6210 (55)
Total storage loss	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510 (56)
If cylinder contains dedicated solar storage	19.2510	17.3880	19.2510	18.6300	19.2510	18.6300	19.2510	19.2510	18.6300	19.2510	18.6300	19.2510 (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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
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 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171 (64)
												Total per year (kWh/year) = Sum(64)m = 2006.2138 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month	85.9403	76.4137	82.0203	73.9000	72.8986	67.0421	67.0521	68.8897	68.7525	75.0629	77.8893	85.2169 (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)m	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	86.3150	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.9142	13.2467	10.7729	8.1558	6.0966	5.1470	5.5615	7.2290	9.7028	12.3199	14.3792	15.3288	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	185.9147	187.8439	182.9824	172.6327	159.5681	147.2892	139.0862	137.1570	142.0185	152.3682	165.4328	177.7117	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	45.0701	(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)	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	-57.5433	(71)
Water heating gains (Table 5)	115.5111	113.7109	110.2423	102.6389	97.9819	93.1141	90.1238	92.5937	95.4895	100.8909	108.1796	114.5389	(72)
Total internal gains	390.1818	388.6433	377.8394	357.2692	337.4884	319.3920	308.6132	310.8214	321.0526	339.4208	361.8333	381.4211	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
West	6.5000	23.8018	0.6300	0.8000	0.7700	54.0364 (80)
West	6.5000	23.8018	0.6300	0.8000	0.7700	54.0364 (80)

Solar gains	108.0728	184.6599	301.3593	445.0487	530.4343	573.9977	541.2251	477.3095	373.2414	235.0507	132.7417	89.3857	(83)
Total gains	498.2546	573.3032	679.1987	802.3179	867.9227	893.3898	849.8382	788.1309	694.2939	574.4715	494.5749	470.8068	(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	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	20.9550	
alpha	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	2.3970	
util living area	0.8772	0.8358	0.7518	0.6195	0.4711	0.3166	0.2174	0.2402	0.4435	0.6857	0.8319	0.8886	(86)
Living	18.8957	19.2362	19.8094	20.3859	20.7576	20.9351	20.9821	20.9770	20.8428	20.3343	19.5204	18.8122	
Non living	17.4236	17.8373	18.5223	19.1811	19.5748	19.7356	19.7671	19.7652	19.6669	19.1516	18.1987	17.3224	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9235	19.2362	19.8094	20.3859	20.7576	20.9351	20.9821	20.9770	20.8428	20.3343	19.5204	19.1182	(87)
Th 2	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	19.7723	(88)
util rest of house	0.8597	0.8135	0.7200	0.5749	0.4131	0.2471	0.1384	0.1561	0.3666	0.6346	0.8049	0.8722	(89)
MIT 2	18.8360	17.8373	18.5223	19.1811	19.5748	19.7356	19.7671	19.7652	19.6669	19.1516	18.1987	17.7639	(90)
Living area fraction									fLA = Living area / (4) =			0.5413	(91)
MIT	19.4246	18.5944	19.2190	19.8332	20.2150	20.3849	20.4248	20.4211	20.3034	19.7918	18.9141	18.4969	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4246	18.5944	19.2190	19.8332	20.2150	20.3849	20.4248	20.4211	20.3034	19.7918	18.9141	18.4969	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8541	0.7883	0.7040	0.5772	0.4347	0.2824	0.1808	0.2011	0.4009	0.6355	0.7825	0.8517	(94)
Useful gains	425.5661	451.9180	478.1273	463.1233	377.2502	252.2724	153.6582	158.4784	278.3675	365.0754	387.0144	400.9751	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	819.3194	737.5191	676.0051	568.1468	418.3929	262.2395	155.8479	161.3573	303.3358	474.2603	624.2509	766.2601	(97)
Space heating kWh	292.9524	191.9240	147.2211	75.6169	30.6102	0.0000	0.0000	0.0000	0.0000	81.2335	170.8102	271.7720	(98a)
Space heating requirement - total per year (kWh/year)												1262.1403	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	292.9524	191.9240	147.2211	75.6169	30.6102	0.0000	0.0000	0.0000	0.0000	81.2335	170.8102	271.7720	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1262.1403	
Space heating per m2										(98c) / (4) =		30.6345	(99)

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

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 %)	234.5298	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

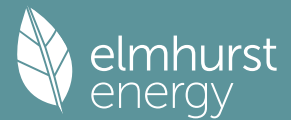
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	292.9524	191.9240	147.2211	75.6169	30.6102	0.0000	0.0000	0.0000	0.0000	81.2335	170.8102	271.7720	(98)
Space heating efficiency (main heating system 1)	234.5298	234.5298	234.5298	234.5298	234.5298	0.0000	0.0000	0.0000	0.0000	234.5298	234.5298	234.5298	(210)
Space heating fuel (main heating system)	124.9105	81.8335	62.7729	32.2419	13.0517	0.0000	0.0000	0.0000	0.0000	34.6368	72.8309	115.8795	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	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													
Water heating requirement	198.6925	175.8259	186.9030	164.4095	159.4693	143.7842	141.8859	147.4125	148.9281	165.9785	176.4072	196.5171	(64)
Efficiency of water heater												191.4621	(216)
(217)m	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	191.4621	(217)
Fuel for water heating, kWh/month	103.7764	91.8333	97.6188	85.8705	83.2903	75.0980	74.1065	76.9931	77.7846	86.6900	92.1369	102.6402	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	13.0543	10.4727	9.4295	6.9084	5.3363	4.3598	4.8679	6.3275	8.2188	10.7836	12.1800	13.4172	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												538.1577	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												191.4621	
Water heating fuel used												1047.8388	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	105.3561	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)

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Total delivered energy for all uses

1691.3526 (238)

10a. Fuel costs - using BEDF prices (521)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	538.1577	18.3900	98.9672 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1047.8388	18.3900	192.6976 (247)
Energy for instantaneous electric shower(s)	0.0000	18.3900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	105.3561	18.3900	19.3750 (250)
Additional standing charges			0.0000 (251)
Total energy cost			311.0397 (255)

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	538.1577	0.1561	83.9879 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1047.8388	0.1409	147.6018 (264)
Space and water heating			231.5897 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	105.3561	0.1443	15.2061 (268)
Total CO2, kg/year			246.7958 (272)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	538.1577	1.5777	849.0683 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1047.8388	1.5209	1593.6148 (278)
Space and water heating			2442.6831 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	105.3561	1.5338	161.5986 (282)
Total Primary energy kWh/year			2604.2817 (286)