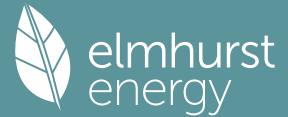


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Plot Reference	B3.1-3.3 1B2P Top				Issued on Date	19/12/2025	
Assessment Reference	1B2P		Plot Type Ref	1B2P			
Plot Address					SAP Version	10.2	
SAP Rating	78 C	DER	4.82	TER	15.29		
Environmental	97 A	% DER < TER				68.48	
CO ₂ Emissions (t/year)	0.21	DFEE	34.76	TFEE	35.71		
Compliance Check	See BREL	% DFEE < TFEE				2.67	
% DPER < TPER	37.97	DPER	50.58	TPER	81.54		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

2. Ventilation rate

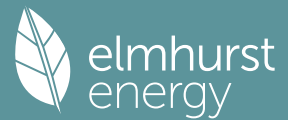
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.3099 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2634 (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)
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	0.3359	0.3293	0.3227	0.2898	0.2832	0.2503	0.2503	0.2437	0.2634	0.2832	0.2964	0.3095 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5564	0.5542	0.5521	0.5420	0.5401	0.5313	0.5313	0.5297	0.5347	0.5401	0.5439	0.5479 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Roof	50.0200		50.0200	0.1300	6.5026	9.0000	450.1800 (30)
Total net area of external elements A _{um} (A, m ²)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	20.0695	(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Floor	50.0200					80.0000	4001.6000 (32a)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity C _m = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	6309.9200 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							126.1479 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				4.5200	0.0500	0.2260	
E4 Jamb				13.5200	0.0500	0.6760	

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E7 Party floor between dwellings (in blocks of flats)	4.4800	0.0700	0.3136	
E18 Party wall between dwellings	7.5000	0.0600	0.4500	
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4100	0.0200	0.1482	
E15 Flat roof with parapet	7.4100	0.5600	4.1496	
P4 Party wall - Roof (insulation at ceiling level)	16.4300	0.1200	1.9716	
R7 Flat ceiling (inverted)	4.4800	0.0400	0.1792	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				8.2642 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		28.3337 (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	22.9612	22.8708	22.7822	22.3660	22.2881	21.9256	21.9256	21.8585	22.0653	22.2881	22.4457	22.6103 (38)
Average = Sum(39)m / 12 =	51.2948	51.2045	51.1158	50.6997	50.6218	50.2593	50.2593	50.1922	50.3989	50.6218	50.7793	50.9440 (39)
												50.6993
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0255	1.0237	1.0219	1.0136	1.0120	1.0048	1.0048	1.0034	1.0076	1.0120	1.0152	1.0185 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.6907 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Hot water usage for other uses												
	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Average daily hot water use (litres/day)												50.1134 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962 (44)
Energy conte	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Energy content (annual)										Total = Sum(45)m =		832.2761
Distribution loss (46)m = 0.15 x (45)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 (46)
Water storage loss (or HIU loss):												
Total storage 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 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary 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 (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												
	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618 (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	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618 (64)
												707.4347 (64)
12Total per year (kWh/year)												
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
												478.8537 (64a)
Heat gains from water heating, kWh/month	28.9244	25.4675	27.0718	24.1708	23.5948	21.4610	21.4800	22.3300	22.5346	24.8445	26.0030	28.6898 (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	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)												
	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)												
	38.8769	37.8981	36.3868	33.5706	31.7134	29.8070	28.8709	30.0134	31.2980	33.3931	36.1152	38.5615 (72)
Total internal gains	311.2631	320.0348	306.4500	297.9925	283.2273	274.1512	264.1585	263.7726	271.4667	279.2030	294.8332	304.4491 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	Table 6d							
Northwest	8.4300	11.2829	0.4000	0.7000	0.7700	18.4562 (81)						
Solar gains	18.4562	37.5680	67.6856	111.1593	149.4199	159.2974	149.0195	118.8000	82.4760	45.9111	23.2226	15.0722 (83)
Total gains	329.7193	357.6029	374.1356	409.1518	432.6471	433.4486	413.1780	382.5726	353.9427	325.1141	318.0559	319.5213 (84)

7. Mean internal temperature (heating season)

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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	34.1702	34.2305	34.2899	34.5713	34.6245	34.8742	34.8742	34.9209	34.7776	34.6245	34.5171	34.4055
alpha	3.2780	3.2820	3.2860	3.3048	3.3083	3.3249	3.3249	3.3281	3.3185	3.3083	3.3011	3.2937
util living area	0.9726	0.9624	0.9447	0.8942	0.7992	0.6441	0.5019	0.5533	0.7616	0.9112	0.9591	0.9752 (86)
MIT	19.0390	19.2418	19.5796	20.0906	20.5407	20.8436	20.9492	20.9292	20.7123	20.1541	19.5288	19.0042 (87)
Th 2	20.0621	20.0636	20.0651	20.0720	20.0733	20.0793	20.0793	20.0805	20.0770	20.0733	20.0707	20.0680 (88)
util rest of house	0.9680	0.9561	0.9347	0.8742	0.7600	0.5757	0.4089	0.4597	0.7031	0.8905	0.9511	0.9710 (89)
MIT 2	18.2716	18.4727	18.8062	19.3054	19.7240	19.9841	20.0575	20.0479	19.8843	19.3750	18.7633	18.2413 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.6290	18.8309	19.1664	19.6711	20.1044	20.3845	20.4729	20.4584	20.2700	19.7379	19.1199	18.5967 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.6290	18.8309	19.1664	19.6711	20.1044	20.3845	20.4729	20.4584	20.2700	19.7379	19.1199	18.5967 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9588	0.9455	0.9230	0.8642	0.7614	0.5995	0.4499	0.4998	0.7165	0.8815	0.9407	0.9624 (94)
Useful gains	316.1457	338.0968	345.3396	353.6041	329.4192	259.8708	185.8824	191.1919	253.5842	286.5968	299.2021	307.5007 (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	735.0060	713.3263	647.4558	546.0932	425.4453	290.7243	194.6490	203.7007	310.9616	462.5764	610.3627	733.4234 (97)
Space heating kWh	311.6321	252.1542	224.7744	138.5921	71.4434	0.0000	0.0000	0.0000	0.0000	130.9288	224.0356	316.8865 (98a)
Space heating requirement - total per year (kWh/year)												1670.4472
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	311.6321	252.1542	224.7744	138.5921	71.4434	0.0000	0.0000	0.0000	0.0000	130.9288	224.0356	316.8865 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1670.4472
Space heating per m2												(98c) / (4) = 33.3956 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	472.4376	371.9190	381.4607	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7729	0.8398	0.8054	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	365.1372	312.3268	307.2393	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	477.5199	455.4119	421.1272	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	80.9155	106.4553	84.7326	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fC = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	20.2289	26.6138	21.1831	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												68.0258 (107)
Energy for space heating												33.3956 (99)
Energy for space cooling												1.3600 (108)
Total												34.7556 (109)
Fabric Energy Efficiency (DFEE)												34.8 (109)

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

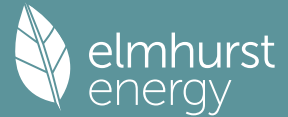
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	50.0200 (1b)	x 2.5000 (2b)	= 125.0500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.0500 (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	2 * 10 = 20.0000 (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)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1599 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

Full SAP Calculation Printout



Measured/design AP50												5.0000 (17)
Infiltration rate												0.4099 (18)
Number of sides sheltered												2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3484 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5519	0.5607	0.5702	0.5768	0.5838 (25)

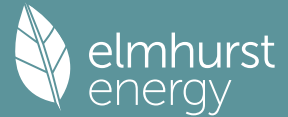
3. Heat losses and heat loss parameter

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					
Main dwelling												
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type			8.4300	1.1450	9.6527		(27)					
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180		(29a)					
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758		(29a)					
Roof	50.0200		50.0200	0.1100	5.5022		(30)					
Total net area of external elements Aum(A, m2)			79.7500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.5387		(33)					
Main dwelling												
Party Wall			41.0700	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							126.1479 (35)					
List of Thermal Bridges												
K1 Element				Length	Psi-value	Total						
E2 Other lintels (including other steel lintels)				4.5200	0.0500	0.2260						
E4 Jamb				13.5200	0.0500	0.6760						
E7 Party floor between dwellings (in blocks of flats)				4.4800	0.0700	0.3136						
E18 Party wall between dwellings				7.5000	0.0600	0.4500						
E25 Staggered party wall between dwellings				2.5000	0.0600	0.1500						
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				16.4300	0.0000	0.0000						
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				7.4100	0.0200	0.1482						
E15 Flat roof with parapet				7.4100	0.5600	4.1496						
P4 Party wall - Roof (insulation at ceiling level)				16.4300	0.1200	1.9716						
R7 Flat ceiling (inverted)				4.4800	0.0400	0.1792						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2642 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	28.8029 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.7057	Feb 24.5476	Mar 24.3926	Apr 23.6645	May 23.5283	Jun 22.8942	Jul 22.8942	Aug 22.7767	Sep 23.1384	Oct 23.5283	Nov 23.8039	Dec 24.0920 (38)
Heat transfer coeff	53.5086	53.3505	53.1954	52.4674	52.3312	51.6970	51.6970	51.5796	51.9413	52.3312	52.6067	52.8948 (39)
Average = Sum(39)m / 12 =												52.4667
HLP	Jan 1.0697	Feb 1.0666	Mar 1.0635	Apr 1.0489	May 1.0462	Jun 1.0335	Jul 1.0335	Aug 1.0312	Sep 1.0384	Oct 1.0462	Nov 1.0517	Dec 1.0575 (40)
HLP (average)												1.0489
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.6907 (42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518	(42b)
Hot water usage for other uses													
	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444	(42c)
Average daily hot water use (litres/day)													50.1134 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962	(44)
Energy content (annual)	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		832.2761	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage 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	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary 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	(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													
	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618	(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	73.6004	64.3610	67.3288	57.5972	54.5596	47.8602	46.6698	49.5003	51.0523	58.4196	63.8237	72.6618	(64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			707.4347	(64)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972	(64a)
												478.8537	(64a)
Heat gains from water heating, kWh/month	28.9244	25.4675	27.0718	24.1708	23.5948	21.4610	21.4800	22.3300	22.5346	24.8445	26.0030	28.6898	(65)

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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	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)												
	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)												
	38.8769	37.8981	36.3868	33.5706	31.7134	29.8070	28.8709	30.0134	31.2980	33.3931	36.1152	38.5615 (72)
Total internal gains												
	311.2631	320.0348	306.4500	297.9925	283.2273	274.1512	264.1585	263.7726	271.4667	279.2030	294.8332	304.4491 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northwest	8.4300		11.2829		0.6300		0.7000		0.7700		29.0684 (81)	
Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388 (83)
Total gains	340.3316	379.2045	413.0549	473.0684	518.5636	525.0446	498.8642	450.8827	401.3664	351.5130	331.4089	328.1878 (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	32.7565	32.8536	32.9494	33.4066	33.4935	33.9044	33.9044	33.9816	33.7449	33.4935	33.3181	33.1366
alpha	3.1838	3.1902	3.1966	3.2271	3.2329	3.2603	3.2603	3.2654	3.2497	3.2329	3.2212	3.2091
util living area												
	0.9708	0.9575	0.9320	0.8614	0.7390	0.5700	0.4361	0.4935	0.7197	0.8978	0.9557	0.9738 (86)
MIT	18.9672	19.2085	19.6027	20.1741	20.6238	20.8848	20.9638	20.9461	20.7466	20.1686	19.4955	18.9383 (87)
Th 2	20.0256	20.0282	20.0308	20.0428	20.0450	20.0555	20.0555	20.0574	20.0514	20.0450	20.0405	20.0357 (88)
util rest of house												
	0.9659	0.9503	0.9200	0.8371	0.6945	0.5019	0.3499	0.4039	0.6572	0.8744	0.9470	0.9693 (89)
MIT 2	18.1749	18.4141	18.8021	19.3575	19.7667	19.9879	20.0406	20.0336	19.8861	19.3654	18.7087	18.1535 (90)
Living area fraction												
	18.5440	18.7842	19.1750	19.7379	20.1659	20.4057	20.4706	20.4586	20.2870	19.7396	19.0752	18.5191 (92)
MIT	18.5440	18.7842	19.1750	19.7379	20.1659	20.4057	20.4706	20.4586	20.2870	19.7396	19.0752	18.5191 (92)
Temperature adjustment												
	18.5440	18.7842	19.1750	19.7379	20.1659	20.4057	20.4706	20.4586	20.2870	19.7396	19.0752	18.5191 (93)
adjusted MIT	18.5440	18.7842	19.1750	19.7379	20.1659	20.4057	20.4706	20.4586	20.2870	19.7396	19.0752	18.5191 (93)

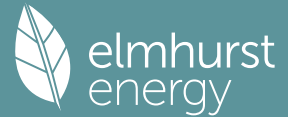
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9560	0.9386	0.9073	0.8283	0.7006	0.5281	0.3886	0.4432	0.6739	0.8655	0.9359	0.9601 (94)
Useful gains	325.3574	355.9360	374.7457	391.8486	363.2829	277.2622	193.8766	199.8247	270.4703	304.2521	310.1592	315.0975 (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	762.1748	740.7258	674.2529	568.6356	443.0329	300.1360	200.1008	209.3416	321.3584	478.2836	629.9776	757.4053 (97)
Space heating kWh	324.9922	258.5787	222.8334	127.2866	59.3340	0.0000	0.0000	0.0000	0.0000	129.4794	230.2692	329.0770 (98a)
Space heating requirement - total per year (kWh/year)												1681.8506
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	324.9922	258.5787	222.8334	127.2866	59.3340	0.0000	0.0000	0.0000	0.0000	129.4794	230.2692	329.0770 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1681.8506
Space heating per m ²												(98c) / (4) = 33.6236 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	485.9522	382.5581	392.0050	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8305	0.8841	0.8495	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.5773	338.2141	333.0025	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	584.5801	555.5646	500.9701	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	130.3220	161.7088	124.9678	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	32.5805	40.4272	31.2420	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												104.2497 (107)
Energy for space heating												33.6236 (99)
Energy for space cooling												2.0842 (108)
Total												35.7077 (109)
Fabric Energy Efficiency (TFEE)												35.7 (109)

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Plot Reference	B3.1-3.3 1B2P Top				Issued on Date	19/12/2025	
Assessment Reference	1B2P		Plot Type Ref		1B2P		
Plot Address					SAP Version	10.2	
SAP Rating	78 C		DER	4.82		TER	15.29
Environmental	97 A		% DER < TER				68.48
CO ₂ Emissions (t/year)	0.21		DFEE	34.76		TFEE	35.71
Compliance Check	See BREL		% DFEE < TFEE				2.67
% DPER < TPER	37.97		DPER	50.58		TPER	81.54
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	50.0200 (1b)	2.5000 (2b)	125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0500 (5)

2. Ventilation rate

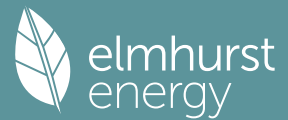
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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 infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			8.4300	0.9615	8.1058		(27)
External Wall	18.5300	8.4300	10.1000	0.1600	1.6160	14.0000	141.4000 (29a)
Communal Wall	11.2000	1.8900	9.3100	0.2100	1.9551	14.0000	130.3400 (29a)
Roof	50.0200		50.0200	0.1300	6.5026	9.0000	450.1800 (30)
Total net area of external elements Aum(A, m ²)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.0695		(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000	20.0000	821.4000 (32)
Party Floor			50.0200			80.0000	4001.6000 (32d)
Stud			85.0000			9.0000	765.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	6309.9200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							126.1479 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5200	0.0500	0.2260
E4 Jamb	13.5200	0.0500	0.6760
E7 Party floor between dwellings (in blocks of flats)	4.4800	0.0700	0.3136
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4100	0.0200	0.1482
E15 Flat roof with parapet	7.4100	0.5600	4.1496
P4 Party wall - Roof (insulation at ceiling level)	16.4300	0.1200	1.9716
R7 Flat ceiling (inverted)	4.4800	0.0400	0.1792
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.2642 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	28.3337 (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	12.4857	12.3542	12.2226	11.5649	11.4334	10.7757	10.7757	10.6442	11.0388	11.4334	11.6965	11.9595 (38)
Heat transfer coeff	40.8194	40.6878	40.5563	39.8986	39.7671	39.1094	39.1094	38.9778	39.3725	39.7671	40.0301	40.2932 (39)
Average = Sum(39)m / 12 =												39.8657
HLP	0.8161	0.8134	0.8108	0.7977	0.7950	0.7819	0.7819	0.7792	0.7871	0.7950	0.8003	0.8055 (40)
HLP (average)												0.7970
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6907 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Hot water usage for other uses	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Average daily hot water use (litres/day)												50.1134 (43)
Daily hot water use	54.6730	53.1739	51.5369	49.4988	47.6810	45.7916	45.3986	47.0322	48.7078	50.6480	52.7041	54.5962 (44)
Energy content (annual)	86.5887	75.7189	79.2103	67.7614	64.1877	56.3062	54.9056	58.2357	60.0615	68.7289	75.0867	85.4844 (45)
Distribution loss (46)m = 0.15 x (45)m	12.9883	11.3578	11.8815	10.1642	9.6282	8.4459	8.2358	8.7354	9.0092	10.3093	11.2630	12.8227 (46)
Water storage loss (or HIU loss):												
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)
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	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (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	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Total per year (kWh/year)												1483.1159 (64)
Electric shower(s)	42.0972	37.5090	40.9584	39.0861	39.8195	37.9840	39.2501	39.8195	39.0861	40.9584	40.1882	42.0972 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												478.8537 (64a)
Heat gains from water heating, kWh/month	83.5365	74.4957	80.7985	75.0971	75.5187	71.0127	72.2901	73.5397	72.5369	77.3134	77.8083	83.1693 (65)

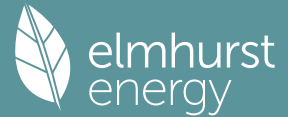
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (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)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	112.2802	110.8567	108.6001	104.3016	101.5037	98.6288	97.1641	98.8437	100.7457	103.9159	108.0671	111.7867 (72)
Total internal gains	384.6665	392.9935	378.6633	368.7235	353.0175	342.9730	332.4517	332.6029	340.9144	349.7258	366.7851	377.6743 (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
Northwest	8.4300	11.2829	0.4000	0.7000	0.7700	18.4562 (81)

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Solar gains	18.4562	37.5680	67.6856	111.1593	149.4199	159.2974	149.0195	118.8000	82.4760	45.9111	23.2226	15.0722 (83)
Total gains	403.1226	430.5615	446.3489	479.8828	502.4374	502.2704	481.4711	451.4029	423.3904	395.6369	390.0077	392.7466 (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	42.9393	43.0781	43.2178	43.9302	44.0756	44.8168	44.8168	44.9680	44.5173	44.0756	43.7859	43.5000
alpha	3.8626	3.8719	3.8812	3.9287	3.9384	3.9878	3.9878	3.9979	3.9678	3.9384	3.9191	3.9000
util living area	0.9418	0.9225	0.8883	0.7995	0.6616	0.4823	0.3536	0.3912	0.5972	0.8148	0.9100	0.9460 (86)
MIT	19.8178	19.9897	20.2488	20.6097	20.8524	20.9681	20.9927	20.9892	20.9256	20.6405	20.2072	19.8005 (87)
Th 2	20.2394	20.2417	20.2440	20.2554	20.2576	20.2691	20.2691	20.2714	20.2645	20.2576	20.2531	20.2485 (88)
util rest of house	0.9337	0.9119	0.8729	0.7736	0.6222	0.4318	0.2964	0.3315	0.5446	0.7855	0.8963	0.9385 (89)
MIT 2	19.1660	19.3345	19.5862	19.9331	20.1484	20.2499	20.2659	20.2664	20.2165	19.9688	19.5569	19.1564 (90)
Living area fraction	19.4696	19.6397	19.8948	20.2482	20.4763	20.5845	20.6044	20.6031	20.5468	20.2817	19.8598	19.4564 (92)
MIT	19.4696	19.6397	19.8948	20.2482	20.4763	20.5845	20.6044	20.6031	20.5468	20.2817	19.8598	19.4564 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4696	19.6397	19.8948	20.2482	20.4763	20.5845	20.6044	20.6031	20.5468	20.2817	19.8598	19.4564 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9241	0.9024	0.8651	0.7733	0.6341	0.4539	0.3228	0.3589	0.5653	0.7865	0.8882	0.9292 (94)
Useful gains	372.5208	388.5347	386.1264	371.0955	318.6034	227.9656	155.4077	162.0005	239.3364	311.1708	346.4041	364.9383 (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	619.2137	599.7267	543.2447	452.7791	349.0087	234.0488	156.6115	163.8266	253.8267	385.0111	510.7767	614.7310 (97)
Space heating kWh	183.5395	141.9210	116.8960	58.8122	22.6216	0.0000	0.0000	0.0000	0.0000	54.9372	118.3483	185.8458 (98a)
Space heating requirement - total per year (kWh/year)												882.9215
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	183.5395	141.9210	116.8960	58.8122	22.6216	0.0000	0.0000	0.0000	0.0000	54.9372	118.3483	185.8458 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												882.9215
Space heating per m2										(98c) / (4) =		17.6514 (99)

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-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	183.5395	141.9210	116.8960	58.8122	22.6216	0.0000	0.0000	0.0000	0.0000	54.9372	118.3483	185.8458 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	289.0748	223.5256	184.1112	92.6292	35.6290	0.0000	0.0000	0.0000	0.0000	86.5260	186.3985	292.7071
Space heating requirement	289.0748	223.5256	184.1112	92.6292	35.6290	0.0000	0.0000	0.0000	0.0000	86.5260	186.3985	292.7071 (307)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	141.8655	125.6463	134.4871	121.2551	119.4645	109.7998	110.1824	113.5125	113.5552	124.0057	128.5804	140.7612 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419
Water heating fuel	212.7983	188.4695	201.7307	181.8827	179.1968	164.6997	165.2736	170.2687	170.3328	186.0086	192.8706	211.1419 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	9.9771	9.0115	9.9771	9.6552	9.9771	9.6552	9.9771	9.9771	9.6552	9.9771	9.6552	9.9771 (331)
Lighting	15.9106	12.7641	11.4927	8.4200	6.5039	5.3137	5.9330	7.7120	10.0171	13.1430	14.8450	16.3529 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.4805	-20.8558	-35.8898	-46.8625	-55.3907	-53.6269	-52.8419	-47.2251	-37.6661	-26.2893	-14.6546	-10.3152 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)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 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)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 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)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 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)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 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)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 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1390.6013 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2224.6738 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												13.9060 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												117.4720 (330a)
Total electricity for the above, kWh/year												117.4720 (331)
Electricity for lighting (calculated in Appendix L)												128.4080 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-414.0986 (333)

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Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	3925.9102 (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			280.0000 (367)
Space and Water heating from Heat pump	1291.1697	0.1558	77.3665 (367)
Electrical energy for heat distribution (space & water)	13.9060	0.0000	5.2879 (372)
Overall CO2 factor for heat network			0.0537 (386)
Total CO2 associated with community systems			194.1423 (373)
Energy for instantaneous electric shower(s)	478.8537	0.1391	66.6191 (264a)
Space and water heating			194.1423 (376)
Pumps, fans and electric keep-hot	117.4720	0.1387	16.2948 (378)
Energy for lighting	128.4080	0.1443	18.5332 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	0.1317	-54.5300
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-54.5300 (380)
Total CO2, kg/year			241.0595 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.8200 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1291.1697	1.5767	783.0748 (467)
Electrical energy for heat distribution (space & water)	13.9060	0.0000	55.7149 (472)
Overall CO2 factor for heat network			0.5658 (486)
Total CO2 associated with community systems			2045.5346 (473)
Energy for instantaneous electric shower(s)	478.8537	1.5143	725.1445 (278a)
Space and water heating			2045.5346 (476)
Pumps, fans and electric keep-hot	117.4720	1.5128	177.7116 (478)
Energy for lighting	128.4080	1.5338	196.9565 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-414.0986	1.4865	-615.5654
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-615.5654 (480)
Total Primary energy kWh/year			2529.7817 (483)
Dwelling Primary energy Rate (DPER)			50.5800 (484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	50.0200 (1b)	x 2.5000 (2b)	= 125.0500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.0500 (5)

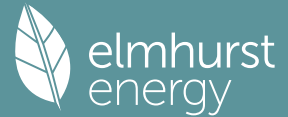
2. Ventilation rate

	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	2 * 10 = 20.0000 (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) =	20.0000 / (5) =	0.1599 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4099	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3484 (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)

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Adj infilt rate	0.4443	0.4356	0.4268	0.3833	0.3746	0.3310	0.3310	0.3223	0.3484	0.3746	0.3920	0.4094 (22b)
Effective ac	0.5987	0.5949	0.5911	0.5735	0.5702	0.5548	0.5548	0.5519	0.5607	0.5702	0.5768	0.5838 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			8.4300	1.1450	9.6527		(27)
External Wall	18.5300	8.4300	10.1000	0.1800	1.8180		(29a)
Communal Wall	11.2000	1.8900	9.3100	0.1800	1.6758		(29a)
Roof	50.0200		50.0200	0.1100	5.5022		(30)
Total net area of external elements Aum(A, m2)			79.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	20.5387		(33)
Main dwelling							
Party Wall			41.0700	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							126.1479 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	4.5200	0.0500	0.2260
E4 Jamb	13.5200	0.0500	0.6760
E7 Party floor between dwellings (in blocks of flats)	4.4800	0.0700	0.3136
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.4300	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	7.4100	0.0200	0.1482
E15 Flat roof with parapet	7.4100	0.5600	4.1496
P4 Party wall - Roof (insulation at ceiling level)	16.4300	0.1200	1.9716
R7 Flat ceiling (inverted)	4.4800	0.0400	0.1792
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.2642 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	28.8029 (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	24.7057	24.5476	24.3926	23.6645	23.5283	22.8942	22.8942	22.7767	23.1384	23.5283	23.8039	24.0920 (38)
Average = Sum(39)m / 12 =	53.5086	53.3505	53.1954	52.4674	52.3312	51.6970	51.6970	51.5796	51.9413	52.3312	52.6067	52.4667 (39)
HLP	1.0697	1.0666	1.0635	1.0489	1.0462	1.0335	1.0335	1.0312	1.0384	1.0462	1.0517	1.0575 (40)
HLP (average)												1.0489
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

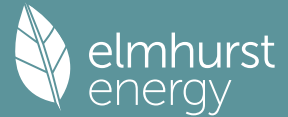
4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6907 (42)
Hot water usage for mixer showers												
Hot water usage for baths	52.5668	51.7768	50.6257	48.4231	46.7977	44.9851	43.9548	45.0972	46.3496	48.2958	50.5456	52.3654 (42a)
Hot water usage for other uses	22.7287	22.3911	21.9158	21.0393	20.3830	19.6553	19.2623	19.7343	20.2482	21.0269	21.9214	22.6518 (42b)
Average daily hot water use (litres/day)	31.9444	30.7827	29.6211	28.4595	27.2979	26.1363	26.1363	27.2979	28.4595	29.6211	30.7827	31.9444 (42c)
Daily hot water use	107.2398	104.9507	102.1626	97.9220	94.4787	90.7767	89.3534	92.1294	95.0573	98.9438	103.2498	106.9616 (44)
Energy conte	169.8417	149.4484	157.0201	134.0503	127.1865	111.6206	108.0652	114.0755	117.2152	134.2658	147.0982	167.4760 (45)
Energy content (annual)										Total = Sum(45)m =		1637.3633
Distribution loss (46)m = 0.15 x (45)m	25.4762	22.4173	23.5530	20.1075	19.0780	16.7431	16.2098	17.1113	17.5823	20.1399	22.0647	25.1214 (46)
Water storage loss (or HIU 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	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)
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 (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	216.4366	191.5341	203.6150	179.1421	173.7814	156.7124	154.6601	160.6704	162.3070	180.8607	192.1901	214.0709 (62)
WWHRS	-24.0313	-21.2535	-22.2555	-18.4284	-17.1746	-14.6964	-13.7756	-14.6489	-15.2055	-17.9256	-20.3075	-23.5863 (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	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1962.6915 (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)
Heat gains from water heating, kWh/month	93.7483	83.3602	89.4851	80.6452	79.5654	73.1873	73.2076	75.2060	75.0475	81.9193	84.9836	92.9617 (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	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345	84.5345 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	76.7400	84.9622	76.7400	79.2980	76.7400	79.2980	76.7400	76.7400	79.2980	76.7400	79.2980	76.7400 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2859	148.8143	144.9628	136.7636	126.4135	116.6859	110.1872	108.6589	112.5103	120.7096	131.0596	140.7872 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534	31.4534 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276	-67.6276 (71)
Water heating gains (Table 5)	126.0057	124.0479	120.2757	112.0072	106.9428	101.6491	98.3973	101.0834	104.2327	110.1066	118.0328	124.9485 (72)
Total internal gains	401.3920	409.1846	393.3388	379.4291	361.4566	345.9933	333.6849	334.8426	344.4013	358.9165	379.7508	393.8361 (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
-----				8.4300	11.2829	0.6300		0.7000	0.7700		29.0684 (81)	

Solar gains	29.0684	59.1697	106.6049	175.0759	235.3363	250.8934	234.7056	187.1101	129.8997	72.3100	36.5756	23.7388 (83)
Total gains	430.4604	468.3543	499.9437	554.5050	596.7929	596.8867	568.3905	521.9526	474.3011	431.2265	416.3264	417.5749 (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	32.7565	32.8536	32.9494	33.4066	33.4935	33.9044	33.9044	33.9816	33.7449	33.4935	33.3181	33.1366
alpha	3.1838	3.1902	3.1966	3.2271	3.2329	3.2603	3.2603	3.2654	3.2497	3.2329	3.2212	3.2091
util living area	0.9468	0.9287	0.8950	0.8123	0.6809	0.5150	0.3878	0.4350	0.6489	0.8439	0.9227	0.9510 (86)
MIT	19.2457	19.4682	19.8287	20.3299	20.7080	20.9145	20.9743	20.9627	20.8155	20.3443	19.7402	19.2192 (87)
Th 2	20.0256	20.0282	20.0308	20.0428	20.0450	20.0555	20.0555	20.0574	20.0514	20.0450	20.0405	20.0357 (88)
util rest of house	0.9385	0.9176	0.8784	0.7832	0.6342	0.4499	0.3093	0.3530	0.5844	0.8130	0.9089	0.9433 (89)
MIT 2	17.9994	18.2789	18.7285	19.3420	19.7735	19.9924	20.0422	20.0368	19.9020	19.3747	18.6322	17.9727 (90)
Living area fraction									FLA = Living area / (4) =			0.4658 (91)
MIT	18.5799	18.8329	19.2410	19.8022	20.2088	20.4219	20.4764	20.4681	20.3275	19.8263	19.1483	18.5533 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5799	18.8329	19.2410	19.8022	20.2088	20.4219	20.4764	20.4681	20.3275	19.8263	19.1483	18.5533 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9227	0.9010	0.8625	0.7752	0.6427	0.4759	0.3449	0.3895	0.6042	0.8050	0.8933	0.9281 (94)
Useful gains	397.2039	421.9659	431.1818	429.8275	383.5492	284.0532	196.0122	203.2963	286.5527	347.1213	371.8977	387.5608 (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	764.0999	743.3260	677.7628	572.0097	445.2763	300.9760	200.3988	209.8310	323.4646	482.8245	633.8229	759.2163 (97)
Space heating kWh	272.9706	215.9540	183.4563	102.3712	45.9250	0.0000	0.0000	0.0000	0.0000	100.9632	188.5862	276.5117 (98a)
Space heating requirement - total per year (kWh/year)												1386.7381
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	272.9706	215.9540	183.4563	102.3712	45.9250	0.0000	0.0000	0.0000	0.0000	100.9632	188.5862	276.5117 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1386.7381
Space heating per m2										(98c) / (4) =		27.7237 (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 %)												92.3000 (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	272.9706	215.9540	183.4563	102.3712	45.9250	0.0000	0.0000	0.0000	0.0000	100.9632	188.5862	276.5117 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	295.7428	233.9697	198.7609	110.9114	49.7562	0.0000	0.0000	0.0000	0.0000	109.3859	204.3187	299.5793 (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	192.4052	170.2806	181.3595	160.7137	156.6068	142.0160	140.8845	146.0215	147.1015	162.9351	171.8825	190.4846 (64)
Efficiency of water heater (217)m	84.8438	84.5938	84.0856	83.0763	81.6771	79.8000	79.8000	79.8000	79.8000	83.0191	84.2682	79.8000 (216)
Fuel for water heating, kWh/month	226.7757	201.2921	215.6844	193.4531	191.7389	177.9649	176.5470	182.9843	184.3378	196.2622	203.9707	224.3777 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	15.9451	12.7917	11.5175	8.4382	6.5179	5.3252	5.9459	7.7287	10.0388	13.1714	14.8771	16.3882 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-13.5536	-20.1624	-30.5685	-36.3268	-40.9181	-38.8583	-38.4088	-35.4019	-30.3885	-23.9265	-15.2784	-11.5999 (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)

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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	-4.7561	-10.2378	-20.7819	-31.8508	-42.7322	-43.1411	-42.6097	-35.7738	-25.8413	-14.8225	-6.4097	-3.7423	(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												1502.4248	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2375.3888	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												128.6858	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-618.0910	(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												3474.4085	(238)

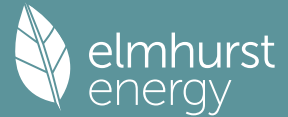
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1502.4248	0.2100	315.5092	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2375.3888	0.2100	498.8317	(264)
Space and water heating			814.3409	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	128.6858	0.1443	18.5733	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.3918	0.1335	-44.7587	
PV Unit electricity exported	-282.6992	0.1253	-35.4284	
Total			-80.1871	(269)
Total CO2, kg/year			764.6563	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.2900	(273)

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	1502.4248	1.1300	1697.7401	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2375.3888	1.1300	2684.1894	(278)
Space and water heating			4381.9294	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	128.6858	1.5338	197.3825	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-335.3918	1.4932	-500.7908	
PV Unit electricity exported	-282.6992	0.4600	-130.0390	
Total			-630.8298	(283)
Total Primary energy kWh/year			4078.5829	(286)
Target Primary Energy Rate (TPER)			81.5400	(287)

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Plot Reference	B3.1-3.3 2B4P Ground				Issued on Date	19/12/2025	
Assessment Reference	2B4P		Plot Type Ref	2B4P			
Plot Address					SAP Version	10.2	
SAP Rating	78 C	DER	4.69	TER	14.18		
Environmental	96 A	% DER < TER				66.93	
CO ₂ Emissions (t/year)	0.28	DFEE	38.51	TFEE	39.60		
Compliance Check	See BREL	% DFEE < TFEE				2.76	
% DPER < TPER	34.85	DPER	49.00	TPER	75.20		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		174.1500 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

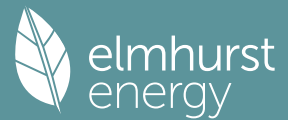
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
Ground Floor			69.6600	0.1300	9.0558	110.0000	7662.6000 (28a)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Total net area of external elements Aum(A, m ²)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.6840		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Ceiling			69.6600			100.0000	6966.0000 (32b)
Stud			120.0000			9.0000	1080.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16840.2200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		241.7488 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E5 Ground floor (normal)	23.4400	0.1600	3.7504
E7 Party floor between dwellings (in blocks of flats)	23.4400	0.0700	1.6408
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	11.5900	0.0800	0.9272
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9869 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	43.6709 (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	17.3881	17.2049	17.0217	16.1058	15.9226	15.0067	15.0067	14.8235	15.3731	15.9226	16.2890	16.6554	(38)
Heat transfer coeff	61.0590	60.8758	60.6926	59.7767	59.5935	58.6776	58.6776	58.4944	59.0440	59.5935	59.9599	60.3263	(39)
Average = Sum(39)m / 12 =												59.7309	
HLP	0.8765	0.8739	0.8713	0.8581	0.8555	0.8423	0.8423	0.8397	0.8476	0.8555	0.8608	0.8660	(40)
HLP (average)												0.8575	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)
Average daily hot water use (litres/day)												58.8652	(43)
Daily hot water use	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314	(44)
Energy conte	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143	(45)
Energy content (annual)										Total = Sum(45)m =		977.6245	
Distribution loss (46)m = 0.15 x (45)m	15.2567	13.3413	13.9564	11.9392	11.3095	9.9208	9.6741	10.2609	10.5827	12.1099	13.2301	15.0621	(46)
Water storage loss (or HIU loss):													
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)
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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911	(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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1628.4643	(64)
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												562.4246	(64a)
Heat gains from water heating, kWh/month	90.4015	80.5291	87.1848	80.7371	80.9830	75.9393	77.1907	78.6587	77.7301	83.0916	83.9221	89.9702	(65)

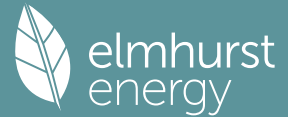
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	121.5074	119.8349	117.1839	112.1348	108.8482	105.4712	103.7509	105.7240	107.9584	111.6822	116.5585	120.9277	(72)
Total internal gains	473.6901	484.6759	466.2673	453.5828	433.1839	420.1325	406.4383	406.3723	417.0489	428.4080	450.3965	464.4402	(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	
North	4.6300	10.6334	0.4000	0.7000	0.7700	9.5531	(74)
Northwest	12.6500	11.2829	0.4000	0.7000	0.7700	27.6952	(81)

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Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812 (83)
Total gains	510.9383	559.3067	598.8580	670.2172	724.5273	731.0324	697.1457	637.8700	578.1105	519.0338	497.0292	495.0214 (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	76.6118	76.8423	77.0742	78.2552	78.4958	79.7210	79.7210	79.9707	79.2264	78.4958	78.0161	77.5423
alpha	6.1075	6.1228	6.1383	6.2170	6.2331	6.3147	6.3147	6.3314	6.2818	6.2331	6.2011	6.1695
util living area	0.9926	0.9859	0.9679	0.8920	0.7254	0.5100	0.3699	0.4208	0.6797	0.9256	0.9832	0.9938 (86)
MIT	20.1465	20.2858	20.4992	20.7903	20.9521	20.9954	20.9995	20.9989	20.9757	20.7669	20.4241	20.1297 (87)
Th 2	20.1875	20.1897	20.1920	20.2032	20.2055	20.2168	20.2168	20.2190	20.2123	20.2055	20.2010	20.1965 (88)
util rest of house	0.9905	0.9819	0.9586	0.8649	0.6751	0.4492	0.3043	0.3499	0.6117	0.9002	0.9777	0.9920 (89)
MIT 2	19.4148	19.5539	19.7637	20.0428	20.1758	20.2148	20.2167	20.2187	20.2001	20.0296	19.7005	19.4056 (90)
Living area fraction	19.7425	19.8817	20.0931	20.3776	20.5235	20.5644	20.5673	20.5682	20.5475	20.3598	20.0246	0.4479 (91)
MIT	19.7425	19.8817	20.0931	20.3776	20.5235	20.5644	20.5673	20.5682	20.5475	20.3598	20.0246	19.7299 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7425	19.8817	20.0931	20.3776	20.5235	20.5644	20.5673	20.5682	20.5475	20.3598	20.0246	19.7299 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9890	0.9800	0.9573	0.8713	0.6958	0.4764	0.3337	0.3817	0.6414	0.9057	0.9762	0.9907 (94)
Useful gains	505.3178	548.1277	573.2867	583.9701	504.1336	348.2281	232.6379	243.4721	370.7914	470.0777	485.1995	490.4141 (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	942.9057	912.0241	825.0017	686.0936	525.8231	349.9780	232.7901	243.8139	380.6863	581.6227	774.9585	936.8630 (97)
Space heating kWh	325.5654	244.5384	187.2759	73.5289	16.1370	0.0000	0.0000	0.0000	0.0000	82.9895	208.6265	332.1580 (98a)
Space heating requirement - total per year (kWh/year)												1470.8195
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	325.5654	244.5384	187.2759	73.5289	16.1370	0.0000	0.0000	0.0000	0.0000	82.9895	208.6265	332.1580 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1470.8195
Space heating per m2										(98c) / (4) =		21.1143 (99)

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-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	325.5654	244.5384	187.2759	73.5289	16.1370	0.0000	0.0000	0.0000	0.0000	82.9895	208.6265	332.1580 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	512.7654	385.1480	294.9596	115.8081	25.4157	0.0000	0.0000	0.0000	0.0000	130.7084	328.5867	523.1488
Space heating requirement	512.7654	385.1480	294.9596	115.8081	25.4157	0.0000	0.0000	0.0000	0.0000	130.7084	328.5867	523.1488 (307)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating												
Annual water heating requirement	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366
Water heating fuel	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.8945	12.5499	13.8945	13.4463	13.8945	13.4463	13.8945	13.8945	13.4463	13.8945	13.4463	13.8945 (311)
Lighting	21.9786	17.6321	15.8757	11.6312	8.9843	7.3403	8.1958	10.6532	13.8374	18.1555	20.5066	22.5895 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	(333a)m	-12.8810	-21.8363	-38.2005	-50.7667	-60.7949	-59.1077	-58.1540	-51.5182	-40.5268	-27.7451	-15.2052
Electricity generated by wind turbines (Appendix M) (negative quantity)	(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												2316.5407 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2442.6964 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												23.1654 (313)
Space cooling fuel												0.0000 (321)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												163.5965 (330a)
Total electricity for the above, kWh/year												163.5965 (331)
Electricity for lighting (calculated in Appendix L)												177.3801 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

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PV generation	-447.3514	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5215.2869	(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			280.0000 (367)
Space and Water heating from Heat pump	1699.7275	0.1567	129.6125 (367)
Electrical energy for heat distribution (space & water)	23.1654	0.0000	7.0595 (372)
Overall CO2 factor for heat network			0.0545 (386)
Total CO2 associated with community systems			259.1838 (373)
Energy for instantaneous electric shower(s)	562.4246	0.1391	78.2457 (264a)
Space and water heating			259.1838 (376)
Pumps, fans and electric keep-hot	163.5965	0.1387	22.6929 (378)
Energy for lighting	177.3801	0.1443	25.6014 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	0.1314	-58.7846
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.7846 (380)
Total CO2, kg/year			326.9392 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6900 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1699.7275	1.5800	1307.1862 (467)
Electrical energy for heat distribution (space & water)	23.1654	0.0000	73.7117 (472)
Overall CO2 factor for heat network			0.5686 (486)
Total CO2 associated with community systems			2706.2730 (473)
Energy for instantaneous electric shower(s)	562.4246	1.5143	851.6987 (278a)
Space and water heating			2706.2730 (476)
Pumps, fans and electric keep-hot	163.5965	1.5128	247.4888 (478)
Energy for lighting	177.3801	1.5338	272.0716 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	1.4855	-664.5288
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-664.5288 (480)
Total Primary energy kWh/year			3413.0033 (483)
Dwelling Primary energy Rate (DPER)			49.0000 (484)

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

1. Overall dwelling characteristics

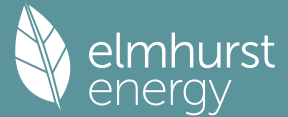
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.1500 (5)

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	2 * 10 = 20.0000 (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) = 20.0000 / (5) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3648 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3101 (21)

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

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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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.5300	1.1450	17.7824		(27)
Ground Floor			69.6600	0.1300	9.0558		(28a)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820		(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304		(29a)
Total net area of external elements Aum(A, m2)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					36.1406		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							241.7488 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E5 Ground floor (normal)	23.4400	0.1600	3.7504
E7 Party floor between dwellings (in blocks of flats)	23.4400	0.0700	1.6408
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	11.5900	0.0800	0.9272
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9869 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	45.1275 (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	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501 (38)
Heat transfer coeff	78.3547	78.1803	78.0093	77.2061	77.0559	76.3563	76.3563	76.2268	76.6258	77.0559	77.3598	77.6776 (39)
Average = Sum(39)m / 12 =												77.2054
HLP	1.1248	1.1223	1.1199	1.1083	1.1062	1.0961	1.0961	1.0943	1.1000	1.1062	1.1105	1.1151 (40)
HLP (average)												1.1083
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers	61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043 (42a)	
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837 (42b)	
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477 (42c)	
Average daily hot water use (litres/day)												115.7882 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357 (44)	
Energy content (annual)	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152 (45)	
Distribution loss (46)m = 0.15 x (45)m	29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073 (46)	
Water storage loss (or HIU 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	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)	
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 (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	246.0887	217.6250	231.0271	202.5443	195.9850	176.1984	173.5259	180.5861	182.7713	204.3019	217.8714	243.3101 (62)	
WWHRS	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027 (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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)	
12Total per year (kWh/year)												2209.5770 (64)	
Electric shower(s)												2210 (64)	
	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)	
												0.0000 (64a)	
Heat gains from water heating, kWh/month	103.6076	92.0354	98.5996	88.4264	86.9481	79.6664	79.4805	81.8280	81.8519	89.7135	93.5227	102.6837 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 111.8921	Feb 111.8921	Mar 111.8921	Apr 111.8921	May 111.8921	Jun 111.8921	Jul 111.8921	Aug 111.8921	Sep 111.8921	Oct 111.8921	Nov 111.8921	Dec 111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Pumps, fans	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (69)
Losses e.g. evaporation	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137 (71)
Total internal gains	139.2575	136.9574	132.5264	122.8145	116.8658	110.6478	106.8286	109.9838	113.6832	120.5827	129.8926	138.0158 (72)
	494.4403	504.7985	484.6099	467.2627	444.2016	425.3092	409.5161	410.6322	422.7737	440.3085	466.7309	484.5284 (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	
North						4.1600	10.6334	0.6300	0.7000	0.7700	13.5188 (74)	
Northwest						11.3700	11.2829	0.6300	0.7000	0.7700	39.2062 (81)	
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	547.1653	610.4389	672.2937	773.9118	856.6023	865.3923	821.0164	738.3206	650.7587	568.5902	532.7395	527.8160 (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	59.7008	59.8340	59.9652	60.5890	60.7071	61.2633	61.2633	61.3674	61.0478	60.7071	60.4686	60.2212
alpha	4.9801	4.9889	4.9977	5.0393	5.0471	5.0842	5.0842	5.0912	5.0699	5.0471	5.0312	5.0147
util living area	0.9924	0.9859	0.9685	0.9022	0.7524	0.5508	0.4066	0.4692	0.7383	0.9412	0.9850	0.9936 (86)
MIT	19.7847	19.9567	20.2372	20.6242	20.8851	20.9808	20.9966	20.9933	20.9230	20.5759	20.1237	19.7586 (87)
Th 2	19.9806	19.9827	19.9846	19.9940	19.9958	20.0040	20.0040	20.0055	20.0008	19.9958	19.9922	19.9885 (88)
util rest of house	0.9900	0.9816	0.9587	0.8737	0.6942	0.4710	0.3160	0.3707	0.6572	0.9175	0.9797	0.9916 (89)
MIT 2	18.5812	18.8006	19.1539	19.6255	19.9046	19.9936	20.0029	20.0032	19.9508	19.5821	19.0211	18.5538 (90)
Living area fraction	FLA = Living area / (4) = 0.4479 (91)											
MIT	19.1203	19.3184	19.6391	20.0728	20.3438	20.4358	20.4480	20.4467	20.3862	20.0272	19.5149	19.0934 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1203	19.3184	19.6391	20.0728	20.3438	20.4358	20.4480	20.4467	20.3862	20.0272	19.5149	19.0934 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9874	0.9779	0.9546	0.8762	0.7154	0.5062	0.3566	0.4149	0.6903	0.9183	0.9764	0.9893 (94)
Ext temp.	540.2664	596.9740	641.7472	678.0929	612.8120	438.0685	292.8015	306.3418	449.2316	522.1556	520.1487	522.1573 (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	1161.2364	1127.2341	1024.9714	862.6058	666.0521	445.5998	293.8191	308.4634	481.6857	726.4233	960.4169	1156.8834 (97)
Space heating requirement - total per year (kWh/year)	462.0016	356.3348	285.1188	132.8493	39.6107	0.0000	0.0000	0.0000	0.0000	151.9752	316.9930	472.2362 (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)	462.0016	356.3348	285.1188	132.8493	39.6107	0.0000	0.0000	0.0000	0.0000	151.9752	316.9930	472.2362 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2217.1197											
Space heating per m ²	(98c) / (4) = 31.8277 (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 %)	92.3000 (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)	462.0016	356.3348	285.1188	132.8493	39.6107	0.0000	0.0000	0.0000	0.0000	151.9752	316.9930	472.2362 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	500.5435	386.0615	308.9045	143.9321	42.9151	0.0000	0.0000	0.0000	0.0000	164.6535	343.4378	511.6319 (211)
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 (212)
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 (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 requirement	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)
Efficiency of water heater (217)m	85.7026	85.4192	84.8010	83.3782	81.3154	79.8000	79.8000	79.8000	79.8000	83.6433	85.1537	79.8000 (216)
Fuel for water heating, kWh/month	254.2085	225.5492	241.6099	216.9630	216.2113	199.1694	197.1757	204.7375	206.6567	219.0826	227.8467	251.3847 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897 (233a)

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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	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764	(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												2402.0798	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2660.5952	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												166.2031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-860.7801	(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												4454.0980	(238)

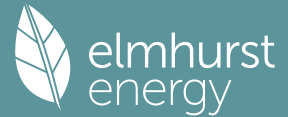
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2402.0798	0.2100	504.4368	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2660.5952	0.2100	558.7250	(264)
Space and water heating			1063.1618	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.2031	0.1443	23.9882	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565	
PV Unit electricity exported	-404.3441	0.1253	-50.6814	
Total			-111.6379	(269)
Total CO2, kg/year			987.4413	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1800	(273)

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	2402.0798	1.1300	2714.3502	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2660.5952	1.1300	3006.4725	(278)
Space and water heating			5720.8228	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	166.2031	1.5338	254.9278	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942	
PV Unit electricity exported	-404.3441	0.4601	-186.0248	
Total			-867.7189	(283)
Total Primary energy kWh/year			5238.1324	(286)
Target Primary Energy Rate (TPER)			75.2000	(287)

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Plot Reference	B3.1-3.3 2B4P Ground				Issued on Date	19/12/2025	
Assessment Reference	2B4P		Plot Type Ref	2B4P			
Plot Address					SAP Version	10.2	
SAP Rating	78 C	DER	4.69	TER	14.18		
Environmental	96 A	% DER < TER				66.93	
CO ₂ Emissions (t/year)	0.28	DFEE	38.51	TFEE	39.60		
Compliance Check	See BREL	% DFEE < TFEE				2.76	
% DPER < TPER	34.85	DPER	49.00	TPER	75.20		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (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	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2648 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2251 (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)
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	0.2870	0.2814	0.2758	0.2476	0.2420	0.2139	0.2139	0.2082	0.2251	0.2420	0.2533	0.2645 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5412	0.5396	0.5380	0.5307	0.5293	0.5229	0.5229	0.5217	0.5253	0.5293	0.5321	0.5350 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
Ground Floor			69.6600	0.1300	9.0558	110.0000	7662.6000 (28a)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Total net area of external elements Aum(A, m ²)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.6840		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Ceiling			69.6600			100.0000	6966.0000 (32b)
Stud			120.0000			9.0000	1080.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) = 16840.2200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							241.7488 (35)
List of Thermal Bridges							
K1 Element					Length	Psi-value	Total
E2 Other lintels (including other steel lintels)					9.9500	0.0500	0.4975
E3 Sill					3.6200	0.0500	0.1810

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E4 Jamb						23.3000		0.0500		1.1650		
E5 Ground floor (normal)						23.4400		0.1600		3.7504		
E7 Party floor between dwellings (in blocks of flats)						23.4400		0.0700		1.6408		
E16 Corner (normal)						2.5000		0.0900		0.2250		
E18 Party wall between dwellings						7.5000		0.0600		0.4500		
E25 Staggered party wall between dwellings						2.5000		0.0600		0.1500		
P1 Party wall - Ground floor						11.5900		0.0800		0.9272		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)						11.5900		0.0000		0.0000		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											8.9869	(36)
Point Thermal bridges											0.0000	
Total fabric heat loss										(33) + (36) + (36a) =	43.6709	(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	31.1020	31.0101	30.9200	30.4968	30.4176	30.0490	30.0490	29.9807	30.1910	30.4176	30.5778	30.7452
Average = Sum(39)m / 12 =	74.7729	74.6810	74.5909	74.1677	74.0885	73.7199	73.7199	73.6516	73.8618	74.0885	74.2487	74.4161
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0734	1.0721	1.0708	1.0647	1.0636	1.0583	1.0583	1.0573	1.0603	1.0636	1.0659	1.0683
HLP (average)												1.0647
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.2378
Hot water usage for mixer showers												
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for other uses	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837
Average daily hot water use (litres/day)	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314
Energy content (annual)	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143
Distribution loss (46)m = 0.15 x (45)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
Water storage loss (or HIU loss):												
Total storage 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
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Primary 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
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
Total heat required for water heating calculated for each month	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521
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
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
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
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
Output from w/h	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521
12Total per year (kWh/year)												831
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												562.4246
Heat gains from water heating, kWh/month	33.9747	29.9140	31.7982	28.3907	27.7140	25.2077	25.2300	26.2285	26.4690	29.1823	30.5431	33.6991

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	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892
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
Losses e.g. evaporation (negative values) (Table 5)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137
Water heating gains (Table 5)	45.6649	44.5149	42.7396	39.4316	37.2500	35.0107	33.9113	35.2534	36.7625	39.2235	42.4210	45.2945
Total internal gains	397.8476	409.3559	391.8229	380.8796	361.5857	349.6720	336.5986	335.9016	345.8529	355.9492	376.2590	388.8069

6. Solar gains												

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	g											
	Specific data											
	or Table 6c											
	FF											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
North	4.6300											9.5531
Northwest	12.6500											27.6952
Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812
Total gains	435.0959	483.9867	524.4137	597.5140	652.9291	660.5718	627.3060	567.3994	506.9146	446.5750	422.8917	419.3881

7. Mean internal temperature (heating season)												

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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	62.5606	62.6376	62.7133	63.0711	63.1386	63.4543	63.4543	63.5131	63.3323	63.1386	63.0023	62.8606
alpha	5.1707	5.1758	5.1809	5.2047	5.2092	5.2303	5.2303	5.2342	5.2222	5.2092	5.2002	5.1907
util living area	0.9972	0.9946	0.9878	0.9563	0.8606	0.6742	0.5090	0.5802	0.8415	0.9746	0.9943	0.9977 (86)
MIT	19.6938	19.8439	20.0961	20.4765	20.7959	20.9575	20.9919	20.9846	20.8665	20.4615	20.0182	19.6653 (87)
Th 2	20.0226	20.0237	20.0248	20.0298	20.0307	20.0350	20.0350	20.0359	20.0334	20.0307	20.0288	20.0268 (88)
util rest of house	0.9963	0.9928	0.9835	0.9406	0.8145	0.5883	0.4016	0.4670	0.7726	0.9626	0.9921	0.9970 (89)
MIT 2	18.8329	18.9832	19.2340	19.6068	19.8935	20.0156	20.0329	20.0313	19.9585	19.5990	19.1613	18.8079 (90)
Living area fraction									fLA = Living area /	(4) =		0.4479 (91)
MIT	19.2185	19.3687	19.6201	19.9963	20.2977	20.4375	20.4624	20.4583	20.3652	19.9853	19.5451	19.1919 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2185	19.3687	19.6201	19.9963	20.2977	20.4375	20.4624	20.4583	20.3652	19.9853	19.5451	19.1919 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9953	0.9913	0.9813	0.9400	0.8284	0.6255	0.4499	0.5179	0.7987	0.9619	0.9906	0.9961 (94)
Useful gains	433.0496	479.7743	514.5996	561.6687	540.8893	413.2062	282.2217	293.8701	404.8936	429.5754	418.9226	417.7539 (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	1115.4991	1080.5362	978.6409	822.9869	636.9881	430.3389	284.7377	298.9009	462.7580	695.3419	924.0298	1115.6407 (97)
Space heating kWh	507.7425	403.7120	345.2467	188.1491	71.4975	0.0000	0.0000	0.0000	0.0000	197.7303	363.6772	519.2278 (98a)
Space heating requirement - total per year (kWh/year)												2596.9831
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	507.7425	403.7120	345.2467	188.1491	71.4975	0.0000	0.0000	0.0000	0.0000	197.7303	363.6772	519.2278 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2596.9831
Space heating per m2										(98c) / (4) =		37.2808 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	692.9667	545.5270	559.7522	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8631	0.9233	0.8847	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	598.0803	503.6646	495.2306	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	734.8477	697.9045	629.8067	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	98.4725	144.5145	100.1246	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area /	(4) =		1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.6181	36.1286	25.0312	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												85.7779 (107)
Energy for space heating												37.2808 (99)
Energy for space cooling												1.2314 (108)
Total												38.5122 (109)
Fabric Energy Efficiency (DFEE)												38.5 (109)

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

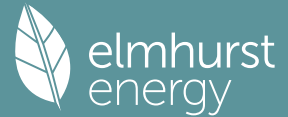
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.1500 (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	2 * 10 = 20.0000 (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	20.0000 / (5) = 0.1148 (8)
Pressure test	Yes

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Pressure Test Method
Measured/design AP50
Infiltration rate
Number of sides sheltered

Blower Door
5.0000 (17)
0.3648 (18)
2 (19)

Shelter factor
Infiltration rate adjusted to include shelter factor

(20) = 1 - [0.075 x (19)] = 0.8500 (20)
(21) = (18) x (20) = 0.3101 (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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			15.5300	1.1450	17.7824			(27)
Ground Floor			69.6600	0.1300	9.0558			(28a)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820			(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304			(29a)
Total net area of external elements Aum (A, m2)			128.2600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 36.1406			(33)
Main dwelling								
Party Wall			28.9800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 241.7488 (35)

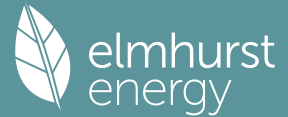
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	9.9500	0.0500	0.4975	
E2 Other lintels (including other steel lintels)	3.6200	0.0500	0.1810	
E3 Sill	23.3000	0.0500	1.1650	
E4 Jamb	23.4400	0.1600	3.7504	
E5 Ground floor (normal)	23.4400	0.0700	1.6408	
E7 Party floor between dwellings (in blocks of flats)	2.5000	0.0900	0.2250	
E16 Corner (normal)	7.5000	0.0600	0.4500	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	11.5900	0.0800	0.9272	
P1 Party wall - Ground floor	11.5900	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9869	(36)
Point Thermal bridges			0.0000	(36a) =
Total fabric heat loss			(33) + (36) + (36a) = 45.1275	(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	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501	(38)
Heat transfer coeff	78.3547	78.1803	78.0093	77.2061	77.0559	76.3563	76.3563	76.2268	76.6258	77.0559	77.3598	77.6776	(39)
Average = Sum(39)m / 12 =												77.2054	
HLP	1.1248	1.1223	1.1199	1.1083	1.1062	1.0961	1.0961	1.0943	1.1000	1.1062	1.1105	1.1151	(40)
HLP (average)												1.1083	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	37.5477	(42c)
Average daily hot water use (litres/day)													58.8652	(43)
Daily hot water use	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314	64.1314	(44)
Energy conte	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143	100.4143	(45)
Energy content (annual)										Total = Sum(45)m =			977.6245	
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage loss (or HIU loss):														
Total storage 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	0.0000	(56)
If cylinder contains dedicated solar storage														
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary 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	0.0000	(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	0.0000	(61)
Total heat required for water heating calculated for each month	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521	85.3521	(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	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	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	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	0.0000	(63d)
Output from w/h	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521	85.3521	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			830.9808	(64)
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442	49.4442	(64a)
													562.4246	(64a)
Heat gains from water heating, kWh/month	33.9747	29.9140	31.7982	28.3907	27.7140	25.2077	25.2300	26.2285	26.4690	29.1823	30.5431	33.6991	33.6991	(65)

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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	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137 (71)
Water heating gains (Table 5)	45.6649	44.5149	42.7396	39.4316	37.2500	35.0107	33.9113	35.2534	36.7625	39.2235	42.4210	45.2945 (72)
Total internal gains	397.8477	409.3561	391.8231	380.8798	361.5858	349.6721	336.5987	335.9018	345.8530	355.9493	376.2592	388.8071 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	4.1600		10.6334		0.6300		0.7000		0.7700		13.5188 (74)	
Northwest	11.3700		11.2829		0.6300		0.7000		0.7700		39.2062 (81)	
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	450.5727	514.9964	579.5069	687.5289	773.9865	789.7551	748.0991	663.5901	573.8380	484.2310	442.2678	432.0947 (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	59.7008	59.8340	59.9652	60.5890	60.7071	61.2633	61.2633	61.3674	61.0478	60.7071	60.4686	60.2212
alpha	4.9801	4.9889	4.9977	5.0393	5.0471	5.0842	5.0842	5.0912	5.0699	5.0471	5.0312	5.0147
util living area	0.9968	0.9931	0.9824	0.9332	0.8009	0.5971	0.4448	0.5185	0.7993	0.9673	0.9932	0.9974 (86)
MIT	19.6356	19.8131	20.1073	20.5340	20.8459	20.9726	20.9949	20.9895	20.8882	20.4695	19.9875	19.6099 (87)
Th 2	19.9806	19.9827	19.9846	19.9940	19.9958	20.0040	20.0040	20.0055	20.0008	19.9958	19.9922	19.9885 (88)
util rest of house	0.9957	0.9909	0.9765	0.9113	0.7460	0.5131	0.3464	0.4114	0.7227	0.9523	0.9906	0.9965 (89)
MIT 2	18.7423	18.9203	19.2123	19.6278	19.8973	19.9922	20.0027	20.0026	19.9411	19.5770	19.1021	18.7228 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.1424	19.3202	19.6132	20.0337	20.3222	20.4313	20.4471	20.4446	20.3653	19.9768	19.4987	19.1201 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.1424	19.3202	19.6132	20.0337	20.3222	20.4313	20.4471	20.4446	20.3653	19.9768	19.4987	19.1201 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9945	0.9890	0.9738	0.9123	0.7651	0.5500	0.3906	0.4595	0.7530	0.9520	0.9889	0.9955 (94)
Useful gains	448.1088	509.3314	564.3275	627.2219	592.1724	434.3820	292.2079	304.9460	432.0757	460.9747	437.3728	430.1656 (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	1162.9725	1127.3746	1022.9484	859.5883	664.3885	445.2572	293.7524	308.3099	480.0840	722.5347	959.1581	1158.9596 (97)
Space heating kWh	531.8585	415.3250	341.2140	167.3038	53.7287	0.0000	0.0000	0.0000	0.0000	194.6007	375.6854	542.2227 (98a)
Space heating requirement - total per year (kWh/year)	2621.9388											
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	531.8585	415.3250	341.2140	167.3038	53.7287	0.0000	0.0000	0.0000	0.0000	194.6007	375.6854	542.2227 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2621.9388											
Space heating per m ²	(98c) / (4) = 37.6391 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	717.7497	565.0370	579.3237	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9098	0.9519	0.9202	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	653.0353	537.8708	533.0963	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	885.8410	839.0911	742.2373	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	167.6201	224.1079	155.6009	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	41.9050	56.0270	38.9002	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	136.8322 (107)											
Energy for space heating	37.6391 (99)											
Energy for space cooling	1.9643 (108)											
Total	39.6034 (109)											
Fabric Energy Efficiency (TFEE)	39.6 (109)											

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Plot Reference	B3.1-3.3 2B4P Ground			Issued on Date	19/12/2025
Assessment Reference	2B4P	Plot Type Ref	2B4P		
Plot Address				SAP Version	10.2
SAP Rating	78 C	DER	4.69	TER	14.18
Environmental	96 A	% DER < TER			66.93
CO ₂ Emissions (t/year)	0.28	DFEE	38.51	TFEE	39.60
Compliance Check	See BREL	% DFEE < TFEE			2.76
% DPER < TPER	34.85	DPER	49.00	TPER	75.20
Assessor Details	Mr. Matthew Stainrod			Assessor ID	AU83-0001
Client	ROK, Wilf Foster				

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

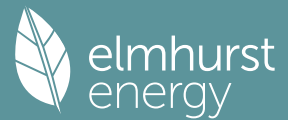
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
Ground Floor			69.6600	0.1300	9.0558	110.0000	7662.6000 (28a)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Total net area of external elements Aum(A, m ²)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.6840		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Ceiling			69.6600			100.0000	6966.0000 (32b)
Stud			120.0000			9.0000	1080.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	16840.2200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		241.7488 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E5 Ground floor (normal)	23.4400	0.1600	3.7504
E7 Party floor between dwellings (in blocks of flats)	23.4400	0.0700	1.6408
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	11.5900	0.0800	0.9272
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9869 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	43.6709 (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	17.3881	17.2049	17.0217	16.1058	15.9226	15.0067	15.0067	14.8235	15.3731	15.9226	16.2890	16.6554	(38)
Heat transfer coeff	61.0590	60.8758	60.6926	59.7767	59.5935	58.6776	58.6776	58.4944	59.0440	59.5935	59.9599	60.3263	(39)
Average = Sum(39)m / 12 =												59.7309	
HLP	0.8765	0.8739	0.8713	0.8581	0.8555	0.8423	0.8423	0.8397	0.8476	0.8555	0.8608	0.8660	(40)
HLP (average)												0.8575	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)
Average daily hot water use (litres/day)												58.8652	(43)
Daily hot water use	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314	(44)
Energy conte	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143	(45)
Energy content (annual)										Total = Sum(45)m =		977.6245	
Distribution loss (46)m = 0.15 x (45)m	15.2567	13.3413	13.9564	11.9392	11.3095	9.9208	9.6741	10.2609	10.5827	12.1099	13.2301	15.0621	(46)
Water storage loss (or HIU loss):													
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)
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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911	(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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1628.4643	(64)
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												562.4246	(64a)
Heat gains from water heating, kWh/month	90.4015	80.5291	87.1848	80.7371	80.9830	75.9393	77.1907	78.6587	77.7301	83.0916	83.9221	89.9702	(65)

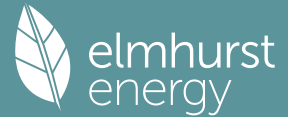
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	121.5074	119.8349	117.1839	112.1348	108.8482	105.4712	103.7509	105.7240	107.9584	111.6822	116.5585	120.9277	(72)
Total internal gains	473.6901	484.6759	466.2673	453.5828	433.1839	420.1325	406.4383	406.3723	417.0489	428.4080	450.3965	464.4402	(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	
North	4.6300	10.6334	0.4000	0.7000	0.7700	9.5531	(74)
Northwest	12.6500	11.2829	0.4000	0.7000	0.7700	27.6952	(81)

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Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812 (83)
Total gains	510.9383	559.3067	598.8580	670.2172	724.5273	731.0324	697.1457	637.8700	578.1105	519.0338	497.0292	495.0214 (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	76.6118	76.8423	77.0742	78.2552	78.4958	79.7210	79.7210	79.9707	79.2264	78.4958	78.0161	77.5423
alpha	6.1075	6.1228	6.1383	6.2170	6.2331	6.3147	6.3147	6.3314	6.2818	6.2331	6.2011	6.1695
util living area	0.9926	0.9859	0.9679	0.8920	0.7254	0.5100	0.3699	0.4208	0.6797	0.9256	0.9832	0.9938 (86)
MIT	20.1465	20.2858	20.4992	20.7903	20.9521	20.9954	20.9995	20.9989	20.9757	20.7669	20.4241	20.1297 (87)
Th 2	20.1875	20.1897	20.1920	20.2032	20.2055	20.2168	20.2168	20.2190	20.2123	20.2055	20.2010	20.1965 (88)
util rest of house	0.9905	0.9819	0.9586	0.8649	0.6751	0.4492	0.3043	0.3499	0.6117	0.9002	0.9777	0.9920 (89)
MIT 2	19.4148	19.5539	19.7637	20.0428	20.1758	20.2148	20.2167	20.2187	20.2001	20.0296	19.7005	19.4056 (90)
Living area fraction	19.7425	19.8817	20.0931	20.3776	20.5235	20.5644	20.5673	20.5682	20.5475	20.3598	20.0246	0.4479 (91)
MIT	19.7425	19.8817	20.0931	20.3776	20.5235	20.5644	20.5673	20.5682	20.5475	20.3598	20.0246	19.7299 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7425	19.8817	20.0931	20.3776	20.5235	20.5644	20.5673	20.5682	20.5475	20.3598	20.0246	19.7299 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9890	0.9800	0.9573	0.8713	0.6958	0.4764	0.3337	0.3817	0.6414	0.9057	0.9762	0.9907 (94)
Useful gains	505.3178	548.1277	573.2867	583.9701	504.1336	348.2281	232.6379	243.4721	370.7914	470.0777	485.1995	490.4141 (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	942.9057	912.0241	825.0017	686.0936	525.8231	349.9780	232.7901	243.8139	380.6863	581.6227	774.9585	936.8630 (97)
Space heating kWh	325.5654	244.5384	187.2759	73.5289	16.1370	0.0000	0.0000	0.0000	0.0000	82.9895	208.6265	332.1580 (98a)
Space heating requirement - total per year (kWh/year)												1470.8195
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	325.5654	244.5384	187.2759	73.5289	16.1370	0.0000	0.0000	0.0000	0.0000	82.9895	208.6265	332.1580 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1470.8195
Space heating per m2										(98c) / (4) =		21.1143 (99)

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-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	325.5654	244.5384	187.2759	73.5289	16.1370	0.0000	0.0000	0.0000	0.0000	82.9895	208.6265	332.1580 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	512.7654	385.1480	294.9596	115.8081	25.4157	0.0000	0.0000	0.0000	0.0000	130.7084	328.5867	523.1488
Space heating requirement	512.7654	385.1480	294.9596	115.8081	25.4157	0.0000	0.0000	0.0000	0.0000	130.7084	328.5867	523.1488 (307)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)

Water heating												
Annual water heating requirement	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366
Water heating fuel	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.8945	12.5499	13.8945	13.4463	13.8945	13.4463	13.8945	13.8945	13.4463	13.8945	13.4463	13.8945 (311)
Lighting	21.9786	17.6321	15.8757	11.6312	8.9843	7.3403	8.1958	10.6532	13.8374	18.1555	20.5066	22.5895 (332)
Electricity generated by PVs (Appendix M) (negative quantity)	(333a)m	-12.8810	-21.8363	-38.2005	-50.7667	-60.7949	-59.1077	-58.1540	-51.5182	-40.5268	-27.7451	-15.2052
Electricity generated by wind turbines (Appendix M) (negative quantity)	(334a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(335a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)	(333b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	(334b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	(335b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												2316.5407 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2442.6964 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												23.1654 (313)
Space cooling fuel												0.0000 (321)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												163.5965 (330a)
Total electricity for the above, kWh/year												163.5965 (331)
Electricity for lighting (calculated in Appendix L)												177.3801 (332)

Energy saving/generation technologies (Appendices M ,N and Q)

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PV generation	-447.3514	(333)
Wind generation	0.0000	(334)
Hydro-electric generation (Appendix N)	0.0000	(335a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(335)
Appendix Q - special features		
Energy saved or generated	-0.0000	(336)
Energy used	0.0000	(337)
Total delivered energy for all uses	5215.2869	(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			280.0000 (367)
Space and Water heating from Heat pump	1699.7275	0.1567	129.6125 (367)
Electrical energy for heat distribution (space & water)	23.1654	0.0000	7.0595 (372)
Overall CO2 factor for heat network			0.0545 (386)
Total CO2 associated with community systems			259.1838 (373)
Energy for instantaneous electric shower(s)	562.4246	0.1391	78.2457 (264a)
Space and water heating			259.1838 (376)
Pumps, fans and electric keep-hot	163.5965	0.1387	22.6929 (378)
Energy for lighting	177.3801	0.1443	25.6014 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	0.1314	-58.7846
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.7846 (380)
Total CO2, kg/year			326.9392 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6900 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1699.7275	1.5800	1307.1862 (467)
Electrical energy for heat distribution (space & water)	23.1654	0.0000	73.7117 (472)
Overall CO2 factor for heat network			0.5686 (486)
Total CO2 associated with community systems			2706.2730 (473)
Energy for instantaneous electric shower(s)	562.4246	1.5143	851.6987 (278a)
Space and water heating			2706.2730 (476)
Pumps, fans and electric keep-hot	163.5965	1.5128	247.4888 (478)
Energy for lighting	177.3801	1.5338	272.0716 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	1.4855	-664.5288
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-664.5288 (480)
Total Primary energy kWh/year			3413.0033 (483)
Dwelling Primary energy Rate (DPER)			49.0000 (484)

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

1. Overall dwelling characteristics

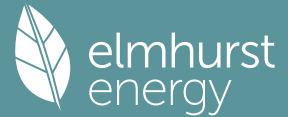
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.1500 (5)

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	2 * 10 = 20.0000 (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) = 20.0000 / (5) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3648 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3101 (21)

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

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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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.5300	1.1450	17.7824		(27)
Ground Floor			69.6600	0.1300	9.0558		(28a)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820		(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304		(29a)
Total net area of external elements Aum(A, m2)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					36.1406		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							241.7488 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E5 Ground floor (normal)	23.4400	0.1600	3.7504
E7 Party floor between dwellings (in blocks of flats)	23.4400	0.0700	1.6408
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P1 Party wall - Ground floor	11.5900	0.0800	0.9272
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5900	0.0000	0.0000
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.9869 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	45.1275 (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	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501 (38)
Heat transfer coeff	78.3547	78.1803	78.0093	77.2061	77.0559	76.3563	76.3563	76.2268	76.6258	77.0559	77.3598	77.6776 (39)
Average = Sum(39)m / 12 =												77.2054
HLP	1.1248	1.1223	1.1199	1.1083	1.1062	1.0961	1.0961	1.0943	1.1000	1.1062	1.1105	1.1151 (40)
HLP (average)												1.1083
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers	61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043 (42a)	
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837 (42b)	
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477 (42c)	
Average daily hot water use (litres/day)												115.7882 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357 (44)		
Energy content (annual)	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152 (45)	
Distribution loss (46)m = 0.15 x (45)m	29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073 (46)	
Water storage loss (or HIU 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	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)	
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 (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	246.0887	217.6250	231.0271	202.5443	195.9850	176.1984	173.5259	180.5861	182.7713	204.3019	217.8714	243.3101 (62)	
WWHRS	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027 (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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)	
12Total per year (kWh/year)												2209.5770 (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	103.6076	92.0354	98.5996	88.4264	86.9481	79.6664	79.4805	81.8280	81.8519	89.7135	93.5227	102.6837 (65)	

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 111.8921	Feb 111.8921	Mar 111.8921	Apr 111.8921	May 111.8921	Jun 111.8921	Jul 111.8921	Aug 111.8921	Sep 111.8921	Oct 111.8921	Nov 111.8921	Dec 111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Pumps, fans	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (69)
Losses e.g. evaporation	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137 (71)
Total internal gains	139.2575	136.9574	132.5264	122.8145	116.8658	110.6478	106.8286	109.9838	113.6832	120.5827	129.8926	138.0158 (72)
	494.4403	504.7985	484.6099	467.2627	444.2016	425.3092	409.5161	410.6322	422.7737	440.3085	466.7309	484.5284 (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	
North						4.1600	10.6334	0.6300	0.7000	0.7700	13.5188 (74)	
Northwest						11.3700	11.2829	0.6300	0.7000	0.7700	39.2062 (81)	
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	547.1653	610.4389	672.2937	773.9118	856.6023	865.3923	821.0164	738.3206	650.7587	568.5902	532.7395	527.8160 (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)												
tau	59.7008	59.8340	59.9652	60.5890	60.7071	61.2633	61.2633	61.3674	61.0478	60.7071	60.4686	60.2212
alpha	4.9801	4.9889	4.9977	5.0393	5.0471	5.0842	5.0842	5.0912	5.0699	5.0471	5.0312	5.0147
util living area	0.9924	0.9859	0.9685	0.9022	0.7524	0.5508	0.4066	0.4692	0.7383	0.9412	0.9850	0.9936 (86)
MIT	19.7847	19.9567	20.2372	20.6242	20.8851	20.9808	20.9966	20.9933	20.9230	20.5759	20.1237	19.7586 (87)
Th 2	19.9806	19.9827	19.9846	19.9940	19.9958	20.0040	20.0040	20.0055	20.0008	19.9958	19.9922	19.9885 (88)
util rest of house	0.9900	0.9816	0.9587	0.8737	0.6942	0.4710	0.3160	0.3707	0.6572	0.9175	0.9797	0.9916 (89)
MIT 2	18.5812	18.8006	19.1539	19.6255	19.9046	19.9936	20.0029	20.0032	19.9508	19.5821	19.0211	18.5538 (90)
Living area fraction									FLA = Living area / (4) =			0.4479 (91)
MIT	19.1203	19.3184	19.6391	20.0728	20.3438	20.4358	20.4480	20.4467	20.3862	20.0272	19.5149	19.0934 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1203	19.3184	19.6391	20.0728	20.3438	20.4358	20.4480	20.4467	20.3862	20.0272	19.5149	19.0934 (93)

8. Space heating requirement

Utilisation	0.9874	0.9779	0.9546	0.8762	0.7154	0.5062	0.3566	0.4149	0.6903	0.9183	0.9764	0.9893 (94)
Useful gains	540.2664	596.9740	641.7472	678.0929	612.8120	438.0685	292.8015	306.3418	449.2316	522.1556	520.1487	522.1573 (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	1161.2364	1127.2341	1024.9714	862.6058	666.0521	445.5998	293.8191	308.4634	481.6857	726.4233	960.4169	1156.8834 (97)
Space heating kWh	462.0016	356.3348	285.1188	132.8493	39.6107	0.0000	0.0000	0.0000	0.0000	151.9752	316.9930	472.2362 (98a)
Space heating requirement - total per year (kWh/year)												2217.1197
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	462.0016	356.3348	285.1188	132.8493	39.6107	0.0000	0.0000	0.0000	0.0000	151.9752	316.9930	472.2362 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2217.1197
Space heating per m ²										(98c) / (4) =		31.8277 (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 %)												92.3000 (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	462.0016	356.3348	285.1188	132.8493	39.6107	0.0000	0.0000	0.0000	0.0000	151.9752	316.9930	472.2362 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	500.5435	386.0615	308.9045	143.9321	42.9151	0.0000	0.0000	0.0000	0.0000	164.6535	343.4378	511.6319 (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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)
Efficiency of water heater (217)m	85.7026	85.4192	84.8010	83.3782	81.3154	79.8000	79.8000	79.8000	79.8000	83.6433	85.1537	79.8000 (216)
Fuel for water heating, kWh/month	254.2085	225.5492	241.6099	216.9630	216.2113	199.1694	197.1757	204.7375	206.6567	219.0826	227.8467	251.3847 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897 (233a)

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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	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764	(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												2402.0798	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2660.5952	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												166.2031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-860.7801	(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												4454.0980	(238)

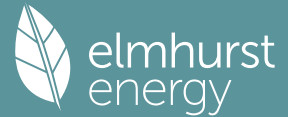
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2402.0798	0.2100	504.4368	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2660.5952	0.2100	558.7250	(264)
Space and water heating			1063.1618	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.2031	0.1443	23.9882	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565	
PV Unit electricity exported	-404.3441	0.1253	-50.6814	
Total			-111.6379	(269)
Total CO2, kg/year			987.4413	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.1800	(273)

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	2402.0798	1.1300	2714.3502	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2660.5952	1.1300	3006.4725	(278)
Space and water heating			5720.8228	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	166.2031	1.5338	254.9278	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942	
PV Unit electricity exported	-404.3441	0.4601	-186.0248	
Total			-867.7189	(283)
Total Primary energy kWh/year			5238.1324	(286)
Target Primary Energy Rate (TPER)			75.2000	(287)

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Plot Reference	B3.1-3.3 2B4P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B4P		Plot Type Ref		2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	80 C		DER	3.83		TER	12.03
Environmental	97 A		% DER < TER				68.16
CO ₂ Emissions (t/year)	0.23		DFEE	28.31		TFEE	29.83
Compliance Check	See BREL		% DFEE < TFEE				5.10
% DPER < TPER	36.79		DPER	40.24		TPER	63.67
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (5)

2. Ventilation rate

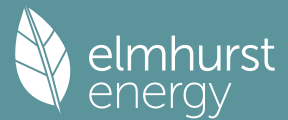
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Total net area of external elements Aum(A, m ²)			58.6000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.6282	(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Floor			69.6600			80.0000	5572.8000 (32d)
Party Ceiling			69.6600			100.0000	6966.0000 (32b)
Stud			120.0000			9.0000	1080.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14750.4200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							211.7488 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E7 Party floor between dwellings (in blocks of flats)	38.3500	0.0700	2.6845
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - intermediate floor between dwellings (in blocks of flats)	23.1800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5300	0.0200	0.1706

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5236 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.1518 (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	17.3881	17.2049	17.0217	16.1058	15.9226	15.0067	15.0067	14.8235	15.3731	15.9226	16.2890	16.6554 (38)
Average = Sum(39)m / 12 =	48.5399	48.3567	48.1735	47.2576	47.0744	46.1585	46.1585	45.9753	46.5249	47.0744	47.4408	47.8072 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6968	0.6942	0.6916	0.6784	0.6758	0.6626	0.6626	0.6600	0.6679	0.6758	0.6810	0.6863 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2378 (42)											
Hot water usage for mixer showers	0.0000 (42a)											
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837 (42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477 (42c)
Average daily hot water use (litres/day)	58.8652 (43)											
Daily hot water use	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314 (44)
Energy content (annual)	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143 (45)
Distribution loss (46)m = 0.15 x (45)m	15.2567	13.3413	13.9564	11.9392	11.3095	9.9208	9.6741	10.2609	10.5827	12.1099	13.2301	15.0621 (46)
Water storage loss (or HIU loss):	110.0000 (47)											
Store volume	0.0152 (51)											
b) If manufacturer declared loss factor is not known :	1.0294 (52)											
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.6000 (53)											
Volume factor from Table 2a	1.0327 (55)											
Temperature factor from Table 2b	1.0327 (55)											
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)
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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (64)
12Total per year (kWh/year)	1628.4643 (64)											
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	562.4246 (64a)											
Heat gains from water heating, kWh/month	90.4015	80.5291	87.1848	80.7371	80.9830	75.9393	77.1907	78.6587	77.7301	83.0916	83.9221	89.9702 (65)

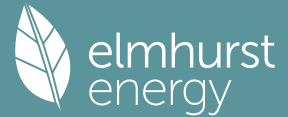
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137 (71)
Water heating gains (Table 5)	121.5074	119.8349	117.1839	112.1348	108.8482	105.4712	103.7509	105.7240	107.9584	111.6822	116.5585	120.9277 (72)
Total internal gains	473.6901	484.6759	466.2673	453.5828	433.1839	420.1325	406.4383	406.3723	417.0489	428.4080	450.3965	464.4402 (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
North	4.6300	10.6334	0.4000	0.7000	0.7700	9.5531 (74)
Northwest	12.6500	11.2829	0.4000	0.7000	0.7700	27.6952 (81)

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Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812 (83)
Total gains	510.9383	559.3067	598.8580	670.2172	724.5273	731.0324	697.1457	637.8700	578.1105	519.0338	497.0292	495.0214 (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	84.4118	84.7315	85.0537	86.7022	87.0396	88.7667	88.7667	89.1204	88.0677	87.0396	86.3674	85.7055
alpha	6.6275	6.6488	6.6702	6.7801	6.8026	6.9178	6.9178	6.9414	6.8712	6.8026	6.7578	6.7137
util living area	0.9821	0.9661	0.9263	0.7930	0.5963	0.4036	0.2913	0.3314	0.5509	0.8450	0.9590	0.9847 (86)
MIT	20.4034	20.5395	20.7218	20.9217	20.9889	20.9993	20.9999	20.9999	20.9951	20.9010	20.6456	20.3886 (87)
Th 2	20.3437	20.3460	20.3483	20.3599	20.3623	20.3740	20.3740	20.3763	20.3693	20.3623	20.3576	20.3530 (88)
util rest of house	0.9781	0.9588	0.9115	0.7629	0.5578	0.3644	0.2499	0.2866	0.5023	0.8131	0.9491	0.9813 (89)
MIT 2	19.8046	19.9387	20.1138	20.3012	20.3553	20.3737	20.3739	20.3763	20.3667	20.2894	20.0527	19.7981 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.0728	20.2078	20.3861	20.5791	20.6390	20.6539	20.6543	20.6556	20.6482	20.5633	20.3183	20.0626 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0728	20.2078	20.3861	20.5791	20.6390	20.6539	20.6543	20.6556	20.6482	20.5633	20.3183	20.0626 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9761	0.9570	0.9125	0.7735	0.5747	0.3819	0.2684	0.3067	0.5239	0.8237	0.9484	0.9794 (94)
Useful gains	498.7304	535.2825	546.4414	518.4212	416.3589	279.2160	187.1263	195.6140	302.8743	427.5036	471.3715	484.8340 (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	765.6081	740.2347	668.9431	551.9284	420.8005	279.4389	187.1416	195.6512	304.6521	469.0184	627.0845	758.3458 (97)
Space heating kWh	198.5570	137.7279	91.1413	24.1252	3.3045	0.0000	0.0000	0.0000	0.0000	30.8871	112.1133	203.4928 (98a)
Space heating requirement - total per year (kWh/year)	801.3491											
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	198.5570	137.7279	91.1413	24.1252	3.3045	0.0000	0.0000	0.0000	0.0000	30.8871	112.1133	203.4928 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	801.3491											
Space heating per m2	(98c) / (4) = 11.5037 (99)											

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-Space and Water													1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating													1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system													1.5000 (306)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating:													
Space heating requirement													
198.5570 137.7279 91.1413 24.1252 3.3045 0.0000 0.0000 0.0000 0.0000 30.8871 112.1133 203.4928 (98)													
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50													
307a 312.7272 216.9214 143.5476 37.9972 5.2046 0.0000 0.0000 0.0000 0.0000 48.6472 176.5785 320.5012													
Space heating requirement													
312.7272 216.9214 143.5476 37.9972 5.2046 0.0000 0.0000 0.0000 0.0000 48.6472 176.5785 320.5012 (307)													
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 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)													
Water heating													
Annual water heating requirement													
156.9881 138.8697 148.3197 133.0884 130.6734 119.6322 119.7707 123.6828 124.0448 136.0092 141.6941 155.6911 (64)													
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50													
310a 235.4821 208.3046 222.4795 199.6326 196.0101 179.4483 179.6561 185.5242 186.0673 204.0137 212.5412 233.5366													
Water heating fuel													
235.4821 208.3046 222.4795 199.6326 196.0101 179.4483 179.6561 185.5242 186.0673 204.0137 212.5412 233.5366 (310)													
Cooling System Energy Efficiency Ratio													0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)													
Pumps and Fa 13.8945 12.5499 13.8945 13.4463 13.8945 13.4463 13.8945 13.8945 13.4463 13.8945 13.4463 13.8945 (331)													
Lighting 21.9786 17.6321 15.8757 11.6312 8.9843 7.3403 8.1958 10.6532 13.8374 18.1555 20.5066 22.5895 (332)													
Electricity generated by PVs (Appendix M) (negative quantity)													
(333a)m -12.8810 -21.8363 -38.2005 -50.7667 -60.7949 -59.1077 -58.1540 -51.5182 -40.5268 -27.7451 -15.2052 -10.6150 (333a)													
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334a)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 (334a)													
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335a)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 (335a)													
Electricity generated by PVs (Appendix M) (negative quantity)													
(333b)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 (333b)													
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(334b)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 (334b)													
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(335b)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 (335b)													
Annual totals kWh/year													
Space heating fuel - community heating													1262.1248 (307)
Space heating fuel - secondary													0.0000 (309)
Water heating fuel - community heating													2442.6964 (310)
Efficiency of water heater													0.0000 (311)
Electricity used for heat distribution													12.6212 (313)
Space cooling fuel													0.0000 (321)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)													
mechanical ventilation fans (SFP = 0.7700)													163.5965 (330a)
Total electricity for the above, kWh/year													163.5965 (331)
Electricity for lighting (calculated in Appendix L)													177.3801 (332)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-447.3514 (333)

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Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4160.8709 (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			280.0000 (367)
Space and Water heating from Heat pump	1323.1504	0.1579	71.1737 (367)
Electrical energy for heat distribution (space & water)	12.6212	0.0000	5.4232 (372)
Overall CO2 factor for heat network			0.0537 (386)
Total CO2 associated with community systems			199.1087 (373)
Energy for instantaneous electric shower(s)	562.4246	0.1391	78.2457 (264a)
Space and water heating			199.1087 (376)
Pumps, fans and electric keep-hot	163.5965	0.1387	22.6929 (378)
Energy for lighting	177.3801	0.1443	25.6014 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	0.1314	-58.7846
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.7846 (380)
Total CO2, kg/year			266.8642 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1323.1504	1.5845	714.2360 (467)
Electrical energy for heat distribution (space & water)	12.6212	0.0000	57.1091 (472)
Overall CO2 factor for heat network			0.5659 (486)
Total CO2 associated with community systems			2096.7202 (473)
Energy for instantaneous electric shower(s)	562.4246	1.5143	851.6987 (278a)
Space and water heating			2096.7202 (476)
Pumps, fans and electric keep-hot	163.5965	1.5128	247.4888 (478)
Energy for lighting	177.3801	1.5338	272.0716 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	1.4855	-664.5288
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-664.5288 (480)
Total Primary energy kWh/year			2803.4505 (483)
Dwelling Primary energy Rate (DPER)			40.2400 (484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (5)

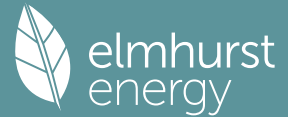
2. Ventilation rate

	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	2 * 10 = 20.0000 (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) =	20.0000 / (5) =	0.1148 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			5.0000 (17)
Infiltration rate			0.3648 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3101 (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)

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Adj infilt rate	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.5300	1.1450	17.7824		(27)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820		(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304		(29a)
Total net area of external elements Aum(A, m2)			58.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.0848		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000		(32)

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

211.7488 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E7 Party floor between dwellings (in blocks of flats)	38.3500	0.0700	2.6845
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	23.1800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5300	0.0200	0.1706

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

5.5236 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 32.6084 (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
	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501 (38)
Heat transfer coeff	65.8356	65.6612	65.4902	64.6870	64.5368	63.8372	63.8372	63.7077	64.1067	64.5368	64.8407	65.1585 (39)
Average = Sum(39)m / 12 =												64.6863

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9451	0.9426	0.9401	0.9286	0.9265	0.9164	0.9164	0.9146	0.9203	0.9265	0.9308	0.9354 (40)
HLP (average)												0.9286
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2378 (42)
Hot water usage for mixer showers												
61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043 (42a)	
Hot water usage for baths												
26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837 (42b)	
Hot water usage for other uses												
37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477 (42c)	
Average daily hot water use (litres/day)												115.7882 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357 (44)
Energy conte	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152 (45)
Energy content (annual)										Total = Sum(45)m =		1923.2178

Distribution loss (46)m = 0.15 x (45)m

29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073 (46)
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Water storage loss (or HIU loss):

Store volume 150.0000 (47)

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

Temperature factor from Table 2b 1.3938 (48)

Enter (49) or (54) in (55) 0.5400 (49)

Total storage loss 0.7527 (55)

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325 (56)
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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	23.3325 (57)
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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)
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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)
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Total heat required for water heating calculated for each month

246.0887	217.6250	231.0271	202.5443	195.9850	176.1984	173.5259	180.5861	182.7713	204.3019	217.8714	243.3101 (62)
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WWHRS	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027 (63a)
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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)
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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)
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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)
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Output from w/h	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)
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Total per year (kWh/year) = Sum(64)m = 2209.5770 (64)

12Total per year (kWh/year) 2210 (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)
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Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

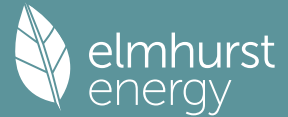
Heat gains from water heating, kWh/month

103.6076	92.0354	98.5996	88.4264	86.9481	79.6664	79.4805	81.8280	81.8519	89.7135	93.5227	102.6837 (65)
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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	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (69)

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Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation	(negative values) (Table 5)											
	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)												
	139.2575	136.9574	132.5264	122.8145	116.8658	110.6478	106.8286	109.9838	113.6832	120.5827	129.8926	138.0158 (72)
Total internal gains	494.4403	504.7985	484.6099	467.2627	444.2016	425.3092	409.5161	410.6322	422.7737	440.3085	466.7309	484.5284 (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			
North				4.1600	10.6334	0.6300	0.7000		13.5188 (74)			
Northwest				11.3700	11.2829	0.6300	0.7000	0.7700	39.2062 (81)			
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	547.1653	610.4389	672.2937	773.9118	856.6023	865.3923	821.0164	738.3206	650.7587	568.5902	532.7395	527.8160 (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)												
tau	62.2359	62.4013	62.5642	63.3410	63.4885	64.1841	64.1841	64.3146	63.9144	63.4885	63.1908	62.8826
alpha	5.1491	5.1601	5.1709	5.2227	5.2326	5.2789	5.2789	5.2876	5.2610	5.2326	5.2127	5.1922
util living area	0.9860	0.9743	0.9444	0.8440	0.6641	0.4673	0.3413	0.3951	0.6484	0.9004	0.9726	0.9881 (86)
MIT	19.9763	20.1542	20.4241	20.7623	20.9425	20.9924	20.9988	20.9975	20.9625	20.7077	20.2973	19.9500 (87)
Th 2	20.1293	20.1314	20.1335	20.1432	20.1451	20.1536	20.1536	20.1551	20.1503	20.1451	20.1414	20.1375 (88)
util rest of house	0.9825	0.9680	0.9311	0.8121	0.6132	0.4075	0.2761	0.3235	0.5796	0.8712	0.9647	0.9851 (89)
MIT 2	18.9456	19.1709	19.5067	19.9107	20.0985	20.1491	20.1531	20.1542	20.1250	19.8609	19.3609	18.9186 (90)
Living area fraction	19.4072	19.6113	19.9176	20.2921	20.4765	20.5268	20.5319	20.5319	20.5001	20.2402	19.7803	19.3806 (92)
MIT	19.4072	19.6113	19.9176	20.2921	20.4765	20.5268	20.5319	20.5319	20.5001	20.2402	19.7803	19.3806 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4072	19.6113	19.9176	20.2921	20.4765	20.5268	20.5319	20.5319	20.5001	20.2402	19.7803	19.3806 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9787	0.9634	0.9272	0.8181	0.6334	0.4341	0.3053	0.3555	0.6087	0.8748	0.9607	0.9817 (94)
Ext temp.	535.5232	588.0749	623.3717	633.1078	542.5665	375.6354	250.6676	262.5075	396.1097	497.4163	511.7954	518.1798 (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	994.5946	965.9602	878.7203	736.9240	566.4056	378.3509	251.0022	263.2339	410.2902	622.1458	822.2007	989.1431 (97)
Space heating requirement - total per year (kWh/year)	341.5491	253.9390	189.9793	74.7477	17.7362	0.0000	0.0000	0.0000	0.0000	92.7988	223.4918	350.3967 (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)	341.5491	253.9390	189.9793	74.7477	17.7362	0.0000	0.0000	0.0000	0.0000	92.7988	223.4918	350.3967 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1544.6386 (99)
Space heating per m2										(98c) / (4) =		22.1740 (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 %)												92.3000 (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	341.5491	253.9390	189.9793	74.7477	17.7362	0.0000	0.0000	0.0000	0.0000	92.7988	223.4918	350.3967 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	370.0424	275.1235	205.8281	80.9834	19.2158	0.0000	0.0000	0.0000	0.0000	100.5404	242.1363	379.6280 (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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)
Efficiency of water heater (217)m	85.0637	84.6800	83.8907	82.2370	80.5481	79.8000	79.8000	79.8000	79.8000	82.6148	84.3777	79.8000 (216)
Fuel for water heating, kWh/month	256.1177	227.5180	244.2315	219.9737	218.2709	199.1694	197.1757	204.7375	206.6567	221.8100	229.9419	253.2324 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897 (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)												

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(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	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764	(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												1673.4979	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2678.8354	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												166.2031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-860.7801	(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												3743.7563	(238)

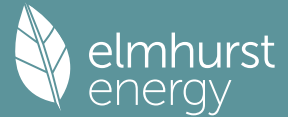
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1673.4979	0.2100	351.4346	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2678.8354	0.2100	562.5554	(264)
Space and water heating			913.9900	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.2031	0.1443	23.9882	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565	
PV Unit electricity exported	-404.3441	0.1253	-50.6814	
Total			-111.6379	(269)
Total CO2, kg/year			838.2696	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0300	(273)

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	1673.4979	1.1300	1891.0526	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2678.8354	1.1300	3027.0840	(278)
Space and water heating			4918.1366	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	166.2031	1.5338	254.9278	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942	
PV Unit electricity exported	-404.3441	0.4601	-186.0248	
Total			-867.7189	(283)
Total Primary energy kWh/year			4435.4463	(286)
Target Primary Energy Rate (TPER)			63.6700	(287)

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Plot Reference	B3.1-3.3 2B4P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B4P		Plot Type Ref		2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	80 C	DER	3.83	TER	12.03		
Environmental	97 A	% DER < TER				68.16	
CO ₂ Emissions (t/year)	0.23	DFEE	28.31	TFEE	29.83		
Compliance Check	See BREL	% DFEE < TFEE				5.10	
% DPER < TPER	36.79	DPER	40.24	TPER	63.67		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (5)

2. Ventilation rate

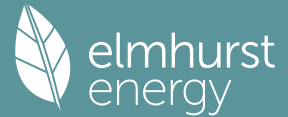
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2648 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2251 (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)
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	0.2870	0.2814	0.2758	0.2476	0.2420	0.2139	0.2139	0.2082	0.2251	0.2420	0.2533	0.2645 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5412	0.5396	0.5380	0.5307	0.5293	0.5229	0.5229	0.5217	0.5253	0.5293	0.5321	0.5350 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Total net area of external elements Aum(A, m ²)			58.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.6282		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Floor			69.6600			80.0000	5572.8000 (32a)
Party Ceiling			69.6600			100.0000	6966.0000 (32b)
Stud			120.0000			9.0000	1080.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	14750.4200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							211.7488 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.9500	0.0500	0.4975	
E3 Sill				3.6200	0.0500	0.1810	

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E4 Jamb	23.3000	0.0500	1.1650	
E7 Party floor between dwellings (in blocks of flats)	38.3500	0.0700	2.6845	
E16 Corner (normal)	2.5000	0.0900	0.2250	
E18 Party wall between dwellings	7.5000	0.0600	0.4500	
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	23.1800	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5300	0.0200	0.1706	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.5236	(36)
Point Thermal bridges			0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	31.1518	(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	31.1020	31.0101	30.9200	30.4968	30.4176	30.0490	30.0490	29.9807	30.1910	30.4176	30.5778	30.7452	(38)
Average = Sum(39)m / 12 =	62.2538	62.1619	62.0718	61.6486	61.5694	61.2008	61.2008	61.1325	61.3427	61.5694	61.7296	61.8970	(39)
												61.6482	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8937	0.8924	0.8911	0.8850	0.8839	0.8786	0.8786	0.8776	0.8806	0.8839	0.8862	0.8886	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	37.5477	(42c)
Average daily hot water use (litres/day)													58.8652	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314	64.1314	(44)
Energy content (annual)	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143	100.4143	(45)
Distribution loss (46)m = 0.15 x (45)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	0.0000	(46)
Water storage loss (or HIU 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	0.0000	(56)
Total storage 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	0.0000	(57)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Primary 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	0.0000	(61)
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	0.0000	(62)
Total heat required for water heating calculated for each month	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521	85.3521	(63a)
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	0.0000	(63b)
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	0.0000	(63c)
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	0.0000	(63d)
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	0.0000	(64)
Output from w/h	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521	85.3521	(64a)
12Total per year (kWh/year)													830.9808	(64)
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442	49.4442	(64a)
Heat gains from water heating, kWh/month	33.9747	29.9140	31.7982	28.3907	27.7140	25.2077	25.2300	26.2285	26.4690	29.1823	30.5431	33.6991	33.6991	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													562.4246	(64a)

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

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	187.8320	(68)
Pumps, fans	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	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)
Water heating gains (Table 5)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Total internal gains	45.6649	44.5149	42.7396	39.4316	37.2500	35.0107	33.9113	35.2534	36.7625	39.2235	42.4210	45.2945	45.2945	(72)
	397.8476	409.3559	391.8229	380.8796	361.5857	349.6720	336.5986	335.9016	345.8529	355.9492	376.2590	388.8069	388.8069	(73)

6. Solar gains

[Jan]												Gains
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		W	
North					4.6300	10.6334	0.4000	0.7000	0.7700		9.5531 (74)	
Northwest					12.6500	11.2829	0.4000	0.7000	0.7700		27.6952 (81)	
Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812 (83)
Total gains	435.0959	483.9867	524.4137	597.5140	652.9291	660.5718	627.3060	567.3994	506.9146	446.5750	422.8917	419.3881 (84)

7. Mean internal temperature (heating season)

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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	65.8167	65.9140	66.0097	66.4629	66.5483	66.9491	66.9491	67.0239	66.7942	66.5483	66.3756	66.1961	
alpha	5.3878	5.3943	5.4006	5.4309	5.4366	5.4633	5.4633	5.4683	5.4529	5.4366	5.4250	5.4131	
util living area	0.9947	0.9896	0.9767	0.9215	0.7843	0.5786	0.4268	0.4902	0.7600	0.9527	0.9890	0.9956 (86)	
MIT	19.8780	20.0350	20.2825	20.6382	20.8879	20.9824	20.9972	20.9943	20.9296	20.6019	20.1855	19.8482 (87)	
Th 2	20.1729	20.1740	20.1751	20.1803	20.1812	20.1858	20.1858	20.1866	20.1840	20.1812	20.1793	20.1772 (88)	
util rest of house	0.9932	0.9869	0.9703	0.9009	0.7374	0.5106	0.3491	0.4062	0.6938	0.9358	0.9855	0.9944 (89)	
MIT 2	19.1449	19.3014	19.5461	19.8892	20.1059	20.1773	20.1849	20.1847	20.1441	19.8626	19.4559	19.1187 (90)	
Living area fraction									fLA = Living area / (4) =				0.4479 (91)
MIT	19.4733	19.6300	19.8760	20.2247	20.4561	20.5379	20.5487	20.5473	20.4959	20.1937	19.7827	19.4454 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4733	19.6300	19.8760	20.2247	20.4561	20.5379	20.5487	20.5473	20.4959	20.1937	19.7827	19.4454 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9917	0.9846	0.9675	0.9021	0.7540	0.5405	0.3839	0.4438	0.7205	0.9361	0.9834	0.9931 (94)
Useful gains	431.4675	476.5387	507.3581	539.0393	492.2943	357.0226	240.8523	251.8123	365.2196	418.0401	415.8748	416.4821 (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	944.5944	915.6430	830.2692	698.1508	539.1099	363.4023	241.6644	253.5349	392.3428	590.6777	782.8979	943.6473 (97)
Space heating kWh	381.7664	295.0781	240.2458	114.5603	34.8308	0.0000	0.0000	0.0000	0.0000	128.4424	264.2566	392.2109 (98a)
Space heating requirement - total per year (kWh/year)												1851.3914
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	381.7664	295.0781	240.2458	114.5603	34.8308	0.0000	0.0000	0.0000	0.0000	128.4424	264.2566	392.2109 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1851.3914
Space heating per m2	(98c) / (4) =											26.5775 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	575.2872	452.8857	464.6070	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9282	0.9648	0.9422	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	534.0091	436.9366	437.7662	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	734.8477	697.9045	629.8067	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	144.6038	194.1601	142.8782	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.1509	48.5400	35.7195	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												120.4105 (107)
Energy for space heating												26.5775 (99)
Energy for space cooling												1.7285 (108)
Total												28.3061 (109)
Fabric Energy Efficiency (DFEE)												28.3 (109)

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

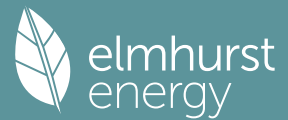
1. Overall dwelling characteristics

		Area (m2)	Storey height (m)	Volume (m3)
Main dwelling		69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		69.6600		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.1500 (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	2 * 10 = 20.0000 (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)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50 5.0000 (17)
Infiltration rate 0.3648 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3101 (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	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.5300	1.1450	17.7824		(27)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820		(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304		(29a)
Total net area of external elements Aum(A, m2)				58.6000			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.0848		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 211.7488 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	9.9500	0.0500	0.4975
E2 Other lintels (including other steel lintels)	3.6200	0.0500	0.1810
E3 Sill	23.3000	0.0500	1.1650
E4 Jamb	38.3500	0.0700	2.6845
E7 Party floor between dwellings (in blocks of flats)	2.5000	0.0900	0.2250
E16 Corner (normal)	7.5000	0.0600	0.4500
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	23.1800	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.5300	0.0200	0.1706
E23 Balcony within or between dwellings, balcony support penetrates wall insulation			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5236 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.6084 (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	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501 (38)
Heat transfer coeff	65.8356	65.6612	65.4902	64.6870	64.5368	63.8372	63.8372	63.7077	64.1067	64.5368	64.8407	65.1585 (39)
Average = Sum(39)m / 12 =												64.6863

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9451	0.9426	0.9401	0.9286	0.9265	0.9164	0.9164	0.9146	0.9203	0.9265	0.9308	0.9354 (40)
HLP (average)												0.9286
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.2378 (42)
Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)
Hot water usage for baths 26.6738 26.2777 25.7198 24.6913 23.9211 23.0670 22.6057 23.1597 23.7629 24.6767 25.7264 26.5837 (42b)
Hot water usage for other uses 37.5477 36.1824 34.8170 33.4516 32.0863 30.7209 30.7209 32.0863 33.4516 34.8170 36.1824 37.5477 (42c)
Average daily hot water use (litres/day) 58.8652 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314 (44)
Energy conte	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143 (45)
Energy content (annual)										Total = Sum(45)m =		977.6245

Distribution loss (46)m = 0.15 x (45)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 (46)

Water storage loss (or HIU loss):
Total storage 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 (56)

If cylinder contains dedicated solar storage 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)

Primary 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 (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

	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521 (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	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521 (64)

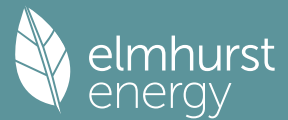
12Total per year (kWh/year) Total per year (kWh/year) = Sum(64)m = 830.9808 (64)
Electric shower(s) 831 (64)

Heat gains from water heating, kWh/month 49.4442 44.0552 48.1066 45.9075 46.7689 44.6130 46.1001 46.7689 45.9075 48.1066 47.2020 49.4442 (64a)
Total Energy used by instantaneous electric shower (s) (kWh/year) = Sum(64a)m = 562.4246 (64a)

	33.9747	29.9140	31.7982	28.3907	27.7140	25.2077	25.2300	26.2285	26.4690	29.1823	30.5431	33.6991 (65)
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5. Internal gains (see Table 5 and 5a)

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137 (71)
Water heating gains (Table 5)	45.6649	44.5149	42.7396	39.4316	37.2500	35.0107	33.9113	35.2534	36.7625	39.2235	42.4210	45.2945 (72)
Total internal gains	397.8477	409.3561	391.8231	380.8798	361.5858	349.6721	336.5987	335.9018	345.8530	355.9493	376.2592	388.8071 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	4.1600		10.6334		0.6300		0.7000		0.7700		13.5188 (74)	
Northwest	11.3700		11.2829		0.6300		0.7000		0.7700		39.2062 (81)	
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	450.5727	514.9964	579.5069	687.5289	773.9865	789.7551	748.0991	663.5901	573.8380	484.2310	442.2678	432.0947 (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	62.2359	62.4013	62.5642	63.3410	63.4885	64.1841	64.1841	64.3146	63.9144	63.4885	63.1908	62.8826
alpha	5.1491	5.1601	5.1709	5.2227	5.2326	5.2789	5.2789	5.2876	5.2610	5.2326	5.2127	5.1922
util living area	0.9940	0.9873	0.9682	0.8884	0.7176	0.5095	0.3741	0.4383	0.7150	0.9419	0.9874	0.9951 (86)
MIT	19.8088	19.9963	20.2889	20.6846	20.9178	20.9886	20.9982	20.9960	20.9411	20.6052	20.1480	19.7823 (87)
Th 2	20.1293	20.1314	20.1335	20.1432	20.1451	20.1536	20.1536	20.1551	20.1503	20.1451	20.1414	20.1375 (88)
util rest of house	0.9924	0.9839	0.9597	0.8619	0.6667	0.4453	0.3028	0.3595	0.6454	0.9219	0.9834	0.9938 (89)
MIT 2	19.0416	19.2289	19.5172	19.8961	20.0919	20.1483	20.1530	20.1539	20.1181	19.8337	19.3883	19.0217 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.3852	19.5726	19.8628	20.2493	20.4618	20.5247	20.5316	20.5310	20.4867	20.1793	19.7285	19.3624 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.3852	19.5726	19.8628	20.2493	20.4618	20.5247	20.5316	20.5310	20.4867	20.1793	19.7285	19.3624 (93)

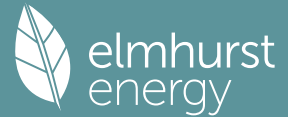
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9906	0.9812	0.9565	0.8655	0.6862	0.4737	0.3348	0.3948	0.6741	0.9228	0.9810	0.9923 (94)
Useful gains	446.3344	505.3285	554.2962	595.0663	531.1292	374.1320	250.4568	261.9813	386.8398	446.8415	433.8845	428.7559 (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	993.1417	963.4226	875.1350	734.1511	565.4566	378.2150	250.9800	263.1791	409.4300	618.2149	818.8435	987.9573 (97)
Space heating kWh	406.8246	307.8393	238.7041	100.1411	25.5395	0.0000	0.0000	0.0000	0.0000	127.5018	277.1704	416.0458 (98a)
Space heating requirement - total per year (kWh/year)	1899.7667											
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	406.8246	307.8393	238.7041	100.1411	25.5395	0.0000	0.0000	0.0000	0.0000	127.5018	277.1704	416.0458 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1899.7667											
Space heating per m ²	(98c) / (4) = 27.2720 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	600.0701	472.3956	484.1786	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9548	0.9784	0.9610	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.9504	462.1714	465.3084	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	885.8410	839.0911	742.2373	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	225.2813	280.4283	206.0351	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) =											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	56.3203	70.1071	51.5088	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	177.9362 (107)											
Energy for space heating	27.2720 (99)											
Energy for space cooling	2.5544 (108)											
Total	29.8263 (109)											
Fabric Energy Efficiency (TFEE)	29.8 (109)											

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Plot Reference	B3.1-3.3 2B4P Mid				Issued on Date	19/12/2025	
Assessment Reference	2B4P		Plot Type Ref		2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	80 C		DER	3.83		TER	12.03
Environmental	97 A		% DER < TER				68.16
CO ₂ Emissions (t/year)	0.23		DFEE	28.31		TFEE	29.83
Compliance Check	See BREL		% DFEE < TFEE				5.10
% DPER < TPER	36.79		DPER	40.24		TPER	63.67
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

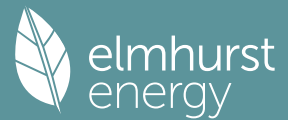
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Total net area of external elements Aum(A, m ²)			58.6000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.6282	(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Floor			69.6600			80.0000	5572.8000 (32d)
Party Ceiling			69.6600			100.0000	6966.0000 (32b)
Stud			120.0000			9.0000	1080.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	14750.4200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		211.7488 (35)
List of Thermal Bridges		

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E7 Party floor between dwellings (in blocks of flats)	38.3500	0.0700	2.6845
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - intermediate floor between dwellings (in blocks of flats)	23.1800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5300	0.0200	0.1706

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.5236 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 31.1518 (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	17.3881	17.2049	17.0217	16.1058	15.9226	15.0067	15.0067	14.8235	15.3731	15.9226	16.2890	16.6554 (38)
Average = Sum(39)m / 12 =	48.5399	48.3567	48.1735	47.2576	47.0744	46.1585	46.1585	45.9753	46.5249	47.0744	47.4408	47.8072 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6968	0.6942	0.6916	0.6784	0.6758	0.6626	0.6626	0.6600	0.6679	0.6758	0.6810	0.6863 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2378 (42)											
Hot water usage for mixer showers	0.0000 (42a)											
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837 (42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477 (42c)
Average daily hot water use (litres/day)	58.8652 (43)											
Daily hot water use	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314 (44)
Energy content (annual)	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143 (45)
Distribution loss (46)m = 0.15 x (45)m	15.2567	13.3413	13.9564	11.9392	11.3095	9.9208	9.6741	10.2609	10.5827	12.1099	13.2301	15.0621 (46)
Water storage loss (or HIU loss):	110.0000 (47)											
Store volume	0.0152 (51)											
b) If manufacturer declared loss factor is not known :	1.0294 (52)											
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.6000 (53)											
Volume factor from Table 2a	1.0327 (55)											
Temperature factor from Table 2b	1.0327 (55)											
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)
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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (64)
12Total per year (kWh/year)	1628.4643 (64)											
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442 (64a)
Heat gains from water heating, kWh/month	90.4015	80.5291	87.1848	80.7371	80.9830	75.9393	77.1907	78.6587	77.7301	83.0916	83.9221	89.9702 (65)

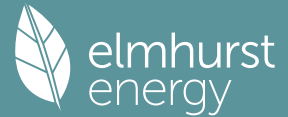
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137 (71)
Water heating gains (Table 5)	121.5074	119.8349	117.1839	112.1348	108.8482	105.4712	103.7509	105.7240	107.9584	111.6822	116.5585	120.9277 (72)
Total internal gains	473.6901	484.6759	466.2673	453.5828	433.1839	420.1325	406.4383	406.3723	417.0489	428.4080	450.3965	464.4402 (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
North	4.6300	10.6334	0.4000	0.7000	0.7700	9.5531 (74)
Northwest	12.6500	11.2829	0.4000	0.7000	0.7700	27.6952 (81)

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Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812 (83)
Total gains	510.9383	559.3067	598.8580	670.2172	724.5273	731.0324	697.1457	637.8700	578.1105	519.0338	497.0292	495.0214 (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	84.4118	84.7315	85.0537	86.7022	87.0396	88.7667	88.7667	89.1204	88.0677	87.0396	86.3674	85.7055
alpha	6.6275	6.6488	6.6702	6.7801	6.8026	6.9178	6.9178	6.9414	6.8712	6.8026	6.7578	6.7137
util living area	0.9821	0.9661	0.9263	0.7930	0.5963	0.4036	0.2913	0.3314	0.5509	0.8450	0.9590	0.9847 (86)
MIT	20.4034	20.5395	20.7218	20.9217	20.9889	20.9993	20.9999	20.9999	20.9951	20.9010	20.6456	20.3886 (87)
Th 2	20.3437	20.3460	20.3483	20.3599	20.3623	20.3740	20.3740	20.3763	20.3693	20.3623	20.3576	20.3530 (88)
util rest of house	0.9781	0.9588	0.9115	0.7629	0.5578	0.3644	0.2499	0.2866	0.5023	0.8131	0.9491	0.9813 (89)
MIT 2	19.8046	19.9387	20.1138	20.3012	20.3553	20.3737	20.3739	20.3763	20.3667	20.2894	20.0527	19.7981 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	20.0728	20.2078	20.3861	20.5791	20.6390	20.6539	20.6543	20.6556	20.6482	20.5633	20.3183	20.0626 (92)
Temperature adjustment	0.0000											
adjusted MIT	20.0728	20.2078	20.3861	20.5791	20.6390	20.6539	20.6543	20.6556	20.6482	20.5633	20.3183	20.0626 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9761	0.9570	0.9125	0.7735	0.5747	0.3819	0.2684	0.3067	0.5239	0.8237	0.9484	0.9794 (94)
Useful gains	498.7304	535.2825	546.4414	518.4212	416.3589	279.2160	187.1263	195.6140	302.8743	427.5036	471.3715	484.8340 (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	765.6081	740.2347	668.9431	551.9284	420.8005	279.4389	187.1416	195.6512	304.6521	469.0184	627.0845	758.3458 (97)
Space heating kWh	198.5570	137.7279	91.1413	24.1252	3.3045	0.0000	0.0000	0.0000	0.0000	30.8871	112.1133	203.4928 (98a)
Space heating requirement - total per year (kWh/year)	801.3491											
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	198.5570	137.7279	91.1413	24.1252	3.3045	0.0000	0.0000	0.0000	0.0000	30.8871	112.1133	203.4928 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	801.3491											
Space heating per m2	(98c) / (4) = 11.5037 (99)											

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-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	198.5570	137.7279	91.1413	24.1252	3.3045	0.0000	0.0000	0.0000	0.0000	30.8871	112.1133	203.4928 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	312.7272	216.9214	143.5476	37.9972	5.2046	0.0000	0.0000	0.0000	0.0000	48.6472	176.5785	320.5012
Space heating requirement												
	312.7272	216.9214	143.5476	37.9972	5.2046	0.0000	0.0000	0.0000	0.0000	48.6472	176.5785	320.5012 (307)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366
Water heating fuel												
	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366 (310)
Cooling System Energy Efficiency Ratio												
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (314)
Pumps and Fa	13.8945	12.5499	13.8945	13.4463	13.8945	13.4463	13.8945	13.8945	13.4463	13.8945	13.4463	13.8945 (331)
Lighting	21.9786	17.6321	15.8757	11.6312	8.9843	7.3403	8.1958	10.6532	13.8374	18.1555	20.5066	22.5895 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.8810	-21.8363	-38.2005	-50.7667	-60.7949	-59.1077	-58.1540	-51.5182	-40.5268	-27.7451	-15.2052	-10.6150 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)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 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)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 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)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 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)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 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)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 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1262.1248 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2442.6964 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												12.6212 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												163.5965 (330a)
Total electricity for the above, kWh/year												163.5965 (331)
Electricity for lighting (calculated in Appendix L)												177.3801 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-447.3514 (333)

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Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4160.8709 (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			280.0000 (367)
Space and Water heating from Heat pump	1323.1504	0.1579	71.1737 (367)
Electrical energy for heat distribution (space & water)	12.6212	0.0000	5.4232 (372)
Overall CO2 factor for heat network			0.0537 (386)
Total CO2 associated with community systems			199.1087 (373)
Energy for instantaneous electric shower(s)	562.4246	0.1391	78.2457 (264a)
Space and water heating			199.1087 (376)
Pumps, fans and electric keep-hot	163.5965	0.1387	22.6929 (378)
Energy for lighting	177.3801	0.1443	25.6014 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	0.1314	-58.7846
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.7846 (380)
Total CO2, kg/year			266.8642 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1323.1504	1.5845	714.2360 (467)
Electrical energy for heat distribution (space & water)	12.6212	0.0000	57.1091 (472)
Overall CO2 factor for heat network			0.5659 (486)
Total CO2 associated with community systems			2096.7202 (473)
Energy for instantaneous electric shower(s)	562.4246	1.5143	851.6987 (278a)
Space and water heating			2096.7202 (476)
Pumps, fans and electric keep-hot	163.5965	1.5128	247.4888 (478)
Energy for lighting	177.3801	1.5338	272.0716 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	1.4855	-664.5288
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-664.5288 (480)
Total Primary energy kWh/year			2803.4505 (483)
Dwelling Primary energy Rate (DPER)			40.2400 (484)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (5)

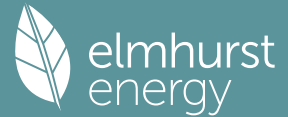
2. Ventilation rate

	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	2 * 10 = 20.0000 (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) =	20.0000 / (5) =	0.1148 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3648	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3101 (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)

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Adj infilt rate	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644 (22b)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			15.5300	1.1450	17.7824		(27)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820		(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304		(29a)
Total net area of external elements Aum(A, m2)			58.6000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.0848		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000		(32)

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

211.7488 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E7 Party floor between dwellings (in blocks of flats)	38.3500	0.0700	2.6845
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	23.1800	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5300	0.0200	0.1706

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

5.5236 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 32.6084 (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	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501 (38)
Average = Sum(39)m / 12 =	65.8356	65.6612	65.4902	64.6870	64.5368	63.8372	63.8372	63.7077	64.1067	64.5368	64.8407	65.1585 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9451	0.9426	0.9401	0.9286	0.9265	0.9164	0.9164	0.9146	0.9203	0.9265	0.9308	0.9354 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.2378 (42)
Hot water usage for mixer showers											
61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043 (42a)
Hot water usage for baths											
26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837 (42b)
Hot water usage for other uses											
37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477 (42c)
Average daily hot water use (litres/day)											115.7882 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357 (44)
Energy content (annual)	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152 (45)
Distribution loss (46)m = 0.15 x (45)m	29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073 (46)

Water storage loss (or HIU 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												
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325 (56)

If cylinder contains dedicated solar storage

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)
Combi 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

WWHRS	246.0887	217.6250	231.0271	202.5443	195.9850	176.1984	173.5259	180.5861	182.7713	204.3019	217.8714	243.3101 (62)
PV diverter	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027 (63a)

Solar input

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 (63b)
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 (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												
	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)

12Total per year (kWh/year)

Total per year (kWh/year) = Sum(64)m = 2209.5770 (64)

Electric shower(s)

0.0000 (64a)

0.0000 (64a)

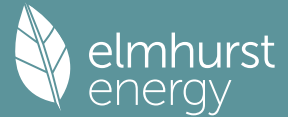
Heat gains from water heating, kWh/month

103.6076	92.0354	98.5996	88.4264	86.9481	79.6664	79.4805	81.8280	81.8519	89.7135	93.5227	102.6837 (65)
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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	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892 (69)

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Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137 (71)
Water heating gains (Table 5)	139.2575	136.9574	132.5264	122.8145	116.8658	110.6478	106.8286	109.9838	113.6832	120.5827	129.8926	138.0158 (72)
Total internal gains	494.4403	504.7985	484.6099	467.2627	444.2016	425.3092	409.5161	410.6322	422.7737	440.3085	466.7309	484.5284 (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			
North				4.1600	10.6334	0.6300	0.7000	0.7700	13.5188 (74)			
Northwest				11.3700	11.2829	0.6300	0.7000	0.7700	39.2062 (81)			
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	547.1653	610.4389	672.2937	773.9118	856.6023	865.3923	821.0164	738.3206	650.7587	568.5902	532.7395	527.8160 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	62.2359	62.4013	62.5642	63.3410	63.4885	64.1841	64.1841	64.3146	63.9144	63.4885	63.1908	62.8826
util living area	5.1491	5.1601	5.1709	5.2227	5.2326	5.2789	5.2789	5.2876	5.2610	5.2326	5.2127	5.1922
	0.9860	0.9743	0.9444	0.8440	0.6641	0.4673	0.3413	0.3951	0.6484	0.9004	0.9726	0.9881 (86)
MIT	19.9763	20.1542	20.4241	20.7623	20.9425	20.9924	20.9988	20.9975	20.9625	20.7077	20.2973	19.9500 (87)
Th 2	20.1293	20.1314	20.1335	20.1432	20.1451	20.1536	20.1536	20.1551	20.1503	20.1451	20.1414	20.1375 (88)
util rest of house	0.9825	0.9680	0.9311	0.8121	0.6132	0.4075	0.2761	0.3235	0.5796	0.8712	0.9647	0.9851 (89)
MIT 2	18.9456	19.1709	19.5067	19.9107	20.0985	20.1491	20.1531	20.1542	20.1250	19.8609	19.3609	18.9186 (90)
Living area fraction	19.4072	19.6113	19.9176	20.2921	20.4765	20.5268	20.5319	20.5319	20.5001	20.2402	19.7803	19.3806 (92)
MIT	19.4072	19.6113	19.9176	20.2921	20.4765	20.5268	20.5319	20.5319	20.5001	20.2402	19.7803	19.3806 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4072	19.6113	19.9176	20.2921	20.4765	20.5268	20.5319	20.5319	20.5001	20.2402	19.7803	19.3806 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9787	0.9634	0.9272	0.8181	0.6334	0.4341	0.3053	0.3555	0.6087	0.8748	0.9607	0.9817 (94)
Ext temp.	535.5232	588.0749	623.3717	633.1078	542.5665	375.6354	250.6676	262.5075	396.1097	497.4163	511.7954	518.1798 (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	994.5946	965.9602	878.7203	736.9240	566.4056	378.3509	251.0022	263.2339	410.2902	622.1458	822.2007	989.1431 (97)
Space heating requirement - total per year (kWh/year)	341.5491	253.9390	189.9793	74.7477	17.7362	0.0000	0.0000	0.0000	0.0000	92.7988	223.4918	350.3967 (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)	341.5491	253.9390	189.9793	74.7477	17.7362	0.0000	0.0000	0.0000	0.0000	92.7988	223.4918	350.3967 (98c)
Space heating requirement after solar 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 (99)
Space heating per m2	(98c) / (4) =											22.1740 (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 %)												92.3000 (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	341.5491	253.9390	189.9793	74.7477	17.7362	0.0000	0.0000	0.0000	0.0000	92.7988	223.4918	350.3967 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	370.0424	275.1235	205.8281	80.9834	19.2158	0.0000	0.0000	0.0000	0.0000	100.5404	242.1363	379.6280 (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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)
Efficiency of water heater (217)m	85.0637	84.6800	83.8907	82.2370	80.5481	79.8000	79.8000	79.8000	79.8000	82.6148	84.3777	79.8000 (216)
Fuel for water heating, kWh/month	256.1177	227.5180	244.2315	219.9737	218.2709	199.1694	197.1757	204.7375	206.6567	221.8100	229.9419	253.2324 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897 (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)												

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(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	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764	(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												1673.4979	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2678.8354	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												166.2031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-860.7801	(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												3743.7563	(238)

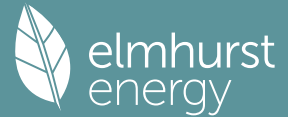
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1673.4979	0.2100	351.4346	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2678.8354	0.2100	562.5554	(264)
Space and water heating			913.9900	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.2031	0.1443	23.9882	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565	
PV Unit electricity exported	-404.3441	0.1253	-50.6814	
Total			-111.6379	(269)
Total CO2, kg/year			838.2696	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.0300	(273)

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	1673.4979	1.1300	1891.0526	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2678.8354	1.1300	3027.0840	(278)
Space and water heating			4918.1366	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	166.2031	1.5338	254.9278	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942	
PV Unit electricity exported	-404.3441	0.4601	-186.0248	
Total			-867.7189	(283)
Total Primary energy kWh/year			4435.4463	(286)
Target Primary Energy Rate (TPER)			63.6700	(287)

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Plot Reference	B3.1-3.3 2B4P Top				Issued on Date	19/12/2025	
Assessment Reference	2B4P			Plot Type Ref	2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	76 C	DER	5.16	TER	14.80		
Environmental	96 A	% DER < TER				65.14	
CO ₂ Emissions (t/year)	0.32	DFEE	41.86	TFEE	42.10		
Compliance Check	See BREL	% DFEE < TFEE				0.56	
% DPER < TPER	31.47	DPER	53.82	TPER	78.54		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (5)

2. Ventilation rate

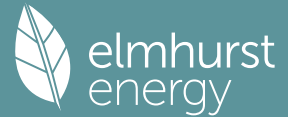
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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 infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Roof	69.6600		69.6600	0.1300	9.0558	9.0000	626.9400 (30)
Total net area of external elements Aum(A, m ²)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.6840		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Floor			69.6600			80.0000	5572.8000 (32d)
Stud			120.0000			9.0000	1080.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8411.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							120.7488 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E7 Party floor between dwellings (in blocks of flats)	14.9100	0.0700	1.0437
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5300	0.0200	0.1706
E15 Flat roof with parapet	16.1700	0.5600	9.0552
P4 Party wall - Roof (insulation at ceiling level)	11.5900	0.1200	1.3908
R7 Flat ceiling (inverted)	7.2700	0.0400	0.2908
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.6196 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	49.3036 (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	17.3881	17.2049	17.0217	16.1058	15.9226	15.0067	15.0067	14.8235	15.3731	15.9226	16.2890	16.6554	(38)
Heat transfer coeff	66.6917	66.5085	66.3253	65.4094	65.2262	64.3103	64.3103	64.1271	64.6767	65.2262	65.5926	65.9590	(39)
Average = Sum(39)m / 12 =												65.3636	
HLP	0.9574	0.9548	0.9521	0.9390	0.9364	0.9232	0.9232	0.9206	0.9285	0.9364	0.9416	0.9469	(40)
HLP (average)												0.9383	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)
Average daily hot water use (litres/day)												58.8652	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314	(44)
Energy content (annual)	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143	(45)
Distribution loss (46)m = 0.15 x (45)m	15.2567	13.3413	13.9564	11.9392	11.3095	9.9208	9.6741	10.2609	10.5827	12.1099	13.2301	15.0621	(46)
Water storage loss (or HIU loss):													
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)
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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911	(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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911	(64)
12Total per year (kWh/year)													1628.4643 (64)
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												562.4246	(64a)
Heat gains from water heating, kWh/month	90.4015	80.5291	87.1848	80.7371	80.9830	75.9393	77.1907	78.6587	77.7301	83.0916	83.9221	89.9702	(65)

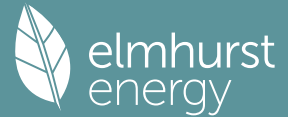
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	121.5074	119.8349	117.1839	112.1348	108.8482	105.4712	103.7509	105.7240	107.9584	111.6822	116.5585	120.9277	(72)
Total internal gains	473.6901	484.6759	466.2673	453.5828	433.1839	420.1325	406.4383	406.3723	417.0489	428.4080	450.3965	464.4402	(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
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North	4.6300		10.6334		0.4000		0.7000		0.7700		9.5531 (74)	
Northwest	12.6500		11.2829		0.4000		0.7000		0.7700		27.6952 (81)	
Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812 (83)
Total gains	510.9383	559.3067	598.8580	670.2172	724.5273	731.0324	697.1457	637.8700	578.1105	519.0338	497.0292	495.0214 (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	35.0342	35.1307	35.2277	35.7210	35.8213	36.3315	36.3315	36.4353	36.1257	35.8213	35.6212	35.4234
alpha	3.3356	3.3420	3.3485	3.3814	3.3881	3.4221	3.4221	3.4290	3.4084	3.3881	3.3747	3.3616
util living area	0.9583	0.9420	0.9115	0.8313	0.6994	0.5256	0.3947	0.4442	0.6649	0.8628	0.9369	0.9620 (86)
MIT	19.2733	19.4939	19.8474	20.3477	20.7217	20.9235	20.9781	20.9674	20.8271	20.3578	19.7594	19.2457 (87)
Th 2	20.1190	20.1212	20.1234	20.1345	20.1367	20.1478	20.1478	20.1500	20.1434	20.1367	20.1323	20.1278 (88)
util rest of house	0.9520	0.9333	0.8979	0.8059	0.6569	0.4657	0.3224	0.3686	0.6059	0.8364	0.9259	0.9562 (89)
MIT 2	18.5459	18.7634	19.1094	19.5925	19.9296	20.1020	20.1384	20.1351	20.0300	19.6132	19.0349	18.5253 (90)
Living area fraction									fLA = Living area / (4) =			0.4479 (91)
MIT	18.8717	19.0906	19.4399	19.9308	20.2844	20.4699	20.5145	20.5078	20.3870	19.9467	19.3594	18.8479 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8717	19.0906	19.4399	19.9308	20.2844	20.4699	20.5145	20.5078	20.3870	19.9467	19.3594	18.8479 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9408	0.9210	0.8855	0.7993	0.6645	0.4889	0.3540	0.4011	0.6236	0.8299	0.9142	0.9456 (94)
Useful gains	480.6955	515.0969	530.2751	535.7368	481.4831	357.3973	246.7589	255.8204	360.4909	430.7221	454.4052	468.0689 (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	971.8112	943.7956	858.2453	721.5163	559.9254	377.4979	251.7407	263.4243	406.6254	609.6479	804.1236	966.1628 (97)
Space heating kWh	365.3901	288.0855	244.0098	133.7613	58.3611	0.0000	0.0000	0.0000	0.0000	133.1208	251.7973	370.5819 (98a)
Space heating requirement - total per year (kWh/year)												1845.1078
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	365.3901	288.0855	244.0098	133.7613	58.3611	0.0000	0.0000	0.0000	0.0000	133.1208	251.7973	370.5819 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1845.1078
Space heating per m2										(98c) / (4) =		26.4873 (99)
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-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	365.3901	288.0855	244.0098	133.7613	58.3611	0.0000	0.0000	0.0000	0.0000	133.1208	251.7973	370.5819 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	575.4894	453.7347	384.3154	210.6740	91.9187	0.0000	0.0000	0.0000	0.0000	209.6653	396.5807	583.6665
Space heating requirement	575.4894	453.7347	384.3154	210.6740	91.9187	0.0000	0.0000	0.0000	0.0000	209.6653	396.5807	583.6665 (307)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366
Water heating fuel	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.8945	12.5499	13.8945	13.4463	13.8945	13.4463	13.8945	13.8945	13.4463	13.8945	13.4463	13.8945 (331)
Lighting	21.9786	17.6321	15.8757	11.6312	8.9843	7.3403	8.1958	10.6532	13.8374	18.1555	20.5066	22.5895 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.8810	-21.8363	-38.2005	-50.7667	-60.7949	-59.1077	-58.1540	-51.5182	-40.5268	-27.7451	-15.2052	-10.6150 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)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 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)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 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)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 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)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 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)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 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												2906.0447 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2442.6964 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												29.0604 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												163.5965 (330a)
Total electricity for the above, kWh/year												163.5965 (331)
Electricity for lighting (calculated in Appendix L)												177.3801 (332)

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Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-447.3514 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	5804.7909 (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			280.0000 (367)
Space and Water heating from Heat pump	1910.2647	0.1552	161.0707 (367)
Electrical energy for heat distribution (space & water)	29.0604	0.0000	7.9403 (372)
Overall CO2 factor for heat network			0.0545 (386)
Total CO2 associated with community systems			291.5229 (373)
Energy for instantaneous electric shower(s)	562.4246	0.1391	78.2457 (264a)
Space and water heating			291.5229 (376)
Pumps, fans and electric keep-hot	163.5965	0.1387	22.6929 (378)
Energy for lighting	177.3801	0.1443	25.6014 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	0.1314	-58.7846
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.7846 (380)
Total CO2, kg/year			359.2783 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1600 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1910.2647	1.5746	1634.2017 (467)
Electrical energy for heat distribution (space & water)	29.0604	0.0000	82.8681 (472)
Overall CO2 factor for heat network			0.5688 (486)
Total CO2 associated with community systems			3042.4449 (473)
Energy for instantaneous electric shower(s)	562.4246	1.5143	851.6987 (278a)
Space and water heating			3042.4449 (476)
Pumps, fans and electric keep-hot	163.5965	1.5128	247.4888 (478)
Energy for lighting	177.3801	1.5338	272.0716 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	1.4855	-664.5288
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-664.5288 (480)
Total Primary energy kWh/year			3749.1752 (483)
Dwelling Primary energy Rate (DPER)			53.8200 (484)

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

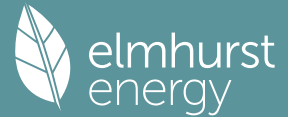
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.1500 (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	2 * 10 = 20.0000 (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) = 20.0000 / (5) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3648 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3101 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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													
Effective ac	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644	(22b)
	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			15.5300	1.1450	17.7824			(27)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820			(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304			(29a)
Roof	69.6600		69.6600	0.1100	7.6626			(30)
Total net area of external elements Aum(A, m2)			128.2600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	34.7474			(33)
Main dwelling								
Party Wall			28.9800	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							120.7488	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				9.9500	0.0500		0.4975	
E3 Sill				3.6200	0.0500		0.1810	
E4 Jamb				23.3000	0.0500		1.1650	
E7 Party floor between dwellings (in blocks of flats)				14.9100	0.0700		1.0437	
E16 Corner (normal)				2.5000	0.0900		0.2250	
E18 Party wall between dwellings				7.5000	0.0600		0.4500	
E25 Staggered party wall between dwellings				2.5000	0.0600		0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				11.5900	0.0000		0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				8.5300	0.0200		0.1706	
E15 Flat roof with parapet				16.1700	0.5600		9.0552	
P4 Party wall - Roof (insulation at ceiling level)				11.5900	0.1200		1.3908	
R7 Flat ceiling (inverted)				7.2700	0.0400		0.2908	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.6196	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	49.3670	(37)

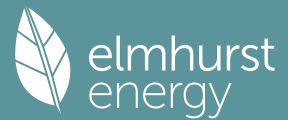
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378	(42)
Hot water usage for mixer showers	61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043	(42a)	
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)	
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)	
Average daily hot water use (litres/day)													115.7882	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357	(44)	
Energy content (annual)	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152	(45)	
Distribution loss (46)m = 0.15 x (45)m	29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073	(46)	
Water storage loss (or HIU 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	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)	
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	(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	246.0887	217.6250	231.0271	202.5443	195.9850	176.1984	173.5259	180.5861	182.7713	204.3019	217.8714	243.3101	(62)	
WWHRS	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027	(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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2209.5770	(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)	
													0.0000	(64a)
Heat gains from water heating, kWh/month	103.6076	92.0354	98.5996	88.4264	86.9481	79.6664	79.4805	81.8280	81.8519	89.7135	93.5227	102.6837	(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	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	139.2575	136.9574	132.5264	122.8145	116.8658	110.6478	106.8286	109.9838	113.6832	120.5827	129.8926	(72)
Total internal gains	494.4403	504.7985	484.6099	467.2627	444.2016	425.3092	409.5161	410.6322	422.7737	440.3085	466.7309	(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			
North				4.1600	10.6334	0.6300	0.7000	0.7700	13.5188 (74)			
Northwest				11.3700	11.2829	0.6300	0.7000	0.7700	39.2062 (81)			
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	547.1653	610.4389	672.2937	773.9118	856.6023	865.3923	821.0164	738.3206	650.7587	568.5902	532.7395	527.8160 (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	28.2888	28.3487	28.4076	28.6877	28.7407	28.9902	28.9902	29.0369	28.8936	28.7407	28.6337	28.5226
alpha	2.8859	2.8899	2.8938	2.9125	2.9160	2.9327	2.9327	2.9358	2.9262	2.9160	2.9089	2.9015
util living area	0.9570	0.9398	0.9070	0.8263	0.6965	0.5353	0.4102	0.4661	0.6855	0.8694	0.9379	0.9608 (86)
MIT	18.7972	19.0594	19.4973	20.1049	20.5872	20.8635	20.9537	20.9324	20.7098	20.0909	19.3593	18.7562 (87)
Th 2	19.9315	19.9335	19.9355	19.9447	19.9465	19.9546	19.9546	19.9561	19.9514	19.9465	19.9430	19.9393 (88)
util rest of house	0.9498	0.9300	0.8913	0.7974	0.6477	0.4639	0.3207	0.3725	0.6177	0.8408	0.9261	0.9544 (89)
MIT 2	17.3835	17.7141	18.2621	19.0072	19.5625	19.8544	19.9310	19.9190	19.7145	19.0104	18.1029	17.3365 (90)
Living area fraction	fLA = Living area / (4) =											0.4479 (91)
MIT	18.0167	18.3166	18.8153	19.4988	20.0215	20.3064	20.3891	20.3729	20.1603	19.4943	18.6656	17.9724 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0167	18.3166	18.8153	19.4988	20.0215	20.3064	20.3891	20.3729	20.1603	19.4943	18.6656	17.9724 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9327	0.9107	0.8712	0.7835	0.6514	0.4889	0.3588	0.4111	0.6323	0.8262	0.9076	0.9381 (94)
Ext temp.	510.3592	555.9209	585.7004	606.3882	558.0283	423.0930	294.6126	303.5589	411.4851	469.7592	483.5080	495.1321 (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	1132.9181	1105.7954	1012.9213	863.2277	676.4979	459.9088	305.3822	319.6837	490.0664	723.0691	943.7453	1128.1942 (97)
Space heating requirement - total per year (kWh/year)	463.1838	369.5156	317.8523	184.9245	88.1414	0.0000	0.0000	0.0000	0.0000	188.4626	331.3708	470.9982 (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)
Space heating contribution - total per year (kWh/year)	463.1838	369.5156	317.8523	184.9245	88.1414	0.0000	0.0000	0.0000	0.0000	188.4626	331.3708	470.9982 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2414.4492
Space heating per m2	(98c) / (4) =											34.6605 (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 %)												92.3000 (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)	463.1838	369.5156	317.8523	184.9245	88.1414	0.0000	0.0000	0.0000	0.0000	188.4626	331.3708	470.9982 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	501.8242	400.3420	344.3687	200.3515	95.4945	0.0000	0.0000	0.0000	0.0000	204.1848	359.0150	510.2906 (211)
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 (212)
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 (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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)
Efficiency of water heater (217)m	85.7078	85.4955	85.0408	84.1092	82.5953	79.8000	79.8000	79.8000	79.8000	84.1228	85.2495	79.8000 (216)
Fuel for water heating, kWh/month	254.1931	225.3478	240.9286	215.0773	212.8607	199.1694	197.1757	204.7375	206.6567	217.8338	227.5906	251.4002 (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)

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Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897	(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	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764	(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												2615.8713	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2652.9714	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												166.2031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-860.7801	(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												4660.2656	(238)

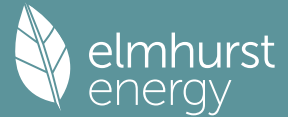
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2615.8713	0.2100	549.3330	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2652.9714	0.2100	557.1240	(264)
Space and water heating			1106.4570	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.2031	0.1443	23.9882	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565	
PV Unit electricity exported	-404.3441	0.1253	-50.6814	
Total			-111.6379	(269)
Total CO2, kg/year			1030.7365	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8000	(273)

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	2615.8713	1.1300	2955.9345	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2652.9714	1.1300	2997.8577	(278)
Space and water heating			5953.7922	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	166.2031	1.5338	254.9278	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942	
PV Unit electricity exported	-404.3441	0.4601	-186.0248	
Total			-867.7189	(283)
Total Primary energy kWh/year			5471.1018	(286)
Target Primary Energy Rate (TPER)			78.5400	(287)

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Plot Reference	B3.1-3.3 2B4P Top				Issued on Date	19/12/2025	
Assessment Reference	2B4P			Plot Type Ref	2B4P		
Plot Address					SAP Version	10.2	
SAP Rating	76 C		DER	5.16		TER	14.80
Environmental	96 A		% DER < TER				65.14
CO ₂ Emissions (t/year)	0.32		DFEE	41.86		TFEE	42.10
Compliance Check	See BREL		% DFEE < TFEE				0.56
% DPER < TPER	31.47		DPER	53.82		TPER	78.54
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (5)

2. Ventilation rate

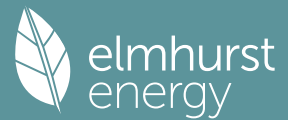
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (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) =	20.0000 / (5) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2648 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2251 (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)
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	0.2870	0.2814	0.2758	0.2476	0.2420	0.2139	0.2139	0.2082	0.2251	0.2420	0.2533	0.2645 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5412	0.5396	0.5380	0.5307	0.5293	0.5229	0.5229	0.5217	0.5253	0.5293	0.5321	0.5350 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Roof	69.6600		69.6600	0.1300	9.0558	9.0000	626.9400 (30)
Total net area of external elements Aum(A, m ²)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.6840	(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Floor			69.6600			80.0000	5572.8000 (32a)
Stud			120.0000			9.0000	1080.0000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	8411.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							120.7488 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				9.9500	0.0500	0.4975	
E3 Sill				3.6200	0.0500	0.1810	

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E4 Jamb													23.3000	0.0500	1.1650	
E7 Party floor between dwellings (in blocks of flats)													14.9100	0.0700	1.0437	
E16 Corner (normal)													2.5000	0.0900	0.2250	
E18 Party wall between dwellings													7.5000	0.0600	0.4500	
E25 Staggered party wall between dwellings													2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													11.5900	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation													8.5300	0.0200	0.1706	
E15 Flat roof with parapet													16.1700	0.5600	9.0552	
P4 Party wall - Roof (insulation at ceiling level)													11.5900	0.1200	1.3908	
R7 Flat ceiling (inverted)													7.2700	0.0400	0.2908	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																14.6196 (36)
Point Thermal bridges																0.0000
Total fabric heat loss															(33) + (36) + (36a) =	49.3036 (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				
	31.1020	31.0101	30.9200	30.4968	30.4176	30.0490	30.0490	29.9807	30.1910	30.4176	30.5778	30.7452	(38)			
Heat transfer coeff	80.4056	80.3137	80.2236	79.8004	79.7212	79.3526	79.3526	79.2843	79.4945	79.7212	79.8814	80.0488	(39)			
Average = Sum(39)m / 12 =												79.8000				
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP (average)	1.1543	1.1529	1.1516	1.1456	1.1444	1.1391	1.1391	1.1382	1.1412	1.1444	1.1467	1.1491	(40)			
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31				

4. Water heating energy requirements (kWh/year)																
Assumed occupancy																2.2378 (42)
Hot water usage for mixer showers																
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)			
Hot water usage for baths																
	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)			
Hot water usage for other uses																
	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)			
Average daily hot water use (litres/day)												58.8652	(43)			
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314	(44)			
Energy conte	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143	(45)			
Energy content (annual)																
Distribution loss (46)m = 0.15 x (45)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	(46)			
Water storage loss (or HIU loss):																
Total storage 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	(56)			
If cylinder contains dedicated solar storage																
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)			
Primary 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	(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																
	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521	(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																
	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521	(64)			
12Total per year (kWh/year)																
Electric shower(s)																
	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442	(64a)			
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												562.4246	(64a)			
Heat gains from water heating, kWh/month																
	33.9747	29.9140	31.7982	28.3907	27.7140	25.2077	25.2300	26.2285	26.4690	29.1823	30.5431	33.6991	(65)			

5. Internal gains (see Table 5 and 5a)																
Metabolic gains (Table 5), Watts																
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)			
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5																
	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128	(67)			
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5																
	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)			
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5																
	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)																
	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)			
Water heating gains (Table 5)																
	45.6649	44.5149	42.7396	39.4316	37.2500	35.0107	33.9113	35.2534	36.7625	39.2235	42.4210	45.2945	(72)			
Total internal gains																
	397.8476	409.3559	391.8229	380.8796	361.5857	349.6720	336.5986	335.9016	345.8529	355.9492	376.2590	388.8069	(73)			

6. Solar gains																
[Jan]																
			Area		Solar flux		g		FF		Access		Gains			
			m2		Table 6a		W/m2		Specific data		factor		W			
					or Table 6b				or Table 6c		Table 6d					
North			4.6300		10.6334		0.4000		0.7000		0.7700		9.5531	(74)		
Northwest			12.6500		11.2829		0.4000		0.7000		0.7700		27.6952	(81)		
Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812	(83)			
Total gains	435.0959	483.9867	524.4137	597.5140	652.9291	660.5718	627.3060	567.3994	506.9146	446.5750	422.8917	419.3881	(84)			

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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	29.0588	29.0920	29.1247	29.2792	29.3083	29.4444	29.4444	29.4698	29.3918	29.3083	29.2495	29.1883
alpha	2.9373	2.9395	2.9416	2.9519	2.9539	2.9630	2.9630	2.9647	2.9595	2.9539	2.9500	2.9459
util living area	0.9750	0.9644	0.9449	0.8912	0.7924	0.6428	0.5084	0.5678	0.7761	0.9188	0.9633	0.9775 (86)
MIT	18.6126	18.8515	19.2631	19.8714	20.4160	20.7826	20.9210	20.8889	20.5953	19.9082	19.1686	18.5664 (87)
Th 2	19.9568	19.9578	19.9589	19.9638	19.9647	19.9690	19.9690	19.9698	19.9673	19.9647	19.9629	19.9609 (88)
util rest of house	0.9707	0.9582	0.9347	0.8702	0.7505	0.5692	0.4059	0.4649	0.7155	0.8986	0.9558	0.9736 (89)
MIT 2	17.7824	18.0192	18.4254	19.0179	19.5244	19.8383	19.9359	19.9195	19.6967	19.0646	18.3390	17.7395 (90)
Living area fraction									fLA = Living area /	(4) =		0.4479 (91)
MIT	18.1542	18.3920	18.8006	19.4002	19.9238	20.2613	20.3771	20.3537	20.0992	19.4424	18.7106	18.1098 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1542	18.3920	18.8006	19.4002	19.9238	20.2613	20.3771	20.3537	20.0992	19.4424	18.7106	18.1098 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9605	0.9460	0.9204	0.8566	0.7486	0.5914	0.4482	0.5054	0.7242	0.8861	0.9438	0.9641 (94)
Useful gains	417.9120	457.8371	482.6957	511.8088	488.7901	390.6729	281.1846	286.7693	367.1062	395.7122	399.1404	404.3420 (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	1113.9584	1083.5896	986.7969	837.9167	655.6075	449.2353	299.7230	313.4652	476.9009	704.9304	927.4690	1113.4669 (97)
Space heating kWh	517.8585	420.5057	375.0513	234.7977	124.1121	0.0000	0.0000	0.0000	0.0000	230.0583	380.3966	527.5889 (98a)
Space heating requirement - total per year (kWh/year)												2810.3691
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	517.8585	420.5057	375.0513	234.7977	124.1121	0.0000	0.0000	0.0000	0.0000	230.0583	380.3966	527.5889 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2810.3691
Space heating per m2										(98c) / (4) =		40.3441 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	745.9141	587.2090	602.5607	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7420	0.8082	0.7641	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	553.5045	474.5533	460.3917	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	734.8477	697.9045	629.8067	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	130.5671	166.1733	126.0448	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area /	(4) =		1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	32.6418	41.5433	31.5112	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												105.6963 (107)
Energy for space heating												40.3441 (99)
Energy for space cooling												1.5173 (108)
Total												41.8614 (109)
Fabric Energy Efficiency (DFEE)												41.9 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.1500 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	

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Infiltration due to chimneys, flues and fans	$= (6a) + (6b) + (6c) + (6d) + (6e) + (6f) + (6g) + (7a) + (7b) + (7c) =$											20.0000 / (5) =	0.1148 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.3648 (18)
Number of sides sheltered													2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.3101 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	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)
Adj infilt rate	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)
	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664	(25)

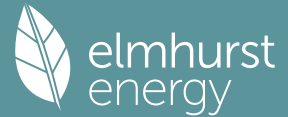
3. Heat losses and heat loss parameter

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						
Main dwelling													
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type			15.5300	1.1450	17.7824			(27)					
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820			(29a)					
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304			(29a)					
Roof	69.6600		69.6600	0.1100	7.6626			(30)					
Total net area of external elements Aum(A, m2)			128.2600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.7474			(33)					
Main dwelling													
Party Wall			28.9800	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							120.7488	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value	Total							
E2 Other lintels (including other steel lintels)				9.9500	0.0500	0.4975							
E3 Sill				3.6200	0.0500	0.1810							
E4 Jamb				23.3000	0.0500	1.1650							
E7 Party floor between dwellings (in blocks of flats)				14.9100	0.0700	1.0437							
E16 Corner (normal)				2.5000	0.0900	0.2250							
E18 Party wall between dwellings				7.5000	0.0600	0.4500							
E25 Staggered party wall between dwellings				2.5000	0.0600	0.1500							
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				11.5900	0.0000	0.0000							
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				8.5300	0.0200	0.1706							
E15 Flat roof with parapet				16.1700	0.5600	9.0552							
P4 Party wall - Roof (insulation at ceiling level)				11.5900	0.1200	1.3908							
R7 Flat ceiling (inverted)				7.2700	0.0400	0.2908							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.6196	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	49.3670	(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	33.2272	33.0527	32.8817	32.0786	31.9283	31.2288	31.2288	31.0993	31.4982	31.9283	32.2323	32.5501	(38)
Average = Sum(39)m / 12 =	82.5942	82.4198	82.2488	81.4456	81.2954	80.5958	80.5958	80.4663	80.8653	81.2954	81.5993	81.9171	(39)
												81.4449	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1857	1.1832	1.1807	1.1692	1.1670	1.1570	1.1570	1.1551	1.1609	1.1670	1.1714	1.1760	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2378	(42)
Hot water usage for mixer showers												0.0000	(42a)
Hot water usage for baths												26.6738	(42b)
Hot water usage for other uses												37.5477	(42c)
Average daily hot water use (litres/day)												58.8652	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314	(44)
Energy content (annual)	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143	(45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m =	977.6245
Water storage loss (or HIU loss):													
Total storage 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	(46)
If cylinder contains dedicated solar storage													
Primary 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	(57)
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	(59)
Total heat required for water heating calculated for each month													
WWHRS	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521	(62)
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	(63a)
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	(63b)
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	(63c)
Output from w/h	86.4546	75.6009	79.0864	67.6555	64.0871	56.2177	54.8198	58.1451	59.9685	68.6225	74.9704	85.3521	(64)
Total per year (kWh/year)												830.9808	(64a)
Electric shower(s)												831	(64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												562.4246	(64a)
Heat gains from water heating, kWh/month													

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33.9747 29.9140 31.7982 28.3907 27.7140 25.2077 25.2300 26.2285 26.4690 29.1823 30.5431 33.6991 (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	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	99.1129	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	45.6649	44.5149	42.7396	39.4316	37.2500	35.0107	33.9113	35.2534	36.7625	39.2235	42.4210	45.2945	(72)
Total internal gains	397.8477	409.3561	391.8231	380.8798	361.5858	349.6721	336.5987	335.9018	345.8530	355.9493	376.2592	388.8071	(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
North					4.1600	10.6334	0.6300		0.7000		0.7700	13.5188 (74)
Northwest					11.3700	11.2829	0.6300		0.7000		0.7700	39.2062 (81)
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	450.5727	514.9964	579.5069	687.5289	773.9865	789.7551	748.0991	663.5901	573.8380	484.2310	442.2678	432.0947 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	28.2888	28.3487	28.4076	28.6877	28.7407	28.9902	28.9902	29.0369	28.8936	28.7407	28.6337	28.5226	
alpha	2.8859	2.8899	2.8938	2.9125	2.9160	2.9327	2.9327	2.9358	2.9262	2.9160	2.9089	2.9015	
util living area	0.9730	0.9593	0.9322	0.8598	0.7358	0.5732	0.4445	0.5084	0.7348	0.9052	0.9596	0.9759	(86)
MIT	18.5778	18.8542	19.3181	19.9796	20.5171	20.8361	20.9427	20.9148	20.6464	19.9459	19.1647	18.5355	(87)
Th 2	19.9315	19.9335	19.9355	19.9447	19.9465	19.9546	19.9546	19.9561	19.9514	19.9465	19.9430	19.9393	(88)
util rest of house	0.9683	0.9522	0.9201	0.8344	0.6890	0.5000	0.3495	0.4097	0.6697	0.8823	0.9513	0.9717	(89)
MIT 2	17.7310	18.0047	18.4611	19.1016	19.5914	19.8593	19.9315	19.9189	19.7209	19.0855	18.3212	17.6945	(90)
Living area fraction	18.1103	18.3852	18.8449	19.4949	20.0060	20.2968	20.3844	20.3650	20.1354	19.4708	18.6990	18.0712	(91)
MIT	18.1103	18.3852	18.8449	19.4949	20.0060	20.2968	20.3844	20.3650	20.1354	19.4708	18.6990	18.0712	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.1103	18.3852	18.8449	19.4949	20.0060	20.2968	20.3844	20.3650	20.1354	19.4708	18.6990	18.0712	(93)

8. Space heating requirement

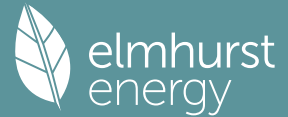
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9574	0.9388	0.9045	0.8219	0.6919	0.5251	0.3898	0.4500	0.6822	0.8698	0.9386	0.9616	(94)
Useful gains	431.3734	483.4921	524.1918	565.1041	535.4865	414.7007	291.6077	298.6048	391.4961	421.1787	415.1163	415.5172	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1140.6491	1111.4458	1015.3561	862.9070	675.2416	459.1392	305.0065	319.0462	488.0538	721.1585	946.4715	1136.2870	(97)
Space heating kWh	527.7011	421.9849	365.4263	214.4180	103.9778	0.0000	0.0000	0.0000	0.0000	223.1850	382.5757	536.2527	(98a)
Space heating requirement - total per year (kWh/year)												2775.5215	
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	527.7011	421.9849	365.4263	214.4180	103.9778	0.0000	0.0000	0.0000	0.0000	223.1850	382.5757	536.2527	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2775.5215	
Space heating per m ²												39.8438	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	757.6010	596.4093	611.5439	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8008	0.8562	0.8131	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	606.6677	510.6236	497.2200	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	885.8410	839.0911	742.2373	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	201.0048	244.3798	182.2929	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	50.2512	61.0950	45.5732	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												156.9194	(107)
Energy for space heating												39.8438	(99)
Energy for space cooling												2.2526	(108)
Total												42.0965	(109)
Fabric Energy Efficiency (TFEE)												42.1	(109)

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Plot Reference	B3.1-3.3 2B4P Top				Issued on Date	19/12/2025	
Assessment Reference	2B4P		Plot Type Ref	2B4P			
Plot Address					SAP Version	10.2	
SAP Rating	76 C	DER	5.16	TER	14.80		
Environmental	96 A	% DER < TER				65.14	
CO ₂ Emissions (t/year)	0.32	DFEE	41.86	TFEE	42.10		
Compliance Check	See BREL	% DFEE < TFEE				0.56	
% DPER < TPER	31.47	DPER	53.82	TPER	78.54		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	69.6600 (1b)	2.5000 (2b)	174.1500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	174.1500 (5)

2. Ventilation rate

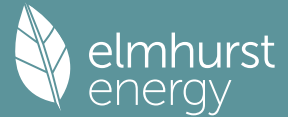
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												72.0000 (23c)
Effective ac	0.3026	0.2994	0.2962	0.2802	0.2771	0.2611	0.2611	0.2579	0.2675	0.2771	0.2834	0.2898 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			17.2800	0.9615	16.6154		(27)
External Wall	40.4300	17.2800	23.1500	0.1600	3.7040	14.0000	324.1000 (29a)
Communal Wall	18.1700	1.8900	16.2800	0.2100	3.4188	14.0000	227.9200 (29a)
Roof	69.6600		69.6600	0.1300	9.0558	9.0000	626.9400 (30)
Total net area of external elements Aum(A, m ²)			128.2600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.6840		(33)
Main dwelling							
Party Wall			28.9800	0.0000	0.0000	20.0000	579.6000 (32)
Party Floor			69.6600			80.0000	5572.8000 (32d)
Stud			120.0000			9.0000	1080.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	8411.3600 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							120.7488 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	9.9500	0.0500	0.4975
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	23.3000	0.0500	1.1650
E7 Party floor between dwellings (in blocks of flats)	14.9100	0.0700	1.0437
E16 Corner (normal)	2.5000	0.0900	0.2250
E18 Party wall between dwellings	7.5000	0.0600	0.4500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.5900	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	8.5300	0.0200	0.1706
E15 Flat roof with parapet	16.1700	0.5600	9.0552
P4 Party wall - Roof (insulation at ceiling level)	11.5900	0.1200	1.3908
R7 Flat ceiling (inverted)	7.2700	0.0400	0.2908
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			14.6196 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	49.3036 (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	17.3881	17.2049	17.0217	16.1058	15.9226	15.0067	15.0067	14.8235	15.3731	15.9226	16.2890	16.6554	(38)
Heat transfer coeff	66.6917	66.5085	66.3253	65.4094	65.2262	64.3103	64.3103	64.1271	64.6767	65.2262	65.5926	65.9590	(39)
Average = Sum(39)m / 12 =												65.3636	
HLP	0.9574	0.9548	0.9521	0.9390	0.9364	0.9232	0.9232	0.9206	0.9285	0.9364	0.9416	0.9469	(40)
HLP (average)												0.9383	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	(42b)
Hot water usage for other uses	37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	(42c)
Average daily hot water use (litres/day)												58.8652	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	64.2216	62.4601	60.5368	58.1429	56.0073	53.7879	53.3266	55.2460	57.2145	59.4937	61.9088	64.1314	(44)
Energy content (annual)	101.7113	88.9423	93.0429	79.5947	75.3966	66.1385	64.4939	68.4060	70.5512	80.7324	88.2005	100.4143	(45)
Distribution loss (46)m = 0.15 x (45)m	15.2567	13.3413	13.9564	11.9392	11.3095	9.9208	9.6741	10.2609	10.5827	12.1099	13.2301	15.0621	(46)
Water storage loss (or HIU loss):													
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)
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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911	(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	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911	(64)
12Total per year (kWh/year)													1628.4643 (64)
Electric shower(s)	49.4442	44.0552	48.1066	45.9075	46.7689	44.6130	46.1001	46.7689	45.9075	48.1066	47.2020	49.4442	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												562.4246	(64a)
Heat gains from water heating, kWh/month	90.4015	80.5291	87.1848	80.7371	80.9830	75.9393	77.1907	78.6587	77.7301	83.0916	83.9221	89.9702	(65)

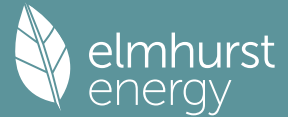
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1128	109.7320	99.1128	102.4166	99.1128	102.4166	99.1128	99.1128	102.4166	99.1128	102.4166	99.1128	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	187.8320	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(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)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	121.5074	119.8349	117.1839	112.1348	108.8482	105.4712	103.7509	105.7240	107.9584	111.6822	116.5585	120.9277	(72)
Total internal gains	473.6901	484.6759	466.2673	453.5828	433.1839	420.1325	406.4383	406.3723	417.0489	428.4080	450.3965	464.4402	(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
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North	4.6300		10.6334		0.4000		0.7000		0.7700		9.5531 (74)	
Northwest	12.6500		11.2829		0.4000		0.7000		0.7700		27.6952 (81)	
Solar gains	37.2483	74.6308	132.5908	216.6344	291.3434	310.8999	290.7074	231.4977	161.0617	90.6258	46.6327	30.5812 (83)
Total gains	510.9383	559.3067	598.8580	670.2172	724.5273	731.0324	697.1457	637.8700	578.1105	519.0338	497.0292	495.0214 (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	35.0342	35.1307	35.2277	35.7210	35.8213	36.3315	36.3315	36.4353	36.1257	35.8213	35.6212	35.4234
alpha	3.3356	3.3420	3.3485	3.3814	3.3881	3.4221	3.4221	3.4290	3.4084	3.3881	3.3747	3.3616
util living area	0.9583	0.9420	0.9115	0.8313	0.6994	0.5256	0.3947	0.4442	0.6649	0.8628	0.9369	0.9620 (86)
MIT	19.2733	19.4939	19.8474	20.3477	20.7217	20.9235	20.9781	20.9674	20.8271	20.3578	19.7594	19.2457 (87)
Th 2	20.1190	20.1212	20.1234	20.1345	20.1367	20.1478	20.1478	20.1500	20.1434	20.1367	20.1323	20.1278 (88)
util rest of house	0.9520	0.9333	0.8979	0.8059	0.6569	0.4657	0.3224	0.3686	0.6059	0.8364	0.9259	0.9562 (89)
MIT 2	18.5459	18.7634	19.1094	19.5925	19.9296	20.1020	20.1384	20.1351	20.0300	19.6132	19.0349	18.5253 (90)
Living area fraction									fLA = Living area / (4) =			0.4479 (91)
MIT	18.8717	19.0906	19.4399	19.9308	20.2844	20.4699	20.5145	20.5078	20.3870	19.9467	19.3594	18.8479 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8717	19.0906	19.4399	19.9308	20.2844	20.4699	20.5145	20.5078	20.3870	19.9467	19.3594	18.8479 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9408	0.9210	0.8855	0.7993	0.6645	0.4889	0.3540	0.4011	0.6236	0.8299	0.9142	0.9456 (94)
Useful gains	480.6955	515.0969	530.2751	535.7368	481.4831	357.3973	246.7589	255.8204	360.4909	430.7221	454.4052	468.0689 (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	971.8112	943.7956	858.2453	721.5163	559.9254	377.4979	251.7407	263.4243	406.6254	609.6479	804.1236	966.1628 (97)
Space heating kWh	365.3901	288.0855	244.0098	133.7613	58.3611	0.0000	0.0000	0.0000	0.0000	133.1208	251.7973	370.5819 (98a)
Space heating requirement - total per year (kWh/year)												1845.1078
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	365.3901	288.0855	244.0098	133.7613	58.3611	0.0000	0.0000	0.0000	0.0000	133.1208	251.7973	370.5819 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1845.1078
Space heating per m2										(98c) / (4) =		26.4873 (99)
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-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	365.3901	288.0855	244.0098	133.7613	58.3611	0.0000	0.0000	0.0000	0.0000	133.1208	251.7973	370.5819 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	575.4894	453.7347	384.3154	210.6740	91.9187	0.0000	0.0000	0.0000	0.0000	209.6653	396.5807	583.6665
Space heating requirement	575.4894	453.7347	384.3154	210.6740	91.9187	0.0000	0.0000	0.0000	0.0000	209.6653	396.5807	583.6665 (307)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	156.9881	138.8697	148.3197	133.0884	130.6734	119.6322	119.7707	123.6828	124.0448	136.0092	141.6941	155.6911 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366
Water heating fuel	235.4821	208.3046	222.4795	199.6326	196.0101	179.4483	179.6561	185.5242	186.0673	204.0137	212.5412	233.5366 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	13.8945	12.5499	13.8945	13.4463	13.8945	13.4463	13.8945	13.8945	13.4463	13.8945	13.4463	13.8945 (331)
Lighting	21.9786	17.6321	15.8757	11.6312	8.9843	7.3403	8.1958	10.6532	13.8374	18.1555	20.5066	22.5895 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-12.8810	-21.8363	-38.2005	-50.7667	-60.7949	-59.1077	-58.1540	-51.5182	-40.5268	-27.7451	-15.2052	-10.6150 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)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 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)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 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)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 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)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 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)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 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												2906.0447 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2442.6964 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												29.0604 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7700)												
mechanical ventilation fans (SFP = 0.7700)												163.5965 (330a)
Total electricity for the above, kWh/year												163.5965 (331)
Electricity for lighting (calculated in Appendix L)												177.3801 (332)

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-447.3514 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	5804.7909 (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			280.0000 (367)
Space and Water heating from Heat pump	1910.2647	0.1552	161.0707 (367)
Electrical energy for heat distribution (space & water)	29.0604	0.0000	7.9403 (372)
Overall CO2 factor for heat network			0.0545 (386)
Total CO2 associated with community systems			291.5229 (373)
Energy for instantaneous electric shower(s)	562.4246	0.1391	78.2457 (264a)
Space and water heating			291.5229 (376)
Pumps, fans and electric keep-hot	163.5965	0.1387	22.6929 (378)
Energy for lighting	177.3801	0.1443	25.6014 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	0.1314	-58.7846
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-58.7846 (380)
Total CO2, kg/year			359.2783 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.1600 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1910.2647	1.5746	1634.2017 (467)
Electrical energy for heat distribution (space & water)	29.0604	0.0000	82.8681 (472)
Overall CO2 factor for heat network			0.5688 (486)
Total CO2 associated with community systems			3042.4449 (473)
Energy for instantaneous electric shower(s)	562.4246	1.5143	851.6987 (278a)
Space and water heating			3042.4449 (476)
Pumps, fans and electric keep-hot	163.5965	1.5128	247.4888 (478)
Energy for lighting	177.3801	1.5338	272.0716 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-447.3514	1.4855	-664.5288
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-664.5288 (480)
Total Primary energy kWh/year			3749.1752 (483)
Dwelling Primary energy Rate (DPER)			53.8200 (484)

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

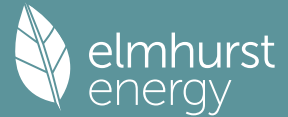
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	69.6600 (1b)	x 2.5000 (2b)	= 174.1500 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	174.1500 (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	2 * 10 = 20.0000 (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) = 20.0000 / (5) = 0.1148 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3648 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3101 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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													
Effective ac	0.3954	0.3876	0.3799	0.3411	0.3334	0.2946	0.2946	0.2869	0.3101	0.3334	0.3489	0.3644	(22b)
	0.5782	0.5751	0.5722	0.5582	0.5556	0.5434	0.5434	0.5411	0.5481	0.5556	0.5609	0.5664	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			15.5300	1.1450	17.7824			(27)
External Wall	40.4300	15.5300	24.9000	0.1800	4.4820			(29a)
Communal Wall	18.1700	1.8900	16.2800	0.1800	2.9304			(29a)
Roof	69.6600		69.6600	0.1100	7.6626			(30)
Total net area of external elements Aum(A, m2)			128.2600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	34.7474			(33)
Main dwelling								
Party Wall			28.9800	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							120.7488	(35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				9.9500	0.0500		0.4975	
E3 Sill				3.6200	0.0500		0.1810	
E4 Jamb				23.3000	0.0500		1.1650	
E7 Party floor between dwellings (in blocks of flats)				14.9100	0.0700		1.0437	
E16 Corner (normal)				2.5000	0.0900		0.2250	
E18 Party wall between dwellings				7.5000	0.0600		0.4500	
E25 Staggered party wall between dwellings				2.5000	0.0600		0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				11.5900	0.0000		0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				8.5300	0.0200		0.1706	
E15 Flat roof with parapet				16.1700	0.5600		9.0552	
P4 Party wall - Roof (insulation at ceiling level)				11.5900	0.1200		1.3908	
R7 Flat ceiling (inverted)				7.2700	0.0400		0.2908	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.6196	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	49.3670	(37)

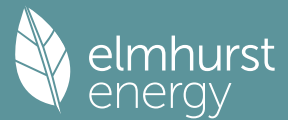
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2378	(42)
Hot water usage for mixer showers														
61.7409	60.8131	59.4610	56.8741	54.9650	52.8360	51.6259	52.9677	54.4386	56.7245	59.3670	61.5043	61.5043	(42a)	
Hot water usage for baths														
26.6738	26.2777	25.7198	24.6913	23.9211	23.0670	22.6057	23.1597	23.7629	24.6767	25.7264	26.5837	26.5837	(42b)	
Hot water usage for other uses														
37.5477	36.1824	34.8170	33.4516	32.0863	30.7209	30.7209	32.0863	33.4516	34.8170	36.1824	37.5477	37.5477	(42c)	
Average daily hot water use (litres/day)													115.7882	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	125.9625	123.2731	119.9978	115.0170	110.9723	106.6240	104.9525	108.2137	111.6531	116.2182	121.2758	125.6357	(44)	
Energy content (annual)	199.4938	175.5393	184.4322	157.4525	149.3901	131.1066	126.9310	133.9912	137.6794	157.7070	172.7796	196.7152	(45)	
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1923.2178		
29.9241	26.3309	27.6648	23.6179	22.4085	19.6660	19.0397	20.0987	20.6519	23.6560	25.9169	29.5073	(46)		
Water storage loss (or HIU 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	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)	
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	(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														
246.0887	217.6250	231.0271	202.5443	195.9850	176.1984	173.5259	180.5861	182.7713	204.3019	217.8714	243.3101	(62)		
WWHRS	-28.2254	-24.9627	-26.1395	-21.6446	-20.1720	-17.2613	-16.1797	-17.2055	-17.8592	-21.0540	-23.8517	-27.7027	(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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074	(64)	
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2209.5770	(64)	
Electric shower(s)												2210	(64)	
0.0000	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	103.6076	92.0354	98.5996	88.4264	86.9481	79.6664	79.4805	81.8280	81.8519	89.7135	93.5227	102.6837	(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	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	111.8921	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	99.1129	109.7322	99.1129	102.4167	99.1129	102.4167	99.1129	99.1129	102.4167	99.1129	102.4167	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	196.5022	198.5413	193.4029	182.4638	168.6552	155.6771	147.0069	144.9678	150.1062	161.0453	174.8539	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	34.1892	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	-89.5137	(71)
Water heating gains (Table 5)	139.2575	136.9574	132.5264	122.8145	116.8658	110.6478	106.8286	109.9838	113.6832	120.5827	129.8926	(72)
Total internal gains	494.4403	504.7985	484.6099	467.2627	444.2016	425.3092	409.5161	410.6322	422.7737	440.3085	466.7309	(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			
North				4.1600	10.6334	0.6300	0.7000	0.7700	13.5188 (74)			
Northwest				11.3700	11.2829	0.6300	0.7000	0.7700	39.2062 (81)			
Solar gains	52.7250	105.6404	187.6839	306.6491	412.4007	440.0830	411.5004	327.6884	227.9849	128.2817	66.0087	43.2877 (83)
Total gains	547.1653	610.4389	672.2937	773.9118	856.6023	865.3923	821.0164	738.3206	650.7587	568.5902	532.7395	527.8160 (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	28.2888	28.3487	28.4076	28.6877	28.7407	28.9902	28.9902	29.0369	28.8936	28.7407	28.6337	28.5226
alpha	2.8859	2.8899	2.8938	2.9125	2.9160	2.9327	2.9327	2.9358	2.9262	2.9160	2.9089	2.9015
util living area	0.9570	0.9398	0.9070	0.8263	0.6965	0.5353	0.4102	0.4661	0.6855	0.8694	0.9379	0.9608 (86)
MIT	18.7972	19.0594	19.4973	20.1049	20.5872	20.8635	20.9537	20.9324	20.7098	20.0909	19.3593	18.7562 (87)
Th 2	19.9315	19.9335	19.9355	19.9447	19.9465	19.9546	19.9546	19.9561	19.9514	19.9465	19.9430	19.9393 (88)
util rest of house	0.9498	0.9300	0.8913	0.7974	0.6477	0.4639	0.3207	0.3725	0.6177	0.8408	0.9261	0.9544 (89)
MIT 2	17.3835	17.7141	18.2621	19.0072	19.5625	19.8544	19.9310	19.9190	19.7145	19.0104	18.1029	17.3365 (90)
Living area fraction									fLA = Living area / (4) =			0.4479 (91)
MIT	18.0167	18.3166	18.8153	19.4988	20.0215	20.3064	20.3891	20.3729	20.1603	19.4943	18.6656	17.9724 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0167	18.3166	18.8153	19.4988	20.0215	20.3064	20.3891	20.3729	20.1603	19.4943	18.6656	17.9724 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9327	0.9107	0.8712	0.7835	0.6514	0.4889	0.3588	0.4111	0.6323	0.8262	0.9076	0.9381 (94)
Ext temp.	510.3592	555.9209	585.7004	606.3882	558.0283	423.0930	294.6126	303.5589	411.4851	469.7592	483.5080	495.1321 (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	1132.9181	1105.7954	1012.9213	863.2277	676.4979	459.9088	305.3822	319.6837	490.0664	723.0691	943.7453	1128.1942 (97)
Space heating requirement - total per year (kWh/year)	463.1838	369.5156	317.8523	184.9245	88.1414	0.0000	0.0000	0.0000	0.0000	188.4626	331.3708	470.9982 (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)	463.1838	369.5156	317.8523	184.9245	88.1414	0.0000	0.0000	0.0000	0.0000	188.4626	331.3708	470.9982 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2414.4492
Space heating per m2										(98c) / (4) =		34.6605 (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 %)												92.3000 (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)	463.1838	369.5156	317.8523	184.9245	88.1414	0.0000	0.0000	0.0000	0.0000	188.4626	331.3708	470.9982 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	501.8242	400.3420	344.3687	200.3515	95.4945	0.0000	0.0000	0.0000	0.0000	204.1848	359.0150	510.2906 (211)
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 (212)
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 (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	217.8633	192.6622	204.8876	180.8997	175.8130	158.9371	157.3462	163.3806	164.9121	183.2479	194.0198	215.6074 (64)
Efficiency of water heater (217)m	85.7078	85.4955	85.0408	84.1092	82.5953	79.8000	79.8000	79.8000	79.8000	84.1228	85.2495	79.8000 (216)
Fuel for water heating, kWh/month	254.1931	225.3478	240.9286	215.0773	212.8607	199.1694	197.1757	204.7375	206.6567	217.8338	227.5906	251.4002 (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)

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Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	20.5937	16.5210	14.8754	10.8983	8.4182	6.8777	7.6793	9.9819	12.9655	17.0115	19.2144	21.1661	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-18.6714	-27.6673	-41.7781	-49.4283	-55.4607	-52.5627	-51.9235	-47.9435	-41.3038	-32.7074	-20.9996	-15.9897	(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	-6.8276	-14.6694	-29.7347	-45.5188	-61.0343	-61.6333	-60.9064	-51.1788	-37.0042	-21.2560	-9.2042	-5.3764	(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												2615.8713	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2652.9714	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												166.2031	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-860.7801	(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												4660.2656	(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	2615.8713	0.2100	549.3330	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2652.9714	0.2100	557.1240	(264)
Space and water heating			1106.4570	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	166.2031	0.1443	23.9882	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	0.1335	-60.9565	
PV Unit electricity exported	-404.3441	0.1253	-50.6814	
Total			-111.6379	(269)
Total CO2, kg/year			1030.7365	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.8000	(273)

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	2615.8713	1.1300	2955.9345	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2652.9714	1.1300	2997.8577	(278)
Space and water heating			5953.7922	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	166.2031	1.5338	254.9278	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-456.4360	1.4935	-681.6942	
PV Unit electricity exported	-404.3441	0.4601	-186.0248	
Total			-867.7189	(283)
Total Primary energy kWh/year			5471.1018	(286)
Target Primary Energy Rate (TPER)			78.5400	(287)

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Plot Reference	B3.1-3.3 3B5P MID EXP			Issued on Date	19/12/2025
Assessment Reference	3B5P	Plot Type Ref	3B5P		
Plot Address				SAP Version	10.2
SAP Rating	78 C	DER	4.43	TER	12.27
Environmental	96 A	% DER < TER			63.90
CO ₂ Emissions (t/year)	0.34	DFEE	35.86	TFEE	36.20
Compliance Check	See BREL	% DFEE < TFEE			0.94
% DPER < TPER	28.58	DPER	46.26	TPER	64.78
Assessor Details	Mr. Matthew Stainrod			Assessor ID	AU83-0001
Client	ROK, Wilf Foster				

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (25)

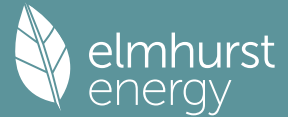
3. Heat losses and heat loss parameter

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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
Exposed Floor			88.5000	0.1200	10.6200	0.0000	0.0000 (28b)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Total net area of external elements Aum(A, m ²)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.0807		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Ceiling			88.5000			100.0000	8850.0000 (32b)
Stud			160.0000			9.0000	1440.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11505.4400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		129.9316 (35)
List of Thermal Bridges		

6. Solar gains						
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	16.8700	36.7938	0.4000	0.7000	0.7700	120.4429 (77)

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Southwest		4.6300			36.7938			0.4000		0.7000		0.7700		33.0558 (79)	
Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629	(83)		
Total gains	698.8975	820.2517	894.6628	965.4437	994.4723	975.5297	941.5416	901.5477	866.0239	780.9138	701.7439	665.6943	(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	39.8387	39.9547	40.0713	40.6649	40.7858	41.4009	41.4009	41.5262	41.1527	40.7858	40.5448	40.3067			
alpha	3.6559	3.6636	3.6714	3.7110	3.7191	3.7601	3.7601	3.7684	3.7435	3.7191	3.7030	3.6871			
util living area															
	0.9534	0.9208	0.8737	0.7817	0.6527	0.4863	0.3557	0.3856	0.5752	0.8046	0.9213	0.9597	(86)		
MIT	19.5845	19.8796	20.2108	20.5851	20.8315	20.9582	20.9899	20.9863	20.9199	20.6050	20.0510	19.5378	(87)		
Th 2	20.1624	20.1647	20.1669	20.1781	20.1803	20.1916	20.1916	20.1938	20.1871	20.1803	20.1759	20.1714	(88)		
util rest of house															
	0.9463	0.9094	0.8560	0.7529	0.6100	0.4307	0.2924	0.3207	0.5186	0.7723	0.9080	0.9534	(89)		
MIT 2	18.8777	19.1652	19.4842	19.8408	20.0579	20.1672	20.1874	20.1878	20.1370	19.8679	19.3445	18.8390	(90)		
Living area fraction															
										fLA = Living area / (4) =				0.4054 (91)	
MIT	19.1642	19.4548	19.7788	20.1425	20.3715	20.4879	20.5127	20.5115	20.4544	20.1668	19.6309	19.1223	(92)		
Temperature adjustment												0.0000			
adjusted MIT	19.1642	19.4548	19.7788	20.1425	20.3715	20.4879	20.5127	20.5115	20.4544	20.1668	19.6309	19.1223	(93)		
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9360	0.8982	0.8468	0.7515	0.6203	0.4515	0.3178	0.3466	0.5378	0.7717	0.8979	0.9437	(94)		
Useful gains	654.1540	736.7697	757.5587	725.5536	616.9181	440.4066	299.1782	312.4344	465.7062	602.6325	630.0939	628.2408	(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															
	1192.4446	1164.2326	1059.0702	883.5765	679.4959	454.5188	302.0451	316.4336	493.4903	749.6467	987.7553	1183.2064	(97)		
Space heating kWh															
	400.4882	287.2550	224.3246	113.7765	46.5579	0.0000	0.0000	0.0000	0.0000	109.3786	257.5162	412.8944	(98a)		
Space heating requirement - total per year (kWh/year)												1852.1914			
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															
	400.4882	287.2550	224.3246	113.7765	46.5579	0.0000	0.0000	0.0000	0.0000	109.3786	257.5162	412.8944	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)												1852.1914			
Space heating per m2										(98c) / (4) =		20.9169	(99)		
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-Space and Water												1.0000 (303a)			
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)			
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)			
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)			
Efficiency of secondary/supplementary heating system, %												0.0000 (208)			
Space heating:															
Space heating requirement															
	400.4882	287.2550	224.3246	113.7765	46.5579	0.0000	0.0000	0.0000	0.0000	109.3786	257.5162	412.8944	(98)		
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50															
307a	630.7690	452.4267	353.3112	179.1980	73.3287	0.0000	0.0000	0.0000	0.0000	172.2713	405.5880	650.3087			
Space heating requirement															
	630.7690	452.4267	353.3112	179.1980	73.3287	0.0000	0.0000	0.0000	0.0000	172.2713	405.5880	650.3087	(307)		
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)		
Water heating															
Annual water heating requirement															
	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	(64)		
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50															
310a	250.7182	221.6273	236.4159	211.5546	207.3032	189.3545	189.3164	195.7709	196.6357	216.1073	225.7534	248.5785			
Water heating fuel															
	250.7182	221.6273	236.4159	211.5546	207.3032	189.3545	189.3164	195.7709	196.6357	216.1073	225.7534	248.5785	(310)		
Cooling System Energy Efficiency Ratio															
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(314)		
Pumps and Fa	20.8737	18.8536	20.8737	20.2003	20.8737	20.2003	20.8737	20.8737	20.2003	20.8737	20.2003	20.8737	(331)		
Lighting	28.3716	22.7608	20.4936	15.0145	11.5976	9.4753	10.5797	13.7519	17.8624	23.4364	26.4714	29.1602	(332)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(333a)m	-13.1364	-22.4678	-39.7083	-53.3554	-64.4292	-62.8241	-61.7681	-54.4254	-42.4416	-28.7016	-15.5605	-10.8064	(333a)		
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(334a)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	(334a)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(335a)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	(335a)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(333b)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	(333b)		
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(334b)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	(334b)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(335b)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	(335b)		
Annual totals kWh/year															
Space heating fuel - community heating												2917.2015 (307)			
Space heating fuel - secondary												0.0000 (309)			
Water heating fuel - community heating												2589.1358 (310)			
Efficiency of water heater												0.0000 (311)			
Electricity used for heat distribution												29.1720 (313)			
Space cooling fuel												0.0000 (321)			
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)															
mechanical ventilation fans (SFP = 0.9100)												245.7705 (330a)			
Total electricity for the above, kWh/year												245.7705 (331)			
Electricity for lighting (calculated in Appendix L)												228.9753 (332)			

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-469.6249 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6130.0149 (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			280.0000 (367)
Space and Water heating from Heat pump	1966.5490	0.1561	162.5850 (367)
Electrical energy for heat distribution (space & water)	29.1720	0.0000	8.1900 (372)
Overall CO2 factor for heat network			0.0546 (386)
Total CO2 associated with community systems			300.6913 (373)
Energy for instantaneous electric shower(s)	618.5567	0.1391	86.0549 (264a)
Space and water heating			300.6913 (376)
Pumps, fans and electric keep-hot	245.7705	0.1387	34.0914 (378)
Energy for lighting	228.9753	0.1443	33.0482 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	0.1312	-61.6291
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6291 (380)
Total CO2, kg/year			392.2567 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1966.5490	1.5777	1643.7534 (467)
Electrical energy for heat distribution (space & water)	29.1720	0.0000	85.3667 (472)
Overall CO2 factor for heat network			0.5692 (486)
Total CO2 associated with community systems			3134.1756 (473)
Energy for instantaneous electric shower(s)	618.5567	1.5143	936.7015 (278a)
Space and water heating			3134.1756 (476)
Pumps, fans and electric keep-hot	245.7705	1.5128	371.8017 (478)
Energy for lighting	228.9753	1.5338	351.2100 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	1.4848	-697.3059
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.3059 (480)
Total Primary energy kWh/year			4096.5829 (483)
Dwelling Primary energy Rate (DPER)			46.2600 (484)

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

1. Overall dwelling characteristics

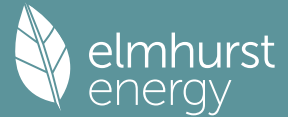
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		221.3750 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.3750 (5)

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	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3277 (21)

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

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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												
	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.2500	1.1450	23.1870		(27)
Exposed Floor			88.5000	0.1300	11.5050		(28b)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870		(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888		(29a)
Total net area of external elements Aum(A, m2)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.2578	(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							129.9316 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.7600	0.0500	0.5880	
E3 Sill				3.6200	0.0500	0.1810	
E4 Jamb				27.9600	0.0500	1.3980	
E7 Party floor between dwellings (in blocks of flats)				32.5800	0.0700	2.2806	
E16 Corner (normal)				7.5000	0.0900	0.6750	
E18 Party wall between dwellings				2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings				2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				8.0500	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				11.3000	0.0200	0.2260	
E20 Exposed floor (normal)				21.2800	0.3200	6.8096	
P7 Party Wall - Exposed floor (normal)				8.0500	0.1600	1.2880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7462 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	61.0040 (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	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421 (38)
Average = Sum(39)m / 12 =	103.9070	103.6594	103.4167	102.2768	102.0636	101.0707	101.0707	100.8869	101.4532	102.0636	102.4950	102.9461 (39)
												102.2758
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1734	1.1706	1.1679	1.1550	1.1526	1.1414	1.1414	1.1393	1.1457	1.1526	1.1575	1.1626 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6053 (42)
Hot water usage for mixer showers												
	67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920	67.6427 (42a)
Hot water usage for baths												
	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245 (42b)
Hot water usage for other uses												
	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114 (42c)
Average daily hot water use (litres/day)												127.3477 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	138.5379	135.5798	131.9773	126.4992	122.0506	117.2681	115.4301	119.0170	122.8000	127.8209	133.3834	138.1786 (44)
Energy content (annual)	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044	32.4532 (46)
Water storage loss (or HIU 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												
	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)
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 (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												
	266.0051	235.1495	249.4390	218.2629	210.8985	189.2866	186.1976	193.9628	196.5165	220.0466	235.1209	262.9493 (62)
WWHRS	-31.0424	-27.4541	-28.7484	-23.8048	-22.1852	-18.9840	-17.7945	-18.9227	-19.6416	-23.1553	-26.2321	-30.4675 (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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818 (64)
12Total per year (kWh/year)												2375.4027 (64)
Electric shower(s)												2375 (64)
	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												
	110.2298	97.8623	104.7216	93.6528	91.9069	84.0182	83.6938	86.2758	86.4222	94.9486	99.2581	109.2137 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548 (68)
Pumps, fans	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Total internal gains	148.1584	145.6284	140.7548	130.0734	123.5307	116.6920	112.4917	115.9620	120.0308	127.6191	137.8585	146.7927 (72)
	568.8522	581.5497	557.7203	537.8539	510.7257	489.2490	470.6445	471.6619	485.8863	505.6596	536.4845	557.0566 (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			
Southeast				15.8900	36.7938	0.6300	0.7000	0.7700	178.6779 (77)			
Southwest				4.3600	36.7938	0.6300	0.7000	0.7700	49.0268 (79)			
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	796.5568	969.4149	1088.4144	1195.4096	1247.2429	1220.4402	1175.5908	1117.6994	1060.5158	934.3333	809.2222	751.9243 (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	30.7578	30.8313	30.9037	31.2481	31.3134	31.6210	31.6210	31.6786	31.5018	31.3134	31.1816	31.0449
alpha	3.0505	3.0554	3.0602	3.0832	3.0876	3.1081	3.1081	3.1119	3.1001	3.0876	3.0788	3.0697
util living area	0.9474	0.9104	0.8587	0.7680	0.6447	0.4926	0.3666	0.3990	0.5844	0.8012	0.9159	0.9546 (86)
MIT	19.0995	19.4746	19.9033	20.3775	20.7169	20.9107	20.9731	20.9646	20.8432	20.3899	19.6690	19.0329 (87)
Th 2	19.9413	19.9436	19.9458	19.9562	19.9581	19.9672	19.9672	19.9688	19.9637	19.9581	19.9542	19.9501 (88)
util rest of house	0.9387	0.8964	0.8371	0.7337	0.5939	0.4239	0.2851	0.3156	0.5157	0.7636	0.9003	0.9470 (89)
MIT 2	17.7588	18.2250	18.7514	19.3218	19.7027	19.9041	19.9542	19.9506	19.8433	19.3534	18.4826	17.6813 (90)
Living area fraction	fLA = Living area / (4) = 0.4054 (91)											
MIT	18.3024	18.7316	19.2184	19.7498	20.1139	20.3122	20.3673	20.3617	20.2487	19.7736	18.9636	18.2293 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3024	18.7316	19.2184	19.7498	20.1139	20.3122	20.3673	20.3617	20.2487	19.7736	18.9636	18.2293 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9211	0.8769	0.8199	0.7263	0.6019	0.4475	0.3172	0.3481	0.5355	0.7561	0.8821	0.9305 (94)
Useful gains	733.7011	850.0417	892.3376	868.2444	750.7652	546.1935	372.9441	389.0643	567.8832	706.4921	713.8394	699.6488 (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												
Space heating	1454.9448	1433.7800	1315.2986	1109.6836	858.7542	577.3344	380.7643	399.6836	623.8039	936.2923	1215.9620	1444.2576 (97)
Useful gains kWh	536.6053	392.2722	314.6829	173.8362	80.3438	0.0000	0.0000	0.0000	0.0000	170.9713	361.5283	553.9890 (98a)
Space heating requirement - total per year (kWh/year)												2584.2290
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	536.6053	392.2722	314.6829	173.8362	80.3438	0.0000	0.0000	0.0000	0.0000	170.9713	361.5283	553.9890 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2584.2290
Space heating per m2										(98c) / (4) =		29.1838 (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 %)												92.3000 (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	536.6053	392.2722	314.6829	173.8362	80.3438	0.0000	0.0000	0.0000	0.0000	170.9713	361.5283	553.9890 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	581.3709	424.9969	340.9349	188.3383	87.0463	0.0000	0.0000	0.0000	0.0000	185.2344	391.6883	600.2047 (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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818 (64)
Efficiency of water heater (217)m	85.8514	85.4633	84.8550	83.8093	82.2905	79.8000	79.8000	79.8000	79.8000	83.7448	85.2779	79.8000 (216)
Fuel for water heating, kWh/month	273.6853	243.0229	260.0797	232.0245	229.3257	213.4118	211.0314	219.3486	221.6478	235.1087	244.9505	270.5319 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168	(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	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433	(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												2799.8148	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2854.1688	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												199.9357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1094.2014	(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												4845.7178	(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	2799.8148	0.2100	587.9611	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2854.1688	0.2100	599.3755	(264)
Space and water heating			1187.3366	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.9357	0.1443	28.8569	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786	
PV Unit electricity exported	-527.1737	0.1254	-66.0937	
Total			-141.8724	(269)
Total CO2, kg/year			1086.2504	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2700	(273)

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	2799.8148	1.1300	3163.7907	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2854.1688	1.1300	3225.2108	(278)
Space and water heating			6389.0015	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.9357	1.5338	306.6680	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623	
PV Unit electricity exported	-527.1737	0.4602	-242.5960	
Total			-1089.6584	(283)
Total Primary energy kWh/year			5736.1119	(286)
Target Primary Energy Rate (TPER)			64.7800	(287)

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Plot Reference	B3.1-3.3 3B5P MID EXP			Issued on Date	19/12/2025
Assessment Reference	3B5P	Plot Type Ref	3B5P		
Plot Address				SAP Version	10.2
SAP Rating	78 C	DER	4.43	TER	12.27
Environmental	96 A	% DER < TER			63.90
CO ₂ Emissions (t/year)	0.34	DFEE	35.86	TFEE	36.20
Compliance Check	See BREL	% DFEE < TFEE			0.94
% DPER < TPER	28.58	DPER	46.26	TPER	64.78
Assessor Details	Mr. Matthew Stainrod			Assessor ID	AU83-0001
Client	ROK, Wilf Foster				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (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	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1355 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.2855	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2427 (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	0.3094	0.3034	0.2973	0.2670	0.2609	0.2306	0.2306	0.2245	0.2427	0.2609	0.2730	0.2852 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5479	0.5460	0.5442	0.5356	0.5340	0.5266	0.5266	0.5252	0.5294	0.5340	0.5373	0.5407 (25)

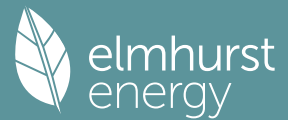
3. Heat losses and heat loss parameter

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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
Exposed Floor			88.5000	0.1200	10.6200	0.0000	0.0000 (28b)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Total net area of external elements Aum(A, m ²)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.0807		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Ceiling			88.5000			100.0000	8850.0000 (32b)
Stud			160.0000			9.0000	1440.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	11505.4400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		129.9316 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	11.7600	0.0500	0.5880
E3 Sill	3.6200	0.0500	0.1810

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E4 Jamb	27.9600	0.0500	1.3980
E7 Party floor between dwellings (in blocks of flats)	32.5800	0.0700	2.2806
E16 Corner (normal)	7.5000	0.0900	0.6750
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.3000	0.0200	0.2260
E20 Exposed floor (normal)	21.2800	0.3200	6.8096
P7 Party Wall - Exposed floor (normal)	8.0500	0.1600	1.2880
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			13.7462 (36)
Point Thermal Bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	57.8269 (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	40.0242	39.8884	39.7553	39.1300	39.0130	38.4685	38.4685	38.3676	38.6782	39.0130	39.2497	39.4971 (38)
Average = Sum(39)m / 12 =	97.8511	97.7153	97.5821	96.9569	96.8399	96.2954	96.2954	96.1945	96.5051	96.8399	97.0766	97.3240 (39)
												96.9563
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1050	1.1035	1.1020	1.0949	1.0936	1.0875	1.0875	1.0863	1.0898	1.0936	1.0963	1.0991 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.6053 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245 (42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114 (42c)
Average daily hot water use (litres/day)												64.7435 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359 (44)
Energy content (annual)	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422 (45)
Distribution loss (46)m = 0.15 x (45)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 (46)
Water storage loss (or HIU 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 (56)
Total storage 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 (57)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Primary 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)
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 (62)
Total heat required for water heating calculated for each month	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759 (63a)
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 (63b)
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 (63c)
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 (63d)
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 (64)
Output from w/h	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759 (64)
12Total per year (kWh/year)												913.9632 (64)
Electric shower(s)	54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789 (64a)
Heat gains from water heating, kWh/month	37.3668	32.9006	34.9729	31.2251	30.4808	27.7242	27.7488	28.8471	29.1116	32.0958	33.5925	37.0637 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.5567 (64a)

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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Water heating gains (Table 5)	50.2242	48.9593	47.0065	43.3683	40.9688	38.5058	37.2967	38.7729	40.4328	43.1395	46.6563	49.8168 (72)
Total internal gains	467.9180	481.8806	460.9720	448.1487	425.1637	411.0629	395.4495	394.4728	406.2883	418.1800	442.2823	457.0807 (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					
Southeast			16.8700	36.7938	0.4000	0.7000	0.7700	120.4429 (77)				
Southwest			4.6300	36.7938	0.4000	0.7000	0.7700	33.0558 (79)				
Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629 (83)
Total gains	621.4168	743.3457	818.7200	891.4158	921.6598	903.9685	870.6632	829.9752	793.6537	707.1547	626.1384	588.4436 (84)

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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	32.6614	32.7068	32.7514	32.9626	33.0025	33.1891	33.1891	33.2239	33.1170	33.0025	32.9220	32.8383
alpha	3.1774	3.1805	3.1834	3.1975	3.2002	3.2126	3.2126	3.2149	3.2078	3.2002	3.1948	3.1892
util living area	0.9708	0.9492	0.9178	0.8542	0.7530	0.6026	0.4607	0.4977	0.6917	0.8758	0.9520	0.9751 (86)
MIT	18.9613	19.2833	19.6867	20.1832	20.5901	20.8578	20.9551	20.9415	20.7678	20.2305	19.5064	18.8975 (87)
Th 2	19.9967	19.9980	19.9992	20.0050	20.0060	20.0111	20.0111	20.0120	20.0091	20.0060	20.0039	20.0016 (88)
util rest of house	0.9656	0.9405	0.9035	0.8281	0.7077	0.5303	0.3668	0.4034	0.6253	0.8481	0.9423	0.9706 (89)
MIT 2	18.1459	18.4623	18.8560	19.3335	19.7043	19.9282	19.9930	19.9869	19.8621	19.3886	18.6899	18.0864 (90)
Living area fraction	18.4765	18.7952	19.1928	19.6780	20.0634	20.3051	20.3831	20.3739	20.2293	19.7299	19.0209	18.4152 (91)
MIT	18.4765	18.7952	19.1928	19.6780	20.0634	20.3051	20.3831	20.3739	20.2293	19.7299	19.0209	18.4152 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4765	18.7952	19.1928	19.6780	20.0634	20.3051	20.3831	20.3739	20.2293	19.7299	19.0209	18.4152 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9554	0.9276	0.8897	0.8184	0.7106	0.5529	0.4032	0.4392	0.6411	0.8391	0.9302	0.9613 (94)
Useful gains	593.7058	689.4937	728.4500	729.5533	654.9107	499.7746	351.0601	364.5397	508.8363	593.3598	582.4321	565.6756 (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	1387.1846	1357.7697	1238.5872	1045.0019	809.9130	549.3720	364.2919	382.2700	591.5073	884.1370	1157.2432	1383.4814 (97)
Space heating kWh	590.3482	449.0814	379.5421	227.1230	115.3218	0.0000	0.0000	0.0000	0.0000	216.3383	413.8640	608.4475 (98a)
Space heating requirement - total per year (kWh/year)												3000.0662
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	590.3482	449.0814	379.5421	227.1230	115.3218	0.0000	0.0000	0.0000	0.0000	216.3383	413.8640	608.4475 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3000.0662
Space heating per m2												33.8799 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	905.1764	712.5856	731.0783	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8026	0.8654	0.8446	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	726.4571	616.7007	617.4507	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1009.9186	973.3036	928.0829	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	204.0922	265.3126	231.1103	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.0231	66.3282	57.7776	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												175.1288 (107)
Energy for space heating												33.8799 (99)
Energy for space cooling												1.9777 (108)
Total												35.8577 (109)
Fabric Energy Efficiency (DFEE)												35.9 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

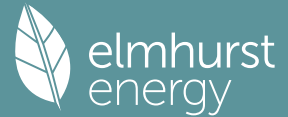
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	88.5500 (1b)	x 2.5000 (2b)	= 221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.3750 (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	3 * 10 =	30.0000	(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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1355 (8)

Full SAP Calculation Printout



Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												5.0000 (17)	
Infiltration rate												0.3855 (18)	
Number of sides sheltered												2 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)	
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3277 (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	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (25)	

3. Heat losses and heat loss parameter

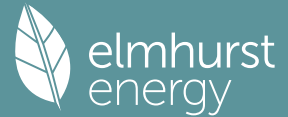
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			20.2500	1.1450	23.1870			(27)
Exposed Floor			88.5000	0.1300	11.5050			(28b)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870			(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888			(29a)
Total net area of external elements Aum(A, m2)			169.9500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.2578		(33)
Main dwelling								
Party Wall			20.1300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								129.9316 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				11.7600	0.0500	0.5880		
E3 Sill				3.6200	0.0500	0.1810		
E4 Jamb				27.9600	0.0500	1.3980		
E7 Party floor between dwellings (in blocks of flats)				32.5800	0.0700	2.2806		
E16 Corner (normal)				7.5000	0.0900	0.6750		
E18 Party wall between dwellings				2.5000	0.0600	0.1500		
E25 Staggered party wall between dwellings				2.5000	0.0600	0.1500		
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				8.0500	0.0000	0.0000		
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				11.3000	0.0200	0.2260		
E20 Exposed floor (normal)				21.2800	0.3200	6.8096		
P7 Party Wall - Exposed floor (normal)				8.0500	0.1600	1.2880		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7462	(36)
Point Thermal bridges							0.0000	
Total fabric heat loss							(33) + (36) + (36a) =	61.0040 (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	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421
Heat transfer coeff	103.9070	103.6594	103.4167	102.2768	102.0636	101.0707	101.0707	100.8869	101.4532	102.0636	102.4950	102.9461
Average = Sum(39)m / 12 =												102.2758
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1734	1.1706	1.1679	1.1550	1.1526	1.1414	1.1414	1.1393	1.1457	1.1526	1.1575	1.1626
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114
Average daily hot water use (litres/day)												
Daily hot water use	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359
Energy conte	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422
Energy content (annual)										Total = Sum(45)m =	1075.2508	
Distribution loss (46)m = 0.15 x (45)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
Water storage loss (or HIU 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
Total storage 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
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Primary 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
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
Total heat required for water heating calculated for each month	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759
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
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
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
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
Output from w/h	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =	913.9632	914
Electric shower(s)	54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789
Heat gains from water heating, kWh/month	37.3668	32.9006	34.9729	31.2251	30.4808	27.7242	27.7488	28.8471	29.1116	32.0958	33.5925	37.0637

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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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Water heating gains (Table 5)	50.2242	48.9593	47.0065	43.3683	40.9688	38.5058	37.2967	38.7729	40.4328	43.1395	46.6563	49.8168 (72)
Total internal gains	467.9180	481.8806	460.9720	448.1487	425.1637	411.0629	395.4495	394.4728	406.2883	418.1800	442.2823	457.0807 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
Southeast	15.8900		36.7938		0.6300		0.7000		0.7700		178.6779 (77)	
Southwest	4.3600		36.7938		0.6300		0.7000		0.7700		49.0268 (79)	
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	695.6227	869.7458	991.6661	1105.7045	1161.6810	1142.2540	1100.3958	1040.5103	980.9178	846.8537	715.0200	651.9484 (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, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	30.7578	30.8313	30.9037	31.2481	31.3134	31.6210	31.6210	31.6786	31.5018	31.3134	31.1816	31.0449
alpha	3.0505	3.0554	3.0602	3.0832	3.0876	3.1081	3.1081	3.1119	3.1001	3.0876	3.0788	3.0697
util living area	0.9622	0.9296	0.8825	0.7958	0.6746	0.5199	0.3894	0.4252	0.6178	0.8330	0.9365	0.9682 (86)
MIT	18.9341	19.3310	19.7879	20.3032	20.6772	20.8962	20.9682	20.9577	20.8163	20.3057	19.5298	18.8646 (87)
Th 2	19.9413	19.9436	19.9458	19.9562	19.9581	19.9672	19.9672	19.9688	19.9637	19.9581	19.9542	19.9501 (88)
util rest of house	0.9556	0.9180	0.8634	0.7635	0.6243	0.4490	0.3037	0.3376	0.5483	0.7987	0.9241	0.9626 (89)
MIT 2	18.0797	18.4675	18.9086	19.3977	19.7288	19.9094	19.9551	19.9517	19.8523	19.4146	18.6753	18.0177 (90)
Living area fraction	18.4261	18.8176	19.2651	19.7648	20.1133	20.3095	20.3658	20.3595	20.2431	19.7759	19.0217	0.4054 (91)
MIT	18.4261	18.8176	19.2651	19.7648	20.1133	20.3095	20.3658	20.3595	20.2431	19.7759	19.0217	18.3610 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4261	18.8176	19.2651	19.7648	20.1133	20.3095	20.3658	20.3595	20.2431	19.7759	19.0217	18.3610 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9433	0.9029	0.8491	0.7570	0.6323	0.4733	0.3374	0.3716	0.5681	0.7919	0.9102	0.9514 (94)
Useful gains	656.1961	785.3129	842.0326	836.9836	734.4879	540.6611	371.3100	386.7042	557.2643	670.6602	650.8283	620.2749 (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	1467.7968	1442.6897	1320.1236	1111.2168	858.6908	577.0602	380.6147	399.4641	623.2390	936.5238	1221.9150	1457.8233 (97)
Space heating kWh	603.8310	441.7572	355.6997	197.4478	92.4070	0.0000	0.0000	0.0000	0.0000	197.8026	411.1824	623.1360 (98a)
Space heating requirement - total per year (kWh/year)												2923.2637
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	603.8310	441.7572	355.6997	197.4478	92.4070	0.0000	0.0000	0.0000	0.0000	197.8026	411.1824	623.1360 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2923.2637
Space heating per m ²										(98c) / (4) =		33.0126 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	950.0650	747.9235	766.7403	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8573	0.9060	0.8886	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	814.4839	677.6472	681.2925	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1288.4341	1241.8223	1174.1628	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	341.2442	419.7463	366.6955	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	85.3110	104.9366	91.6739	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												281.9215 (107)
Energy for space heating												33.0126 (99)
Energy for space cooling												3.1838 (108)
Total												36.1963 (109)
Fabric Energy Efficiency (TFEE)												36.2 (109)

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Plot Reference	B3.1-3.3 3B5P MID EXP			Issued on Date	19/12/2025
Assessment Reference	3B5P	Plot Type Ref	3B5P		
Plot Address				SAP Version	10.2
SAP Rating	78 C	DER	4.43	TER	12.27
Environmental	96 A	% DER < TER			63.90
CO ₂ Emissions (t/year)	0.34	DFEE	35.86	TFEE	36.20
Compliance Check	See BREL	% DFEE < TFEE			0.94
% DPER < TPER	28.58	DPER	46.26	TPER	64.78
Assessor Details	Mr. Matthew Stainrod			Assessor ID	AU83-0001
Client	ROK, Wilf Foster				

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (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) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.0000	(17)
Infiltration rate	0.1500	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (21)

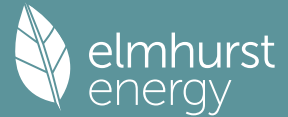
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
Exposed Floor			88.5000	0.1200	10.6200	0.0000	0.0000 (28b)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Total net area of external elements Aum(A, m ²)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.0807		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Ceiling			88.5000			100.0000	8850.0000 (32b)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		11505.4400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							129.9316 (35)
List of Thermal Bridges							

6. Solar gains						
[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	16.8700	36.7938	0.4000	0.7000	0.7700	120.4429 (77)

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Southwest		4.6300			36.7938			0.4000		0.7000		0.7700		33.0558 (79)	
Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629	(83)		
Total gains	698.8975	820.2517	894.6628	965.4437	994.4723	975.5297	941.5416	901.5477	866.0239	780.9138	701.7439	665.6943	(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	39.8387	39.9547	40.0713	40.6649	40.7858	41.4009	41.4009	41.5262	41.1527	40.7858	40.5448	40.3067			
alpha	3.6559	3.6636	3.6714	3.7110	3.7191	3.7601	3.7601	3.7684	3.7435	3.7191	3.7030	3.6871			
util living area															
	0.9534	0.9208	0.8737	0.7817	0.6527	0.4863	0.3557	0.3856	0.5752	0.8046	0.9213	0.9597	(86)		
MIT	19.5845	19.8796	20.2108	20.5851	20.8315	20.9582	20.9899	20.9863	20.9199	20.6050	20.0510	19.5378	(87)		
Th 2	20.1624	20.1647	20.1669	20.1781	20.1803	20.1916	20.1916	20.1938	20.1871	20.1803	20.1759	20.1714	(88)		
util rest of house															
	0.9463	0.9094	0.8560	0.7529	0.6100	0.4307	0.2924	0.3207	0.5186	0.7723	0.9080	0.9534	(89)		
MIT 2	18.8777	19.1652	19.4842	19.8408	20.0579	20.1672	20.1874	20.1878	20.1370	19.8679	19.3445	18.8390	(90)		
Living area fraction															
										fLA = Living area / (4) =		0.4054	(91)		
MIT	19.1642	19.4548	19.7788	20.1425	20.3715	20.4879	20.5127	20.5115	20.4544	20.1668	19.6309	19.1223	(92)		
Temperature adjustment												0.0000			
adjusted MIT	19.1642	19.4548	19.7788	20.1425	20.3715	20.4879	20.5127	20.5115	20.4544	20.1668	19.6309	19.1223	(93)		
8. Space heating requirement															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9360	0.8982	0.8468	0.7515	0.6203	0.4515	0.3178	0.3466	0.5378	0.7717	0.8979	0.9437	(94)		
Useful gains	654.1540	736.7697	757.5587	725.5536	616.9181	440.4066	299.1782	312.4344	465.7062	602.6325	630.0939	628.2408	(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															
	1192.4446	1164.2326	1059.0702	883.5765	679.4959	454.5188	302.0451	316.4336	493.4903	749.6467	987.7553	1183.2064	(97)		
Space heating kWh															
	400.4882	287.2550	224.3246	113.7765	46.5579	0.0000	0.0000	0.0000	0.0000	109.3786	257.5162	412.8944	(98a)		
Space heating requirement - total per year (kWh/year)												1852.1914			
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															
	400.4882	287.2550	224.3246	113.7765	46.5579	0.0000	0.0000	0.0000	0.0000	109.3786	257.5162	412.8944	(98c)		
Space heating requirement after solar contribution - total per year (kWh/year)												1852.1914			
Space heating per m2										(98c) / (4) =		20.9169	(99)		
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-Space and Water													1.0000 (303a)		
Factor for control and charging method (Table 4c(3)) for space heating													1.0500 (305)		
Factor for charging method (Table 4c(3)) for water heating													1.0000 (305a)		
Distribution loss factor (Table 12c) for community heating system													1.5000 (306)		
Efficiency of secondary/supplementary heating system, %													0.0000 (208)		
Space heating:															
Space heating requirement															
	400.4882	287.2550	224.3246	113.7765	46.5579	0.0000	0.0000	0.0000	0.0000	109.3786	257.5162	412.8944	(98)		
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50															
307a	630.7690	452.4267	353.3112	179.1980	73.3287	0.0000	0.0000	0.0000	0.0000	172.2713	405.5880	650.3087			
Space heating requirement															
	630.7690	452.4267	353.3112	179.1980	73.3287	0.0000	0.0000	0.0000	0.0000	172.2713	405.5880	650.3087	(307)		
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(309)		
Water heating															
Annual water heating requirement															
	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	(64)		
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50															
310a	250.7182	221.6273	236.4159	211.5546	207.3032	189.3545	189.3164	195.7709	196.6357	216.1073	225.7534	248.5785			
Water heating fuel															
	250.7182	221.6273	236.4159	211.5546	207.3032	189.3545	189.3164	195.7709	196.6357	216.1073	225.7534	248.5785	(310)		
Cooling System Energy Efficiency Ratio															
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(314)		
Pumps and Fa	20.8737	18.8536	20.8737	20.2003	20.8737	20.2003	20.8737	20.8737	20.2003	20.8737	20.2003	20.8737	(331)		
Lighting	28.3716	22.7608	20.4936	15.0145	11.5976	9.4753	10.5797	13.7519	17.8624	23.4364	26.4714	29.1602	(332)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(333a)m	-13.1364	-22.4678	-39.7083	-53.3554	-64.4292	-62.8241	-61.7681	-54.4254	-42.4416	-28.7016	-15.5605	-10.8064	(333a)		
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(334a)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	(334a)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(335a)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	(335a)		
Electricity generated by PVs (Appendix M) (negative quantity)															
(333b)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	(333b)		
Electricity generated by wind turbines (Appendix M) (negative quantity)															
(334b)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	(334b)		
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)															
(335b)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	(335b)		
Annual totals kWh/year															
Space heating fuel - community heating													2917.2015 (307)		
Space heating fuel - secondary													0.0000 (309)		
Water heating fuel - community heating													2589.1358 (310)		
Efficiency of water heater													0.0000 (311)		
Electricity used for heat distribution													29.1720 (313)		
Space cooling fuel													0.0000 (321)		
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)															
mechanical ventilation fans (SFP = 0.9100)													245.7705 (330a)		
Total electricity for the above, kWh/year													245.7705 (331)		
Electricity for lighting (calculated in Appendix L)													228.9753 (332)		

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-469.6249 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6130.0149 (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			280.0000 (367)
Space and Water heating from Heat pump	1966.5490	0.1561	162.5850 (367)
Electrical energy for heat distribution (space & water)	29.1720	0.0000	8.1900 (372)
Overall CO2 factor for heat network			0.0546 (386)
Total CO2 associated with community systems			300.6913 (373)
Energy for instantaneous electric shower(s)	618.5567	0.1391	86.0549 (264a)
Space and water heating			300.6913 (376)
Pumps, fans and electric keep-hot	245.7705	0.1387	34.0914 (378)
Energy for lighting	228.9753	0.1443	33.0482 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	0.1312	-61.6291
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6291 (380)
Total CO2, kg/year			392.2567 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.4300 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1966.5490	1.5777	1643.7534 (467)
Electrical energy for heat distribution (space & water)	29.1720	0.0000	85.3667 (472)
Overall CO2 factor for heat network			0.5692 (486)
Total CO2 associated with community systems			3134.1756 (473)
Energy for instantaneous electric shower(s)	618.5567	1.5143	936.7015 (278a)
Space and water heating			3134.1756 (476)
Pumps, fans and electric keep-hot	245.7705	1.5128	371.8017 (478)
Energy for lighting	228.9753	1.5338	351.2100 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	1.4848	-697.3059
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.3059 (480)
Total Primary energy kWh/year			4096.5829 (483)
Dwelling Primary energy Rate (DPER)			46.2600 (484)

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

1. Overall dwelling characteristics

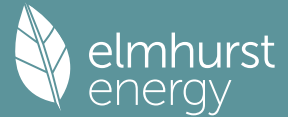
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		221.3750 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.3750 (5)

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	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3277 (21)

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

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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												
	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.2500	1.1450	23.1870		(27)
Exposed Floor			88.5000	0.1300	11.5050		(28b)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870		(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888		(29a)
Total net area of external elements Aum(A, m2)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	47.2578	(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							129.9316 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.7600	0.0500	0.5880	
E3 Sill				3.6200	0.0500	0.1810	
E4 Jamb				27.9600	0.0500	1.3980	
E7 Party floor between dwellings (in blocks of flats)				32.5800	0.0700	2.2806	
E16 Corner (normal)				7.5000	0.0900	0.6750	
E18 Party wall between dwellings				2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings				2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				8.0500	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				11.3000	0.0200	0.2260	
E20 Exposed floor (normal)				21.2800	0.3200	6.8096	
P7 Party Wall - Exposed floor (normal)				8.0500	0.1600	1.2880	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7462 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	61.0040 (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	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421 (38)
Average = Sum(39)m / 12 =	103.9070	103.6594	103.4167	102.2768	102.0636	101.0707	101.0707	100.8869	101.4532	102.0636	102.4950	102.9461 (39)
												102.2758
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1734	1.1706	1.1679	1.1550	1.1526	1.1414	1.1414	1.1393	1.1457	1.1526	1.1575	1.1626 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

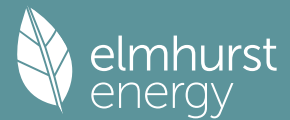
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6053 (42)
Hot water usage for mixer showers												
	67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920	67.6427 (42a)
Hot water usage for baths												
	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245 (42b)
Hot water usage for other uses												
	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114 (42c)
Average daily hot water use (litres/day)												127.3477 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	138.5379	135.5798	131.9773	126.4992	122.0506	117.2681	115.4301	119.0170	122.8000	127.8209	133.3834	138.1786 (44)
Energy content (annual)	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044	32.4532 (46)
Water storage loss (or HIU 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												
	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)
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 (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												
	266.0051	235.1495	249.4390	218.2629	210.8985	189.2866	186.1976	193.9628	196.5165	220.0466	235.1209	262.9493 (62)
WWHRS	-31.0424	-27.4541	-28.7484	-23.8048	-22.1852	-18.9840	-17.7945	-18.9227	-19.6416	-23.1553	-26.2321	-30.4675 (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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818 (64)
12Total per year (kWh/year)												2375.4027 (64)
Electric shower(s)												2375 (64)
	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												
	110.2298	97.8623	104.7216	93.6528	91.9069	84.0182	83.6938	86.2758	86.4222	94.9486	99.2581	109.2137 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												

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Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548 (68)
Pumps, fans	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Total internal gains	148.1584	145.6284	140.7548	130.0734	123.5307	116.6920	112.4917	115.9620	120.0308	127.6191	137.8585	146.7927 (72)
	568.8522	581.5497	557.7203	537.8539	510.7257	489.2490	470.6445	471.6619	485.8863	505.6596	536.4845	557.0566 (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			
Southeast				15.8900	36.7938	0.6300	0.7000	0.7700	178.6779 (77)			
Southwest				4.3600	36.7938	0.6300	0.7000	0.7700	49.0268 (79)			
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	796.5568	969.4149	1088.4144	1195.4096	1247.2429	1220.4402	1175.5908	1117.6994	1060.5158	934.3333	809.2222	751.9243 (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	30.7578	30.8313	30.9037	31.2481	31.3134	31.6210	31.6210	31.6786	31.5018	31.3134	31.1816	31.0449
alpha	3.0505	3.0554	3.0602	3.0832	3.0876	3.1081	3.1081	3.1119	3.1001	3.0876	3.0788	3.0697
util living area	0.9474	0.9104	0.8587	0.7680	0.6447	0.4926	0.3666	0.3990	0.5844	0.8012	0.9159	0.9546 (86)
MIT	19.0995	19.4746	19.9033	20.3775	20.7169	20.9107	20.9731	20.9646	20.8432	20.3899	19.6690	19.0329 (87)
Th 2	19.9413	19.9436	19.9458	19.9562	19.9581	19.9672	19.9672	19.9688	19.9637	19.9581	19.9542	19.9501 (88)
util rest of house	0.9387	0.8964	0.8371	0.7337	0.5939	0.4239	0.2851	0.3156	0.5157	0.7636	0.9003	0.9470 (89)
MIT 2	17.7588	18.2250	18.7514	19.3218	19.7027	19.9041	19.9542	19.9506	19.8433	19.3534	18.4826	17.6813 (90)
Living area fraction	FLA = Living area / (4) =											
MIT	18.3024	18.7316	19.2184	19.7498	20.1139	20.3122	20.3673	20.3617	20.2487	19.7736	18.9636	18.2293 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3024	18.7316	19.2184	19.7498	20.1139	20.3122	20.3673	20.3617	20.2487	19.7736	18.9636	18.2293 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9211	0.8769	0.8199	0.7263	0.6019	0.4475	0.3172	0.3481	0.5355	0.7561	0.8821	0.9305 (94)
Ext temp.	733.7011	850.0417	892.3376	868.2444	750.7652	546.1935	372.9441	389.0643	567.8832	706.4921	713.8394	699.6488 (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	1454.9448	1433.7800	1315.2986	1109.6836	858.7542	577.3344	380.7643	399.6836	623.8039	936.2923	1215.9620	1444.2576 (97)
Space heating requirement - total per year (kWh/year)	536.6053	392.2722	314.6829	173.8362	80.3438	0.0000	0.0000	0.0000	0.0000	170.9713	361.5283	553.9890 (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 (98c)
Space heating kWh	536.6053	392.2722	314.6829	173.8362	80.3438	0.0000	0.0000	0.0000	0.0000	170.9713	361.5283	553.9890 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	536.6053	392.2722	314.6829	173.8362	80.3438	0.0000	0.0000	0.0000	0.0000	170.9713	361.5283	553.9890 (98c)
Space heating per m2	(98c) / (4) =											29.1838 (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 %)												92.3000 (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)	536.6053	392.2722	314.6829	173.8362	80.3438	0.0000	0.0000	0.0000	0.0000	170.9713	361.5283	553.9890 (98)
Space heating fuel (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	581.3709	424.9969	340.9349	188.3383	87.0463	0.0000	0.0000	0.0000	0.0000	185.2344	391.6883	600.2047 (211)
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 (212)
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 (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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818 (64)
Efficiency of water heater (217)m	85.8514	85.4633	84.8550	83.8093	82.2905	79.8000	79.8000	79.8000	79.8000	83.7448	85.2779	79.8000 (216)
Fuel for water heating, kWh/month	273.6853	243.0229	260.0797	232.0245	229.3257	213.4118	211.0314	219.3486	221.6478	235.1087	244.9505	270.5319 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619 (232)

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Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168	(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	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433	(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												2799.8148	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2854.1688	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												199.9357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1094.2014	(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												4845.7178	(238)

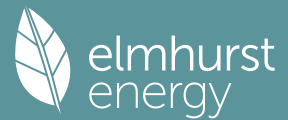
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2799.8148	0.2100	587.9611	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2854.1688	0.2100	599.3755	(264)
Space and water heating			1187.3366	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.9357	0.1443	28.8569	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786	
PV Unit electricity exported	-527.1737	0.1254	-66.0937	
Total			-141.8724	(269)
Total CO2, kg/year			1086.2504	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2700	(273)

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	2799.8148	1.1300	3163.7907	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2854.1688	1.1300	3225.2108	(278)
Space and water heating			6389.0015	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.9357	1.5338	306.6680	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623	
PV Unit electricity exported	-527.1737	0.4602	-242.5960	
Total			-1089.6584	(283)
Total Primary energy kWh/year			5736.1119	(286)
Target Primary Energy Rate (TPER)			64.7800	(287)

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Plot Reference	B3.1-3.3 3B5P MID				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	81 B	DER	3.44	TER	9.83		
Environmental	97 A	% DER < TER				65.01	
CO ₂ Emissions (t/year)	0.27	DFEE	25.21	TFEE	25.22		
Compliance Check	See BREL	% DFEE < TFEE				0.03	
% DPER < TPER	29.92	DPER	36.19	TPER	51.65		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (5)

2. Ventilation rate

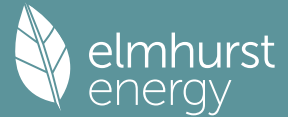
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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 infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Total net area of external elements Aum(A, m ²)			81.4500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.4607		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Floor			88.5000			80.0000	7080.0000 (32d)
Party Ceiling			88.5000			100.0000	8850.0000 (32b)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18585.4400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							209.8864 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.7600	0.0500	0.5880
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	27.9600	0.0500	1.3980
E7 Party floor between dwellings (in blocks of flats)	53.8600	0.0700	3.7702
E16 Corner (normal)	7.5000	0.0900	0.6750
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - intermediate floor between dwellings (in blocks of flats)	16.1100	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.3000	0.0200	0.2260

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.1382 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 40.5989 (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	22.3955	22.1627	21.9298	20.7655	20.5327	19.3684	19.3684	19.1355	19.8341	20.5327	20.9984	21.4641 (38)
Average = Sum(39)m / 12 =	62.9944	62.7616	62.5287	61.3644	61.1315	59.9673	59.9673	59.7344	60.4330	61.1315	61.5973	62.0630 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7114	0.7088	0.7061	0.6930	0.6904	0.6772	0.6772	0.6746	0.6825	0.6904	0.6956	0.7009 (40)
HLP (average)												0.6923
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6053 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245	29.2245 (42b)
Hot water usage for other uses												
41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114	41.3114 (42c)
Average daily hot water use (litres/day)												64.7435 (43)
Daily hot water use												
70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359	70.5359 (44)
Energy conte	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												1075.2508
16.7803	14.6736	15.3501	13.1314	12.4388	10.9114	10.6401	11.2856	11.6395	13.3192	14.5513	16.5663	16.5663 (46)
Water storage loss (or HIU loss):												
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	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	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	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												
167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	165.7190 (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												
167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	165.7190 (64)
Total per year (kWh/year)												1726.0905 (64)
Electric shower(s)												1726 (64)
54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789	54.3789 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.5567 (64a)
Heat gains from water heating, kWh/month												
95.0125	84.5815	91.4744	84.5252	84.6533	79.2483	80.4823	82.0970	81.2182	86.9726	88.0285	94.5382	94.5382 (65)

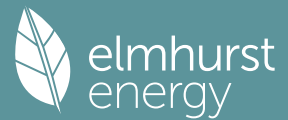
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	123.2032	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	225.9548 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (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)												
-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Water heating gains (Table 5)												
127.7050	125.8653	122.9494	117.3961	113.7813	110.0670	108.1751	110.3454	112.8030	116.8987	122.2618	127.0675	127.0675 (72)
Total internal gains												
545.3988	558.7866	536.9149	522.1766	497.9762	482.6241	466.3280	466.0452	478.6585	491.9392	517.8878	534.3314	534.3314 (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
Southeast	16.8700	36.7938	0.4000	0.7000	0.7700	120.4429 (77)
Southwest	4.6300	36.7938	0.4000	0.7000	0.7700	33.0558 (79)

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Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629 (83)
Total gains	698.8975	820.2517	894.6628	965.4437	994.4723	975.5297	941.5416	901.5477	866.0239	780.9138	701.7439	665.6943 (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	81.9536	82.2577	82.5640	84.1306	84.4510	86.0907	86.0907	86.4263	85.4272	84.4510	83.8125	83.1836
alpha	6.4636	6.4838	6.5043	6.6087	6.6301	6.7394	6.7394	6.7618	6.6951	6.6301	6.5875	6.5456
util living area	0.9749	0.9384	0.8724	0.7328	0.5656	0.3930	0.2802	0.3047	0.4796	0.7652	0.9375	0.9802 (86)
MIT	20.4344	20.6324	20.8073	20.9464	20.9907	20.9993	20.9999	20.9999	20.9975	20.9415	20.6963	20.4031 (87)
Th 2	20.3308	20.3331	20.3354	20.3470	20.3494	20.3610	20.3610	20.3633	20.3563	20.3494	20.3447	20.3401 (88)
util rest of house	0.9695	0.9268	0.8517	0.7010	0.5279	0.3539	0.2395	0.2626	0.4356	0.7287	0.9239	0.9758 (89)
MIT 2	19.8237	20.0148	20.1779	20.3077	20.3435	20.3607	20.3610	20.3633	20.3551	20.3080	20.0882	19.8014 (90)
Living area fraction									fLA = Living area / (4) =			0.4054 (91)
MIT	20.0713	20.2652	20.4331	20.5666	20.6059	20.6196	20.6200	20.6214	20.6155	20.5648	20.3347	20.0453 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0713	20.2652	20.4331	20.5666	20.6059	20.6196	20.6200	20.6214	20.6155	20.5648	20.3347	20.0453 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9671	0.9255	0.8550	0.7119	0.5428	0.3697	0.2560	0.2797	0.4534	0.7412	0.9237	0.9735 (94)
Useful gains	675.8944	759.1278	764.8995	687.3320	539.8484	360.6994	241.0519	252.1296	392.6531	578.7854	648.1749	648.0398 (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	993.5044	964.3437	871.2172	715.9153	544.4325	360.9794	241.0704	252.1626	393.7523	609.1654	815.2219	983.4087 (97)
Space heating kWh	236.3018	137.9051	79.1004	20.5800	3.4106	0.0000	0.0000	0.0000	0.0000	22.6027	120.2739	249.5145 (98a)
Space heating requirement - total per year (kWh/year)												869.6889
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	236.3018	137.9051	79.1004	20.5800	3.4106	0.0000	0.0000	0.0000	0.0000	22.6027	120.2739	249.5145 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												869.6889
Space heating per m2										(98c) / (4) =		9.8214 (99)

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-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement												
	236.3018	137.9051	79.1004	20.5800	3.4106	0.0000	0.0000	0.0000	0.0000	22.6027	120.2739	249.5145 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	372.1754	217.2005	124.5831	32.4135	5.3717	0.0000	0.0000	0.0000	0.0000	35.5993	189.4313	392.9853
Space heating requirement	372.1754	217.2005	124.5831	32.4135	5.3717	0.0000	0.0000	0.0000	0.0000	35.5993	189.4313	392.9853 (307)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement												
	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	250.7182	221.6273	236.4159	211.5546	207.3032	189.3545	189.3164	195.7709	196.6357	216.1073	225.7534	248.5785
Water heating fuel	250.7182	221.6273	236.4159	211.5546	207.3032	189.3545	189.3164	195.7709	196.6357	216.1073	225.7534	248.5785 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	20.8737	18.8536	20.8737	20.2003	20.8737	20.2003	20.8737	20.8737	20.2003	20.8737	20.2003	20.8737 (331)
Lighting	28.3716	22.7608	20.4936	15.0145	11.5976	9.4753	10.5797	13.7519	17.8624	23.4364	26.4714	29.1602 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.1364	-22.4678	-39.7083	-53.3554	-64.4292	-62.8241	-61.7681	-54.4254	-42.4416	-28.7016	-15.5605	-10.8064 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)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 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)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 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)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 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)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 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)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 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1369.7601 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2589.1358 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												13.6976 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												245.7705 (330a)
Total electricity for the above, kWh/year												245.7705 (331)
Electricity for lighting (calculated in Appendix L)												228.9753 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-469.6249 (333)

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Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4582.5735 (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			280.0000 (367)
Space and Water heating from Heat pump	1413.8914	0.1587	77.6158 (367)
Electrical energy for heat distribution (space & water)	13.6976	0.0000	5.8109 (372)
Overall CO2 factor for heat network			0.0539 (386)
Total CO2 associated with community systems			213.3430 (373)
Energy for instantaneous electric shower(s)	618.5567	0.1391	86.0549 (264a)
Space and water heating			213.3430 (376)
Pumps, fans and electric keep-hot	245.7705	0.1387	34.0914 (378)
Energy for lighting	228.9753	0.1443	33.0482 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	0.1312	-61.6291
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6291 (380)
Total CO2, kg/year			304.9084 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1413.8914	1.5873	776.4913 (467)
Electrical energy for heat distribution (space & water)	13.6976	0.0000	61.0833 (472)
Overall CO2 factor for heat network			0.5665 (486)
Total CO2 associated with community systems			2242.6303 (473)
Energy for instantaneous electric shower(s)	618.5567	1.5143	936.7015 (278a)
Space and water heating			2242.6303 (476)
Pumps, fans and electric keep-hot	245.7705	1.5128	371.8017 (478)
Energy for lighting	228.9753	1.5338	351.2100 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	1.4848	-697.3059
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.3059 (480)
Total Primary energy kWh/year			3205.0375 (483)
Dwelling Primary energy Rate (DPER)			36.1900 (484)

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

1. Overall dwelling characteristics

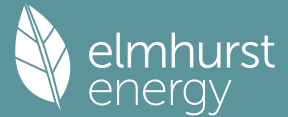
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (5)

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	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3277 (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)

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Adj infilt rate	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.2500	1.1450	23.1870		(27)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870		(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888		(29a)
Total net area of external elements Aum(A, m2)			81.4500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.7528		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000		(32)

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

209.8864 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.7600	0.0500	0.5880
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	27.9600	0.0500	1.3980
E7 Party floor between dwellings (in blocks of flats)	53.8600	0.0700	3.7702
E16 Corner (normal)	7.5000	0.0900	0.6750
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.1100	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.3000	0.0200	0.2260

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

7.1382 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 42.8910 (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
42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421	(38)
Heat transfer coeff	85.7940	85.5464	85.3037	84.1638	83.9506	82.9577	82.9577	82.7739	83.3402	83.9506	84.3820	84.8331 (39)
Average = Sum(39)m / 12 =												84.1628

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9689	0.9661	0.9633	0.9505	0.9481	0.9368	0.9368	0.9348	0.9412	0.9481	0.9529	0.9580 (40)
HLP (average)												0.9505
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6053 (42)
Hot water usage for mixer showers	67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920	67.6427 (42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245 (42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114 (42c)
Average daily hot water use (litres/day)												127.3477 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	138.5379	135.5798	131.9773	126.4992	122.0506	117.2681	115.4301	119.0170	122.8000	127.8209	133.3834	138.1786 (44)
Energy conte	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544 (45)
Energy content (annual)										Total = Sum(45)m =		2115.2180

Distribution loss (46)m = 0.15 x (45)m	32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044	32.4532 (46)
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Water storage loss (or HIU loss):

Store volume 150.0000 (47)

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

Temperature factor from Table 2b 1.3938 (48)

Enter (49) or (54) in (55) 0.5400 (49)

Total storage loss 0.7527 (55)

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)

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 (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 266.0051 235.1495 249.4390 218.2629 210.8985 189.2866 186.1976 193.9628 196.5165 220.0466 235.1209 262.9493 (62)

WWHRS -31.0424 -27.4541 -28.7484 -23.8048 -22.1852 -18.9840 -17.7945 -18.9227 -19.6416 -23.1553 -26.2321 -30.4675 (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 234.9628 207.6954 220.6907 194.4581 188.7133 170.3026 168.4031 175.0402 176.8749 196.8913 208.8887 232.4818 (64)

Total per year (kWh/year) = Sum(64)m = 2375.4027 (64)

12Total per year (kWh/year) 2375 (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)

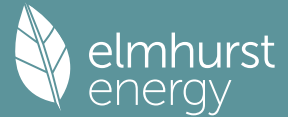
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 110.2298 97.8623 104.7216 93.6528 91.9069 84.0182 83.6938 86.2758 86.4222 94.9486 99.2581 109.2137 (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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (69)

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Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Water heating gains (Table 5)	148.1584	145.6284	140.7548	130.0734	123.5307	116.6920	112.4917	115.9620	120.0308	127.6191	137.8585	146.7927 (72)
Total internal gains	568.8522	581.5497	557.7203	537.8539	510.7257	489.2490	470.6445	471.6619	485.8863	505.6596	536.4845	557.0566 (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			
Southeast				15.8900	36.7938	0.6300	0.7000	0.7700	178.6779 (77)			
Southwest				4.3600	36.7938	0.6300	0.7000	0.7700	49.0268 (79)			
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	796.5568	969.4149	1088.4144	1195.4096	1247.2429	1220.4402	1175.5908	1117.6994	1060.5158	934.3333	809.2222	751.9243 (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)												
tau	60.1746	60.3488	60.5205	61.3401	61.4960	62.2320	62.2320	62.3702	61.9464	61.4960	61.1815	60.8562
alpha	5.0116	5.0233	5.0347	5.0893	5.0997	5.1488	5.1488	5.1580	5.1298	5.0997	5.0788	5.0571
util living area	0.9759	0.9423	0.8828	0.7624	0.6032	0.4316	0.3100	0.3398	0.5312	0.8065	0.9474	0.9810 (86)
MIT	20.0556	20.3313	20.6017	20.8451	20.9589	20.9940	20.9991	20.9986	20.9831	20.8269	20.4126	20.0070 (87)
Th 2	20.1094	20.1117	20.1140	20.1248	20.1268	20.1363	20.1363	20.1380	20.1327	20.1268	20.1227	20.1185 (88)
util rest of house	0.9701	0.9300	0.8601	0.7246	0.5531	0.3748	0.2494	0.2766	0.4686	0.7650	0.9340	0.9764 (89)
MIT 2	19.0303	19.3721	19.6972	19.9790	20.0943	20.1328	20.1360	20.1375	20.1218	19.9689	19.4862	18.9764 (90)
Living area fraction	19.4460	19.7610	20.0639	20.3302	20.4448	20.4819	20.4859	20.4866	20.4710	20.3167	19.8618	19.3942 (92)
MIT	19.4460	19.7610	20.0639	20.3302	20.4448	20.4819	20.4859	20.4866	20.4710	20.3167	19.8618	19.3942 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4460	19.7610	20.0639	20.3302	20.4448	20.4819	20.4859	20.4866	20.4710	20.3167	19.8618	19.3942 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9648	0.9244	0.8587	0.7338	0.5717	0.3977	0.2740	0.3022	0.4934	0.7746	0.9293	0.9716 (94)
Ext temp.	768.5477	896.1214	934.6384	877.2469	713.0604	485.3326	322.0667	337.7675	523.2254	723.7026	752.0319	730.5860 (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	1299.4368	1271.3054	1157.0508	962.0062	734.1305	487.9525	322.3661	338.2636	530.9611	815.7249	1076.8672	1288.9700 (97)
Space heating requirement - total per year (kWh/year)	394.9815	252.1236	165.4748	61.0267	15.6762	0.0000	0.0000	0.0000	0.0000	68.4646	233.8814	415.4377 (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)	394.9815	252.1236	165.4748	61.0267	15.6762	0.0000	0.0000	0.0000	0.0000	68.4646	233.8814	415.4377 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1607.0665 (99)
Space heating per m2										(98c) / (4) =		18.1487 (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 %)												92.3000 (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)	394.9815	252.1236	165.4748	61.0267	15.6762	0.0000	0.0000	0.0000	0.0000	68.4646	233.8814	415.4377 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	427.9323	273.1567	179.2794	66.1178	16.9839	0.0000	0.0000	0.0000	0.0000	74.1761	253.3926	450.0950 (211)
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 (212)
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 (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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818 (64)
Efficiency of water heater (217)m	85.2153	84.4956	83.4230	81.7798	80.4252	79.8000	79.8000	79.8000	79.8000	81.9428	84.3138	79.8000 (216)
Fuel for water heating, kWh/month	275.7284	245.8062	264.5440	237.7824	234.6446	213.4118	211.0314	219.3486	221.6478	240.2790	247.7514	272.3984 (219)
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 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168 (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)												

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(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	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433	(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												1741.1338	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2884.3739	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												199.9357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1094.2014	(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												3817.2419	(238)

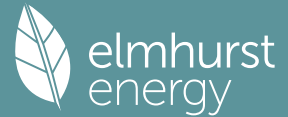
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1741.1338	0.2100	365.6381	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2884.3739	0.2100	605.7185	(264)
Space and water heating			971.3566	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.9357	0.1443	28.8569	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786	
PV Unit electricity exported	-527.1737	0.1254	-66.0937	
Total			-141.8724	(269)
Total CO2, kg/year			870.2704	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8300	(273)

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	1741.1338	1.1300	1967.4812	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2884.3739	1.1300	3259.3425	(278)
Space and water heating			5226.8237	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.9357	1.5338	306.6680	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623	
PV Unit electricity exported	-527.1737	0.4602	-242.5960	
Total			-1089.6584	(283)
Total Primary energy kWh/year			4573.9341	(286)
Target Primary Energy Rate (TPER)			51.6500	(287)

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Plot Reference	B3.1-3.3 3B5P MID				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	81 B	DER	3.44	TER	9.83		
Environmental	97 A	% DER < TER				65.01	
CO ₂ Emissions (t/year)	0.27	DFEE	25.21	TFEE	25.22		
Compliance Check	See BREL	% DFEE < TFEE				0.03	
% DPER < TPER	29.92	DPER	36.19	TPER	51.65		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		221.3750 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 221.3750 (5)

2. Ventilation rate

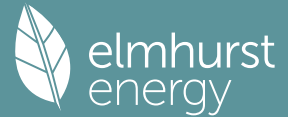
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2855 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2427 (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	0.3094	0.3034	0.2973	0.2670	0.2609	0.2306	0.2306	0.2245	0.2427	0.2609	0.2730	0.2852 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5479	0.5460	0.5442	0.5356	0.5340	0.5266	0.5266	0.5252	0.5294	0.5340	0.5373	0.5407 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Total net area of external elements Aum(A, m ²)			81.4500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.4607		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Floor			88.5000			80.0000	7080.0000 (32d)
Party Ceiling			88.5000			100.0000	8850.0000 (32b)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18585.4400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							209.8864 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.7600	0.0500	0.5880	
E3 Sill				3.6200	0.0500	0.1810	

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E4 Jamb	27.9600	0.0500	1.3980	
E7 Party floor between dwellings (in blocks of flats)	53.8600	0.0700	3.7702	
E16 Corner (normal)	7.5000	0.0900	0.6750	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.1100	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.3000	0.0200	0.2260	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.1382 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		40.5989 (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	40.0242	39.8884	39.7553	39.1300	39.0130	38.4685	38.4685	38.3676	38.6782	39.0130	39.2497	39.4971	(38)
Average = Sum(39)m / 12 =	80.6231	80.4873	80.3541	79.7289	79.6119	79.0674	79.0674	78.9665	79.2771	79.6119	79.8486	80.0960	(39)
												79.7283	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9105	0.9089	0.9074	0.9004	0.8991	0.8929	0.8929	0.8918	0.8953	0.8991	0.9017	0.9045	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6053 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245	(42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114	(42c)
Average daily hot water use (litres/day)												64.7435	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359	(44)
Energy content (annual)	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422	(45)
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss (or HIU loss):													
Total storage 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	(56)
If cylinder contains dedicated solar storage													
Primary 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	(57)
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	(59)
Total heat required for water heating calculated for each month													
WWHRS	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759	(62)
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	(63a)
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	(63b)
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	(63c)
Output from w/h	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759	(64)
12Total per year (kWh/year)													
Electric shower(s)	54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789	(64a)
Heat gains from water heating, kWh/month	37.3668	32.9006	34.9729	31.2251	30.4808	27.7242	27.7488	28.8471	29.1116	32.0958	33.5925	37.0637	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.5567	(64a)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	(68)
Pumps, fans	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Total internal gains	50.2242	48.9593	47.0065	43.3683	40.9688	38.5058	37.2967	38.7729	40.4328	43.1395	46.6563	49.8168	(72)
	467.9180	481.8806	460.9720	448.1487	425.1637	411.0629	395.4495	394.4728	406.2883	418.1800	442.2823	457.0807	(73)

6. Solar gains

[Jan]												
				Area	Solar flux		g		FF	Access	Gains	
				m2	Table 6a		Specific data		Specific data	factor		
					W/m2		or Table 6b		or Table 6c	Table 6d	W	
Southeast				16.8700	36.7938		0.4000		0.7000	0.7700	120.4429 (77)	
Southwest				4.6300	36.7938		0.4000		0.7000	0.7700	33.0558 (79)	
Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629 (83)
Total gains	621.4168	743.3457	818.7200	891.4158	921.6598	903.9685	870.6632	829.9752	793.6537	707.1547	626.1384	588.4436 (84)

7. Mean internal temperature (heating season)

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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	64.0341	64.1421	64.2484	64.7522	64.8474	65.2940	65.2940	65.3774	65.1212	64.8474	64.6552	64.4555	
alpha	5.2689	5.2761	5.2832	5.3168	5.3232	5.3529	5.3529	5.3585	5.3414	5.3232	5.3103	5.2970	
util living area	0.9908	0.9766	0.9483	0.8730	0.7376	0.5485	0.3978	0.4347	0.6568	0.9001	0.9786	0.9929 (86)	
MIT	19.9336	20.1680	20.4323	20.7272	20.9114	20.9850	20.9977	20.9964	20.9624	20.7199	20.2730	19.8875 (87)	
Th 2	20.1586	20.1599	20.1612	20.1672	20.1683	20.1735	20.1735	20.1745	20.1715	20.1683	20.1660	20.1637 (88)	
util rest of house	0.9884	0.9708	0.9359	0.8449	0.6883	0.4821	0.3240	0.3582	0.5892	0.8714	0.9723	0.9911 (89)	
MIT 2	19.1891	19.4204	19.6770	19.9549	20.1101	20.1664	20.1729	20.1733	20.1515	19.9554	19.5307	19.1474 (90)	
Living area fraction	19.4909	19.7235	19.9832	20.2680	20.4350	20.4983	20.5073	20.5070	fLA = Living area / (4) =				0.4054 (91)
MIT	19.4909	19.7235	19.9832	20.2680	20.4350	20.4983	20.5073	20.5070	20.4802	20.2654	19.8317	19.4475 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4909	19.7235	19.9832	20.2680	20.4350	20.4983	20.5073	20.5070	20.4802	20.2654	19.8317	19.4475 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9860	0.9673	0.9328	0.8486	0.7048	0.5086	0.3539	0.3892	0.6152	0.8751	0.9693	0.9891 (94)
Useful gains	612.7159	719.0127	763.7294	756.4585	649.5740	459.7296	308.1593	323.0291	488.2600	618.8609	606.8959	582.0039 (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	1224.7376	1193.1028	1083.4330	906.3573	695.4081	466.3607	308.9381	324.3176	505.8061	769.4774	1016.6062	1221.2611 (97)
Space heating kWh	455.3442	318.5886	237.8595	107.9271	34.1005	0.0000	0.0000	0.0000	0.0000	112.0586	294.9914	475.6073 (98a)
Space heating requirement - total per year (kWh/year)												2036.4773
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	455.3442	318.5886	237.8595	107.9271	34.1005	0.0000	0.0000	0.0000	0.0000	112.0586	294.9914	475.6073 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2036.4773
Space heating per m2												(98c) / (4) = 22.9980 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	743.2332	585.0984	600.1455	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9403	0.9728	0.9635	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	698.8889	569.1612	578.2687	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1009.9186	973.3036	928.0829	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	223.9414	300.6820	260.2617	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												0.2500
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	55.9853	75.1705	65.0654	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												196.2213 (107)
Energy for space heating												22.9980 (99)
Energy for space cooling												2.2159 (108)
Total												25.2140 (109)
Fabric Energy Efficiency (DFEE)												25.2 (109)

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

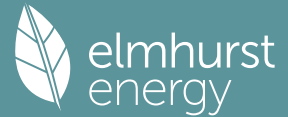
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	88.5500 (1b)	x 2.5000 (2b)	= 221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.3750 (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	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		30.0000 / (5) = 0.1355 (8)
Pressure test		Yes
Pressure Test Method		Blower Door

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Measured/design AP50 5.0000 (17)
Infiltration rate 0.3855 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3277 (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	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.2500	1.1450	23.1870		(27)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870		(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888		(29a)
Total net area of external elements Aum(A, m2)				81.4500			(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.7528	(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 209.8864 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	11.7600	0.0500	0.5880
E2 Other lintels (including other steel lintels)	3.6200	0.0500	0.1810
E3 Sill	27.9600	0.0500	1.3980
E4 Jamb	53.8600	0.0700	3.7702
E7 Party floor between dwellings (in blocks of flats)	7.5000	0.0900	0.6750
E16 Corner (normal)	2.5000	0.0600	0.1500
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	16.1100	0.0000	0.0000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.3000	0.0200	0.2260
E23 Balcony within or between dwellings, balcony support penetrates wall insulation			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.1382 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.8910 (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	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421 (38)
Heat transfer coeff	85.7940	85.5464	85.3037	84.1638	83.9506	82.9577	82.9577	82.7739	83.3402	83.9506	84.3820	84.8331 (39)
Average = Sum(39)m / 12 =												84.1628

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9689	0.9661	0.9633	0.9505	0.9481	0.9368	0.9368	0.9348	0.9412	0.9481	0.9529	0.9580 (40)
HLP (average)												0.9505
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6053 (42)
Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)
Hot water usage for baths 29.3237 28.8882 28.2749 27.1442 26.2974 25.3586 24.8515 25.4604 26.1235 27.1281 28.2822 29.2245 (42b)
Hot water usage for other uses 41.3114 39.8091 38.3069 36.8047 35.3024 33.8002 33.8002 35.3024 36.8047 38.3069 39.8091 41.3114 (42c)
Average daily hot water use (litres/day) 64.7435 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359 (44)
Energy conte	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422 (45)
Energy content (annual)										Total = Sum(45)m =		1075.2508
Distribution loss (46)m = 0.15 x (45)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 (46)
Water storage loss (or HIU loss):												
Total storage 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 (56)
If cylinder contains dedicated solar storage												
Primary 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 (57)
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 (59)
Total heat required for water heating calculated for each month	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759 (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	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759 (64)
Total per year (kWh/year) = Sum(64)m =												914 (64)

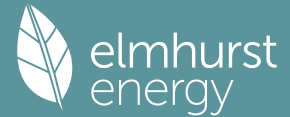
12Total per year (kWh/year) 914 (64)

Electric shower(s) 54.3789 48.4520 52.9078 50.4892 51.4367 49.0656 50.7011 51.4367 50.4892 52.9078 51.9129 54.3789 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 618.5567 (64a)

Heat gains from water heating, kWh/month 37.3668 32.9006 34.9729 31.2251 30.4808 27.7242 27.7488 28.8471 29.1116 32.0958 33.5925 37.0637 (65)

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

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Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Water heating gains (Table 5)	50.2242	48.9593	47.0065	43.3683	40.9688	38.5058	37.2967	38.7729	40.4328	43.1395	46.6563	49.8168	(72)
Total internal gains	467.9180	481.8806	460.9720	448.1487	425.1637	411.0629	395.4495	394.4728	406.2883	418.1800	442.2823	457.0807	(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		
Southeast				15.8900	36.7938	0.6300	0.7000		0.7700	178.6779 (77)		
Southwest				4.3600	36.7938	0.6300	0.7000		0.7700	49.0268 (79)		
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	695.6227	869.7458	991.6661	1105.7045	1161.6810	1142.2540	1100.3958	1040.5103	980.9178	846.8537	715.0200	651.9484 (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	60.1746	60.3488	60.5205	61.3401	61.4960	62.2320	62.2320	62.3702	61.9464	61.4960	61.1815	60.8562	
alpha	5.0116	5.0233	5.0347	5.0893	5.0997	5.1488	5.1488	5.1580	5.1298	5.0997	5.0788	5.0571	
util living area	0.9861	0.9609	0.9115	0.7996	0.6402	0.4599	0.3310	0.3646	0.5699	0.8485	0.9667	0.9895	(86)
MIT	19.9239	20.2192	20.5196	20.8057	20.9464	20.9919	20.9988	20.9980	20.9768	20.7764	20.3036	19.8733	(87)
Th 2	20.1094	20.1117	20.1140	20.1248	20.1268	20.1363	20.1363	20.1380	20.1327	20.1268	20.1227	20.1185	(88)
util rest of house	0.9825	0.9519	0.8926	0.7638	0.5890	0.3999	0.2664	0.2970	0.5043	0.8113	0.9575	0.9868	(89)
MIT 2	19.1398	19.4292	19.7157	19.9799	20.0933	20.1326	20.1359	20.1374	20.1209	19.9636	19.5238	19.0973	(90)
Living area fraction									fLA = Living area / (4) =			0.4054	(91)
MIT	19.4577	19.7495	20.0416	20.3147	20.4392	20.4810	20.4858	20.4863	20.4679	20.2931	19.8399	19.4119	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4577	19.7495	20.0416	20.3147	20.4392	20.4810	20.4858	20.4863	20.4679	20.2931	19.8399	19.4119	(93)

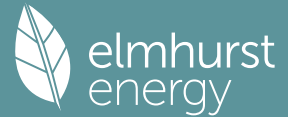
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9793	0.9476	0.8909	0.7720	0.6078	0.4240	0.2926	0.3244	0.5301	0.8189	0.9539	0.9841	(94)
Ext temp.	681.2221	824.1942	883.5074	853.5904	706.0425	484.3560	321.9443	337.5479	520.0315	693.5256	682.0748	641.5723	(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	1300.4397	1270.3229	1155.1492	960.7051	733.6582	487.8754	322.3541	338.2425	530.7048	813.7435	1075.0199	1290.4729	(97)
Space heating requirement - total per year (kWh/year)	460.6979	299.7985	202.1015	77.1225	20.5461	0.0000	0.0000	0.0000	0.0000	89.4422	282.9205	482.7821	(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	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	460.6979	299.7985	202.1015	77.1225	20.5461	0.0000	0.0000	0.0000	0.0000	89.4422	282.9205	482.7821	(98c)
Space heating per m2										(98c) / (4) =		21.6308	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	779.8028	613.8873	629.0815	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9688	0.9864	0.9810	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	755.4939	605.5253	617.1439	0.0000	0.0000	0.0000	0.0000	(102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1288.4341	1241.8223	1174.1628	0.0000	0.0000	0.0000	0.0000	(103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	383.7170	473.4050	414.4220	0.0000	0.0000	0.0000	0.0000	(104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000	(105)
Space cooling kWh	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling requirement	0.0000	0.0000	0.0000	0.0000	0.0000	95.9292	118.3512	103.6055	0.0000	0.0000	0.0000	0.0000	(107)
Energy for space heating												317.8860	(107)
Energy for space cooling												21.6308	(99)
Total												3.5899	(108)
Fabric Energy Efficiency (TFEE)												25.2207	(109)

Full SAP Calculation Printout



Plot Reference	B3.1-3.3 3B5P MID				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	81 B	DER	3.44	TER	9.83		
Environmental	97 A	% DER < TER				65.01	
CO ₂ Emissions (t/year)	0.27	DFEE	25.21	TFEE	25.22		
Compliance Check	See BREL	% DFEE < TFEE				0.03	
% DPER < TPER	29.92	DPER	36.19	TPER	51.65		
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Total net area of external elements Aum(A, m ²)			81.4500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.4607		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Floor			88.5000			80.0000	7080.0000 (32d)
Party Ceiling			88.5000			100.0000	8850.0000 (32b)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18585.4400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							209.8864 (35)
List of Thermal Bridges							

elmhurst
energy

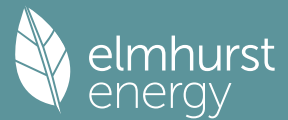
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	22.3955	22.1627	21.9298	20.7655	20.5327	19.3684	19.3684	19.1355	19.8341	20.5327	20.9984	21.4641 (38)
Heat transfer coeff	62.9944	62.7616	62.5287	61.3644	61.1315	59.9673	59.9673	59.7344	60.4330	61.1315	61.5973	62.0630 (39)
Average = Sum(39)m / 12 =												61.3062
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.7114	0.7088	0.7061	0.6930	0.6904	0.6772	0.6772	0.6746	0.6825	0.6904	0.6956	0.7009 (40)
HLP (average)												0.6923
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy													2.6053 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245	29.2245 (42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114	41.3114 (42c)
Average daily hot water use (litres/day)													64.7435 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359	(44)
Distribution loss (46)m = 0.15 x (45)m	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422	(45)
Water storage loss (or HIU loss):													
Store volume	16.7803	14.6736	15.3501	13.1314	12.4388	10.9114	10.6401	11.2856	11.6395	13.3192	14.5513	16.5663	(46)
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)
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	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	(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	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	(64)
12Total per year (kWh/year)													1726 (64)
Electric shower(s)	54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789	(64a)
Heat gains from water heating, kWh/month	95.0125	84.5815	91.4744	84.5252	84.6533	79.2483	80.4823	82.0970	81.2182	86.9726	88.0285	94.5382	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Water heating gains (Table 5)	127.7050	125.8653	122.9494	117.3961	113.7813	110.0670	108.1751	110.3454	112.8030	116.8987	122.2618	127.0675 (72)
Total internal gains	545.3988	558.7866	536.9149	522.1766	497.9762	482.6241	466.3280	466.0452	478.6585	491.9392	517.8878	534.3314 (73)

[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
Southeast	16.8700	36.7938	0.4000	0.7000	0.7700	120.4429 (77)
Southwest	4.6300	36.7938	0.4000	0.7000	0.7700	33.0558 (79)

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Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629 (83)
Total gains	698.8975	820.2517	894.6628	965.4437	994.4723	975.5297	941.5416	901.5477	866.0239	780.9138	701.7439	665.6943 (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	81.9536	82.2577	82.5640	84.1306	84.4510	86.0907	86.0907	86.4263	85.4272	84.4510	83.8125	83.1836
alpha	6.4636	6.4838	6.5043	6.6087	6.6301	6.7394	6.7394	6.7618	6.6951	6.6301	6.5875	6.5456
util living area	0.9749	0.9384	0.8724	0.7328	0.5656	0.3930	0.2802	0.3047	0.4796	0.7652	0.9375	0.9802 (86)
MIT	20.4344	20.6324	20.8073	20.9464	20.9907	20.9993	20.9999	20.9999	20.9975	20.9415	20.6963	20.4031 (87)
Th 2	20.3308	20.3331	20.3354	20.3470	20.3494	20.3610	20.3610	20.3633	20.3563	20.3494	20.3447	20.3401 (88)
util rest of house	0.9695	0.9268	0.8517	0.7010	0.5279	0.3539	0.2395	0.2626	0.4356	0.7287	0.9239	0.9758 (89)
MIT 2	19.8237	20.0148	20.1779	20.3077	20.3435	20.3607	20.3610	20.3633	20.3551	20.3080	20.0882	19.8014 (90)
Living area fraction									fLA = Living area / (4) =			0.4054 (91)
MIT	20.0713	20.2652	20.4331	20.5666	20.6059	20.6196	20.6200	20.6214	20.6155	20.5648	20.3347	20.0453 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0713	20.2652	20.4331	20.5666	20.6059	20.6196	20.6200	20.6214	20.6155	20.5648	20.3347	20.0453 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9671	0.9255	0.8550	0.7119	0.5428	0.3697	0.2560	0.2797	0.4534	0.7412	0.9237	0.9735 (94)
Useful gains	675.8944	759.1278	764.8995	687.3320	539.8484	360.6994	241.0519	252.1296	392.6531	578.7854	648.1749	648.0398 (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	993.5044	964.3437	871.2172	715.9153	544.4325	360.9794	241.0704	252.1626	393.7523	609.1654	815.2219	983.4087 (97)
Space heating kWh	236.3018	137.9051	79.1004	20.5800	3.4106	0.0000	0.0000	0.0000	0.0000	22.6027	120.2739	249.5145 (98a)
Space heating requirement - total per year (kWh/year)												869.6889
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	236.3018	137.9051	79.1004	20.5800	3.4106	0.0000	0.0000	0.0000	0.0000	22.6027	120.2739	249.5145 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												869.6889
Space heating per m2										(98c) / (4) =		9.8214 (99)

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-Space and Water												1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating												1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating												1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system												1.5000 (306)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating:												
Space heating requirement	236.3018	137.9051	79.1004	20.5800	3.4106	0.0000	0.0000	0.0000	0.0000	22.6027	120.2739	249.5145 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50												
307a	372.1754	217.2005	124.5831	32.4135	5.3717	0.0000	0.0000	0.0000	0.0000	35.5993	189.4313	392.9853
Space heating requirement	372.1754	217.2005	124.5831	32.4135	5.3717	0.0000	0.0000	0.0000	0.0000	35.5993	189.4313	392.9853 (307)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (309)
Water heating												
Annual water heating requirement	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50												
310a	250.7182	221.6273	236.4159	211.5546	207.3032	189.3545	189.3164	195.7709	196.6357	216.1073	225.7534	248.5785
Water heating fuel	250.7182	221.6273	236.4159	211.5546	207.3032	189.3545	189.3164	195.7709	196.6357	216.1073	225.7534	248.5785 (310)
Cooling System Energy Efficiency Ratio												0.0000 (314)
Space coolin	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (315)
Pumps and Fa	20.8737	18.8536	20.8737	20.2003	20.8737	20.2003	20.8737	20.8737	20.2003	20.8737	20.2003	20.8737 (331)
Lighting	28.3716	22.7608	20.4936	15.0145	11.5976	9.4753	10.5797	13.7519	17.8624	23.4364	26.4714	29.1602 (332)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333a)m	-13.1364	-22.4678	-39.7083	-53.3554	-64.4292	-62.8241	-61.7681	-54.4254	-42.4416	-28.7016	-15.5605	-10.8064 (333a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334a)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 (334a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335a)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 (335a)
Electricity generated by PVs (Appendix M) (negative quantity)												
(333b)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 (333b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(334b)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 (334b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(335b)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 (335b)
Annual totals kWh/year												
Space heating fuel - community heating												1369.7601 (307)
Space heating fuel - secondary												0.0000 (309)
Water heating fuel - community heating												2589.1358 (310)
Efficiency of water heater												0.0000 (311)
Electricity used for heat distribution												13.6976 (313)
Space cooling fuel												0.0000 (321)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)												
mechanical ventilation fans (SFP = 0.9100)												245.7705 (330a)
Total electricity for the above, kWh/year												245.7705 (331)
Electricity for lighting (calculated in Appendix L)												228.9753 (332)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-469.6249 (333)

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Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	4582.5735 (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			280.0000 (367)
Space and Water heating from Heat pump	1413.8914	0.1587	77.6158 (367)
Electrical energy for heat distribution (space & water)	13.6976	0.0000	5.8109 (372)
Overall CO2 factor for heat network			0.0539 (386)
Total CO2 associated with community systems			213.3430 (373)
Energy for instantaneous electric shower(s)	618.5567	0.1391	86.0549 (264a)
Space and water heating			213.3430 (376)
Pumps, fans and electric keep-hot	245.7705	0.1387	34.0914 (378)
Energy for lighting	228.9753	0.1443	33.0482 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	0.1312	-61.6291
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6291 (380)
Total CO2, kg/year			304.9084 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.4400 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	1413.8914	1.5873	776.4913 (467)
Electrical energy for heat distribution (space & water)	13.6976	0.0000	61.0833 (472)
Overall CO2 factor for heat network			0.5665 (486)
Total CO2 associated with community systems			2242.6303 (473)
Energy for instantaneous electric shower(s)	618.5567	1.5143	936.7015 (278a)
Space and water heating			2242.6303 (476)
Pumps, fans and electric keep-hot	245.7705	1.5128	371.8017 (478)
Energy for lighting	228.9753	1.5338	351.2100 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	1.4848	-697.3059
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.3059 (480)
Total Primary energy kWh/year			3205.0375 (483)
Dwelling Primary energy Rate (DPER)			36.1900 (484)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (5)

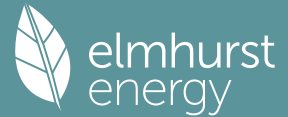
2. Ventilation rate

	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	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1355 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3855	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3277 (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)

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Adj infilt rate	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.2500	1.1450	23.1870		(27)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870		(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888		(29a)
Total net area of external elements Aum(A, m2)			81.4500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.7528		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000		(32)

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

209.8864 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.7600	0.0500	0.5880
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	27.9600	0.0500	1.3980
E7 Party floor between dwellings (in blocks of flats)	53.8600	0.0700	3.7702
E16 Corner (normal)	7.5000	0.0900	0.6750
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.1100	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.3000	0.0200	0.2260

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

7.1382 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 42.8910 (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	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421 (38)
Average = Sum(39)m / 12 =	85.7940	85.5464	85.3037	84.1638	83.9506	82.9577	82.9577	82.7739	83.3402	83.9506	84.3820	84.8331 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9689	0.9661	0.9633	0.9505	0.9481	0.9368	0.9368	0.9348	0.9412	0.9481	0.9529	0.9580 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6053 (42)
Hot water usage for mixer showers	67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920	67.6427 (42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245 (42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114 (42c)
Average daily hot water use (litres/day)												127.3477 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	138.5379	135.5798	131.9773	126.4992	122.0506	117.2681	115.4301	119.0170	122.8000	127.8209	133.3834	138.1786 (44)
Energy content (annual)	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044	32.4532 (46)

Water storage loss (or HIU loss):												150.0000 (47)
Store volume												1.3938 (48)

a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)

Enter (49) or (54) in (55)												
Total storage 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 (56)
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 (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	266.0051	235.1495	249.4390	218.2629	210.8985	189.2866	186.1976	193.9628	196.5165	220.0466	235.1209	262.9493 (62)
WWHRS	-31.0424	-27.4541	-28.7484	-23.8048	-22.1852	-18.9840	-17.7945	-18.9227	-19.6416	-23.1553	-26.2321	-30.4675 (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)

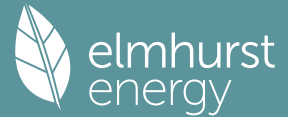
Output from w/h	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818 (64)
Total per year (kWh/year)												2375.4027 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)

Heat gains from water heating, kWh/month	110.2298	97.8623	104.7216	93.6528	91.9069	84.0182	83.6938	86.2758	86.4222	94.9486	99.2581	109.2137 (65)
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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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267 (69)

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Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139 (71)
Water heating gains (Table 5)	148.1584	145.6284	140.7548	130.0734	123.5307	116.6920	112.4917	115.9620	120.0308	127.6191	137.8585	146.7927 (72)
Total internal gains	568.8522	581.5497	557.7203	537.8539	510.7257	489.2490	470.6445	471.6619	485.8863	505.6596	536.4845	557.0566 (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			
Southeast				15.8900	36.7938	0.6300	0.7000	0.7700	178.6779 (77)			
Southwest				4.3600	36.7938	0.6300	0.7000	0.7700	49.0268 (79)			
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	796.5568	969.4149	1088.4144	1195.4096	1247.2429	1220.4402	1175.5908	1117.6994	1060.5158	934.3333	809.2222	751.9243 (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)												
tau	60.1746	60.3488	60.5205	61.3401	61.4960	62.2320	62.2320	62.3702	61.9464	61.4960	61.1815	60.8562
alpha	5.0116	5.0233	5.0347	5.0893	5.0997	5.1488	5.1488	5.1580	5.1298	5.0997	5.0788	5.0571
util living area	0.9759	0.9423	0.8828	0.7624	0.6032	0.4316	0.3100	0.3398	0.5312	0.8065	0.9474	0.9810 (86)
MIT	20.0556	20.3313	20.6017	20.8451	20.9589	20.9940	20.9991	20.9986	20.9831	20.8269	20.4126	20.0070 (87)
Th 2	20.1094	20.1117	20.1140	20.1248	20.1268	20.1363	20.1363	20.1380	20.1327	20.1268	20.1227	20.1185 (88)
util rest of house	0.9701	0.9300	0.8601	0.7246	0.5531	0.3748	0.2494	0.2766	0.4686	0.7650	0.9340	0.9764 (89)
MIT 2	19.0303	19.3721	19.6972	19.9790	20.0943	20.1328	20.1360	20.1375	20.1218	19.9689	19.4862	18.9764 (90)
Living area fraction	19.4460	19.7610	20.0639	20.3302	20.4448	20.4819	20.4859	20.4866	20.4710	20.3167	19.8618	19.3942 (92)
MIT	19.4460	19.7610	20.0639	20.3302	20.4448	20.4819	20.4859	20.4866	20.4710	20.3167	19.8618	19.3942 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4460	19.7610	20.0639	20.3302	20.4448	20.4819	20.4859	20.4866	20.4710	20.3167	19.8618	19.3942 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9648	0.9244	0.8587	0.7338	0.5717	0.3977	0.2740	0.3022	0.4934	0.7746	0.9293	0.9716 (94)
Ext temp.	768.5477	896.1214	934.6384	877.2469	713.0604	485.3326	322.0667	337.7675	523.2254	723.7026	752.0319	730.5860 (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	1299.4368	1271.3054	1157.0508	962.0062	734.1305	487.9525	322.3661	338.2636	530.9611	815.7249	1076.8672	1288.9700 (97)
Space heating requirement - total per year (kWh/year)	394.9815	252.1236	165.4748	61.0267	15.6762	0.0000	0.0000	0.0000	0.0000	68.4646	233.8814	415.4377 (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)	394.9815	252.1236	165.4748	61.0267	15.6762	0.0000	0.0000	0.0000	0.0000	68.4646	233.8814	415.4377 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1607.0665 (99)
Space heating per m2										(98c) / (4) =		18.1487 (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 %)												92.3000 (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)	394.9815	252.1236	165.4748	61.0267	15.6762	0.0000	0.0000	0.0000	0.0000	68.4646	233.8814	415.4377 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	427.9323	273.1567	179.2794	66.1178	16.9839	0.0000	0.0000	0.0000	0.0000	74.1761	253.3926	450.0950 (211)
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 (212)
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 (213)
Water heating	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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818 (64)
Efficiency of water heater (217)m	85.2153	84.4956	83.4230	81.7798	80.4252	79.8000	79.8000	79.8000	79.8000	81.9428	84.3138	79.8000 (216)
Fuel for water heating, kWh/month	275.7284	245.8062	264.5440	237.7824	234.6446	213.4118	211.0314	219.3486	221.6478	240.2790	247.7514	272.3984 (219)
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 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168 (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)												

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(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	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433	(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												1741.1338	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2884.3739	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												199.9357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1094.2014	(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												3817.2419	(238)

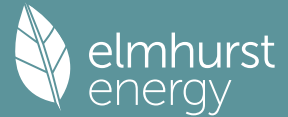
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1741.1338	0.2100	365.6381	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2884.3739	0.2100	605.7185	(264)
Space and water heating			971.3566	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.9357	0.1443	28.8569	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786	
PV Unit electricity exported	-527.1737	0.1254	-66.0937	
Total			-141.8724	(269)
Total CO2, kg/year			870.2704	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.8300	(273)

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	1741.1338	1.1300	1967.4812	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2884.3739	1.1300	3259.3425	(278)
Space and water heating			5226.8237	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.9357	1.5338	306.6680	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623	
PV Unit electricity exported	-527.1737	0.4602	-242.5960	
Total			-1089.6584	(283)
Total Primary energy kWh/year			4573.9341	(286)
Target Primary Energy Rate (TPER)			51.6500	(287)

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Plot Reference	B3.1-3.3 3B5P TOP				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	77 C		DER	4.66		TER	12.46
Environmental	96 A		% DER < TER				62.60
CO ₂ Emissions (t/year)	0.36		DFEE	38.17		TFEE	37.11
Compliance Check	See BREL		% DFEE < TFEE				-2.84
% DPER < TPER	26.18		DPER	48.61		TPER	65.84
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (5)

2. Ventilation rate

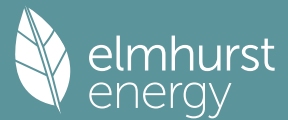
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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 infiltr rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Roof	88.5000		88.5000	0.1300	11.5050	9.0000	796.5000 (30)
Total net area of external elements Aum(A, m ²)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		44.9657		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Floor			88.5000			80.0000	7080.0000 (32d)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10531.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.9378 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.7600	0.0500	0.5880
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	27.9600	0.0500	1.3980
E7 Party floor between dwellings (in blocks of flats)	21.2800	0.0700	1.4896
E16 Corner (normal)	7.5000	0.0900	0.6750
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.3000	0.0200	0.2260
E15 Flat roof with parapet	18.9600	0.5600	10.6176
P4 Party wall - Roof (insulation at ceiling level)	8.0500	0.1200	0.9660
R7 Flat ceiling (inverted)	13.6200	0.0400	0.5448
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.9860 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 61.9517 (37)

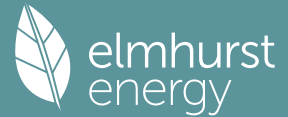
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	22.3955	22.1627	21.9298	20.7655	20.5327	19.3684	19.3684	19.1355	19.8341	20.5327	20.9984	21.4641	(38)
Heat transfer coeff	84.3472	84.1144	83.8815	82.7172	82.4843	81.3201	81.3201	81.0872	81.7858	82.4843	82.9501	83.4158	(39)
Average = Sum(39)m / 12 =												82.6590	
HLP	0.9525	0.9499	0.9473	0.9341	0.9315	0.9184	0.9184	0.9157	0.9236	0.9315	0.9368	0.9420	(40)
HLP (average)												0.9335	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)													
Assumed occupancy													2.6053 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245	(42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114	(42c)
Average daily hot water use (litres/day)												64.7435	(43)
Daily hot water use	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359	(44)
Energy conte	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422	(45)
Energy content (annual)										Total = Sum(45)m =		1075.2508	
Distribution loss (46)m = 0.15 x (45)m	16.7803	14.6736	15.3501	13.1314	12.4388	10.9114	10.6401	11.2856	11.6395	13.3192	14.5513	16.5663	(46)
Water storage loss (or HIU loss):													
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)
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	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	(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	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1726.0905	(64)
Electric shower(s)	54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.5567	(64a)
Heat gains from water heating, kWh/month	95.0125	84.5815	91.4744	84.5252	84.6533	79.2483	80.4823	82.0970	81.2182	86.9726	88.0285	94.5382	(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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Water heating gains (Table 5)	127.7050	125.8653	122.9494	117.3961	113.7813	110.0670	108.1751	110.3454	112.8030	116.8987	122.2618	127.0675	(72)
Total internal gains	545.3988	558.7866	536.9149	522.1766	497.9762	482.6241	466.3280	466.0452	478.6585	491.9392	517.8878	534.3314	(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								

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Southeast				16.8700		36.7938		0.4000		0.7000		0.7700		120.4429 (77)
Southwest				4.6300		36.7938		0.4000		0.7000		0.7700		33.0558 (79)

Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629 (83)		
Total gains	698.8975	820.2517	894.6628	965.4437	994.4723	975.5297	941.5416	901.5477	866.0239	780.9138	701.7439	665.6943 (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	34.6845	34.7805	34.8770	35.3680	35.4678	35.9756	35.9756	36.0789	35.7708	35.4678	35.2687	35.0718		
alpha	3.3123	3.3187	3.3251	3.3579	3.3645	3.3984	3.3984	3.4053	3.3847	3.3645	3.3512	3.3381		
util living area	0.9480	0.9156	0.8704	0.7842	0.6627	0.5021	0.3711	0.4015	0.5887	0.8057	0.9162	0.9544 (86)		
MIT	19.3567	19.6702	20.0346	20.4598	20.7604	20.9317	20.9813	20.9753	20.8789	20.4928	19.8706	19.3068 (87)		
Th 2	20.1231	20.1253	20.1275	20.1386	20.1408	20.1519	20.1519	20.1542	20.1475	20.1408	20.1364	20.1319 (88)		
util rest of house	0.9405	0.9040	0.8528	0.7558	0.6199	0.4440	0.3029	0.3321	0.5309	0.7738	0.9028	0.9477 (89)		
MIT 2	18.6311	18.9367	19.2887	19.6954	19.9639	20.1111	20.1438	20.1429	20.0700	19.7356	19.1447	18.5889 (90)		
Living area fraction									fLA = Living area / (4) =			0.4054 (91)		
MIT	18.9253	19.2341	19.5911	20.0053	20.2868	20.4438	20.4834	20.4804	20.3979	20.0426	19.4390	18.8800 (92)		
Temperature adjustment												0.0000		
adjusted MIT	18.9253	19.2341	19.5911	20.0053	20.2868	20.4438	20.4834	20.4804	20.3979	20.0426	19.4390	18.8800 (93)		

8. Space heating requirement														

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9278	0.8902	0.8405	0.7510	0.6275	0.4645	0.3299	0.3593	0.5485	0.7699	0.8900	0.9358 (94)		
Useful gains	648.4093	730.1559	751.9833	725.0540	624.0614	453.1310	310.6280	323.8872	475.0171	601.1995	624.5257	622.9363 (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	1233.6016	1205.7032	1098.0987	918.5976	708.2796	475.2208	315.7949	330.8681	515.0810	778.8659	1023.5212	1224.5417 (97)		
Space heating kWh	435.3831	319.5678	257.5099	139.3514	62.6584	0.0000	0.0000	0.0000	0.0000	132.1839	287.2767	447.5944 (98a)		
Space heating requirement - total per year (kWh/year)												2081.5255		
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	435.3831	319.5678	257.5099	139.3514	62.6584	0.0000	0.0000	0.0000	0.0000	132.1839	287.2767	447.5944 (98c)		
Space heating requirement after solar contribution - total per year (kWh/year)												2081.5255		
Space heating per m2										(98c) / (4) =		23.5068 (99)		

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-Space and Water														1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating														1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating														1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system														1.5000 (306)
Efficiency of secondary/supplementary heating system, %														0.0000 (208)
Space heating:														
Space heating requirement														
435.3831 319.5678 257.5099 139.3514 62.6584 0.0000 0.0000 0.0000 0.0000 132.1839 287.2767 447.5944 (98)														
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50														
307a 685.7283 503.3192 405.5781 219.4784 98.6869 0.0000 0.0000 0.0000 0.0000 208.1896 452.4609 704.9612														
Space heating requirement														
685.7283 503.3192 405.5781 219.4784 98.6869 0.0000 0.0000 0.0000 0.0000 208.1896 452.4609 704.9612 (307)														
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 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)														
Water heating														
Annual water heating requirement														
167.1455 147.7515 157.6106 141.0364 138.2021 126.2363 126.2109 130.5140 131.0904 144.0715 150.5022 165.7190 (64)														
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50														
310a 250.7182 221.6273 236.4159 211.5546 207.3032 189.3545 189.3164 195.7709 196.6357 216.1073 225.7534 248.5785														
Water heating fuel														
250.7182 221.6273 236.4159 211.5546 207.3032 189.3545 189.3164 195.7709 196.6357 216.1073 225.7534 248.5785 (310)														
Cooling System Energy Efficiency Ratio														0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)														
Pumps and Fa 20.8737 18.8536 20.8737 20.2003 20.8737 20.2003 20.8737 20.8737 20.2003 20.8737 20.2003 20.8737 (331)														
Lighting 28.3716 22.7608 20.4936 15.0145 11.5976 9.4753 10.5797 13.7519 17.8624 23.4364 26.4714 29.1602 (332)														
Electricity generated by PVs (Appendix M) (negative quantity)														
(333a)m -13.1364 -22.4678 -39.7083 -53.3554 -64.4292 -62.8241 -61.7681 -54.4254 -42.4416 -28.7016 -15.5605 -10.8064 (333a)														
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334a)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 (334a)														
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(335a)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 (335a)														
Electricity generated by PVs (Appendix M) (negative quantity)														
(333b)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 (333b)														
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334b)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 (334b)														
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(335b)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 (335b)														
Annual totals kWh/year														
Space heating fuel - community heating														3278.4026 (307)
Space heating fuel - secondary														0.0000 (309)
Water heating fuel - community heating														2589.1358 (310)
Efficiency of water heater														0.0000 (311)
Electricity used for heat distribution														32.7840 (313)
Space cooling fuel														0.0000 (321)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)														
mechanical ventilation fans (SFP = 0.9100)														245.7705 (330a)
Total electricity for the above, kWh/year														245.7705 (331)
Electricity for lighting (calculated in Appendix L)														228.9753 (332)

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-469.6249 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6491.2160 (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			280.0000 (367)
Space and Water heating from Heat pump	2095.5494	0.1557	182.2551 (367)
Electrical energy for heat distribution (space & water)	32.7840	0.0000	8.7408 (372)
Overall CO2 factor for heat network			0.0547 (386)
Total CO2 associated with community systems			320.9122 (373)
Energy for instantaneous electric shower(s)	618.5567	0.1391	86.0549 (264a)
Space and water heating			320.9122 (376)
Pumps, fans and electric keep-hot	245.7705	0.1387	34.0914 (378)
Energy for lighting	228.9753	0.1443	33.0482 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	0.1312	-61.6291
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6291 (380)
Total CO2, kg/year			412.4776 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6600 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	2095.5494	1.5763	1845.5818 (467)
Electrical energy for heat distribution (space & water)	32.7840	0.0000	91.0178 (472)
Overall CO2 factor for heat network			0.5695 (486)
Total CO2 associated with community systems			3341.6553 (473)
Energy for instantaneous electric shower(s)	618.5567	1.5143	936.7015 (278a)
Space and water heating			3341.6553 (476)
Pumps, fans and electric keep-hot	245.7705	1.5128	371.8017 (478)
Energy for lighting	228.9753	1.5338	351.2100 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	1.4848	-697.3059
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.3059 (480)
Total Primary energy kWh/year			4304.0625 (483)
Dwelling Primary energy Rate (DPER)			48.6100 (484)

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

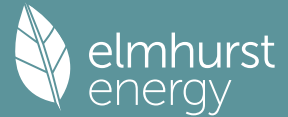
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500 (1b)	x 2.5000 (2b)	= 221.3750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.3750 (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	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3277 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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												
Effective ac	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850 (22b)
	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741 (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
Main dwelling							
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type			20.2500	1.1450	23.1870		(27)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870		(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888		(29a)
Roof	88.5000		88.5000	0.1100	9.7350		(30)
Total net area of external elements Aum(A, m2)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	45.4878		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							118.9378 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value		Total
E2 Other lintels (including other steel lintels)				11.7600	0.0500		0.5880
E3 Sill				3.6200	0.0500		0.1810
E4 Jamb				27.9600	0.0500		1.3980
E7 Party floor between dwellings (in blocks of flats)				21.2800	0.0700		1.4896
E16 Corner (normal)				7.5000	0.0900		0.6750
E18 Party wall between dwellings				2.5000	0.0600		0.1500
E25 Staggered party wall between dwellings				2.5000	0.0600		0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				8.0500	0.0000		0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				11.3000	0.0200		0.2260
E15 Flat roof with parapet				18.9600	0.5600		10.6176
P4 Party wall - Roof (insulation at ceiling level)				8.0500	0.1200		0.9660
R7 Flat ceiling (inverted)				13.6200	0.0400		0.5448
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.9860 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	62.4738 (37)

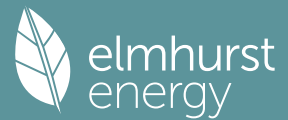
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6053 (42)
Hot water usage for mixer showers												67.6427 (42a)
67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920		
Hot water usage for baths												29.2245 (42b)
29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822		
Hot water usage for other uses												41.3114 (42c)
41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091		127.3477 (43)
Average daily hot water use (litres/day)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	138.5379	135.5798	131.9773	126.4992	122.0506	117.2681	115.4301	119.0170	122.8000	127.8209	133.3834	138.1786 (44)
Energy content (annual)	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2115.2180
32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044		32.4532 (46)
Water storage loss (or HIU 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	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)
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 (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												
266.0051	235.1495	249.4390	218.2629	210.8985	189.2866	186.1976	193.9628	196.5165	220.0466	235.1209	262.9493 (62)	
WWHRS	-31.0424	-27.4541	-28.7484	-23.8048	-22.1852	-18.9840	-17.7945	-18.9227	-19.6416	-23.1553	-26.2321	-30.4675 (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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2375.4027 (64)
Electric shower(s)												2375 (64)
0.0000	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	110.2298	97.8623	104.7216	93.6528	91.9069	84.0182	83.6938	86.2758	86.4222	94.9486	99.2581	109.2137 (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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Water heating gains (Table 5)	148.1584	145.6284	140.7548	130.0734	123.5307	116.6920	112.4917	115.9620	120.0308	127.6191	137.8585	(72)
Total internal gains	568.8522	581.5497	557.7203	537.8539	510.7257	489.2490	470.6445	471.6619	485.8863	505.6596	536.4845	(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
Southeast					15.8900	36.7938	0.6300	0.7000			0.7700			178.6779 (77)
Southwest					4.3600	36.7938	0.6300	0.7000			0.7700			49.0268 (79)
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377			194.8677 (83)
Total gains	796.5568	969.4149	1088.4144	1195.4096	1247.2429	1220.4402	1175.5908	1117.6994	1060.5158	934.3333	809.2222			751.9243 (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	27.7626	27.8280	27.8924	28.1989	28.2570	28.5306	28.5306	28.5818	28.4246	28.2570	28.1397	28.0181		
alpha	2.8508	2.8552	2.8595	2.8799	2.8838	2.9020	2.9020	2.9055	2.8950	2.8838	2.8760	2.8679		
util living area	0.9400	0.9015	0.8493	0.7601	0.6404	0.4926	0.3687	0.4008	0.5820	0.7926	0.9072	0.9477	(86)	
MIT	18.9356	19.3269	19.7801	20.2881	20.6626	20.8866	20.9635	20.9528	20.8085	20.3091	19.5410	18.8660	(87)	
Th 2	19.9280	19.9302	19.9324	19.9428	19.9447	19.9538	19.9538	19.9554	19.9503	19.9447	19.9408	19.9367	(88)	
util rest of house	0.9307	0.8870	0.8276	0.7263	0.5905	0.4243	0.2866	0.3171	0.5142	0.7553	0.8910	0.9394	(89)	
MIT 2	17.5554	18.0415	18.5987	19.2117	19.6359	19.8714	19.9354	19.9302	19.8001	19.2544	18.3241	17.4739	(90)	
Living area fraction									fLA = Living area / (4) =			0.4054	(91)	
MIT	18.1149	18.5626	19.0776	19.6481	20.0521	20.2830	20.3522	20.3448	20.2089	19.6820	18.8175	18.0383	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.1149	18.5626	19.0776	19.6481	20.0521	20.2830	20.3522	20.3448	20.2089	19.6820	18.8175	18.0383	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9100	0.8644	0.8073	0.7159	0.5959	0.4466	0.3186	0.3490	0.5318	0.7449	0.8698	0.9199	(94)	
Ext temp.	724.8748	837.9856	878.7191	855.8093	743.2023	544.9909	374.5019	390.1281	563.9342	695.9613	703.8625	691.7089	(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	1455.7730	1436.3397	1319.2260	1115.0759	864.7254	582.7365	384.7565	403.7716	628.7498	940.2902	1218.2051	1444.9365	(97)	
Space heating requirement - total per year (kWh/year)	543.7882	402.0940	327.7372	186.6719	90.4132	0.0000	0.0000	0.0000	0.0000	181.7807	370.3267	560.4014	(98a)	
Solar heating kWh												2663.2131		
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	543.7882	402.0940	327.7372	186.6719	90.4132	0.0000	0.0000	0.0000	0.0000	181.7807	370.3267	560.4014	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												2663.2131		
Space heating per m2										(98c) / (4) =		30.0758	(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 %)													92.3000	(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)	543.7882	402.0940	327.7372	186.6719	90.4132	0.0000	0.0000	0.0000	0.0000	181.7807	370.3267	560.4014	(98)	
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)	
Space heating efficiency (main heating system 2)	589.1530	435.6381	355.0782	202.2447	97.9558	0.0000	0.0000	0.0000	0.0000	196.9455	401.2207	607.1521	(211)	
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	(212)	
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	(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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818	(64)	
Efficiency of water heater (217)m	85.8777	85.5150	84.9449	83.9682	82.5087	79.8000	79.8000	79.8000	79.8000	83.8811	85.3293	85.9575	(216)	
Fuel for water heating, kWh/month	273.6015	242.8758	259.8046	231.5854	228.7193	213.4118	211.0314	219.3486	221.6478	234.7266	244.8030	270.4613	(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)	

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Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168	(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	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433	(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												2885.3879	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2852.0171	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												199.9357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1094.2014	(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												4929.1392	(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	2885.3879	0.2100	605.9315	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2852.0171	0.2100	598.9236	(264)
Space and water heating			1204.8551	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.9357	0.1443	28.8569	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786	
PV Unit electricity exported	-527.1737	0.1254	-66.0937	
Total			-141.8724	(269)
Total CO2, kg/year			1103.7689	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4600	(273)

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	2885.3879	1.1300	3260.4884	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2852.0171	1.1300	3222.7793	(278)
Space and water heating			6483.2677	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.9357	1.5338	306.6680	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623	
PV Unit electricity exported	-527.1737	0.4602	-242.5960	
Total			-1089.6584	(283)
Total Primary energy kWh/year			5830.3781	(286)
Target Primary Energy Rate (TPER)			65.8400	(287)

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Plot Reference	B3.1-3.3 3B5P TOP				Issued on Date	19/12/2025
Assessment Reference	3B5P	Plot Type Ref	3B5P			
Plot Address					SAP Version	10.2
SAP Rating	77 C	DER	4.66	TER	12.46	
Environmental	96 A	% DER < TER				62.60
CO ₂ Emissions (t/year)	0.36	DFEE	38.17	TFEE	37.11	
Compliance Check	See BREL	% DFEE < TFEE				-2.84
% DPER < TPER	26.18	DPER	48.61	TPER	65.84	
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001
Client	ROK, Wilf Foster					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (5)

2. Ventilation rate

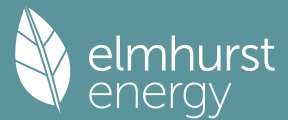
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.2855 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2427 (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	0.3094	0.3034	0.2973	0.2670	0.2609	0.2306	0.2306	0.2245	0.2427	0.2609	0.2730	0.2852 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5479	0.5460	0.5442	0.5356	0.5340	0.5266	0.5266	0.5252	0.5294	0.5340	0.5373	0.5407 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Roof	88.5000		88.5000	0.1300	11.5050	9.0000	796.5000 (30)
Total net area of external elements Aum(A, m ²)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 44.9657		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Floor			88.5000			80.0000	7080.0000 (32a)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	10531.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.9378 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				11.7600	0.0500	0.5880	
E3 Sill				3.6200	0.0500	0.1810	

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E4 Jamb													27.9600	0.0500	1.3980	
E7 Party floor between dwellings (in blocks of flats)													21.2800	0.0700	1.4896	
E16 Corner (normal)													7.5000	0.0900	0.6750	
E18 Party wall between dwellings													2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings													2.5000	0.0600	0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)													8.0500	0.0000	0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation													11.3000	0.0200	0.2260	
E15 Flat roof with parapet													18.9600	0.5600	10.6176	
P4 Party wall - Roof (insulation at ceiling level)													8.0500	0.1200	0.9660	
R7 Flat ceiling (inverted)													13.6200	0.0400	0.5448	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																16.9860 (36)
Point Thermal bridges																0.0000
Total fabric heat loss															(33) + (36) + (36a) =	61.9517 (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	40.0242	39.8884	39.7553	39.1300	39.0130	38.4685	38.4685	38.3676	38.6782	39.0130	39.2497	39.4971	(38)			
Average = Sum(39)m / 12 =	101.9759	101.8401	101.7069	101.0817	100.9647	100.4202	100.4202	100.3193	100.6299	100.9647	101.2014	101.4488	(39)			
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP (average)	1.1516	1.1501	1.1486	1.1415	1.1402	1.1341	1.1341	1.1329	1.1364	1.1402	1.1429	1.1457	(40)			
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31				
4. Water heating energy requirements (kWh/year)																
Assumed occupancy																2.6053 (42)
Hot water usage for mixer showers																
Hot water usage for baths																
Hot water usage for other uses																
Average daily hot water use (litres/day)																
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Energy conte	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359	(44)			
Energy content (annual)	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422	(45)			
Distribution loss (46)m = 0.15 x (45)m																
Water storage loss (or HIU loss):																
Total storage loss																
If cylinder contains dedicated solar storage																
Primary loss																
Combi loss																
Total heat required for water heating calculated for each month																
WWHRS	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759	(62)			
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	(63a)			
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	(63b)			
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	(63c)			
Output from w/h	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759	(64)			
12Total per year (kWh/year)																
Electric shower(s)	54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789	(64a)			
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =																618.5567 (64a)
Heat gains from water heating, kWh/month	37.3668	32.9006	34.9729	31.2251	30.4808	27.7242	27.7488	28.8471	29.1116	32.0958	33.5925	37.0637	(65)			
5. Internal gains (see Table 5 and 5a)																
Metabolic gains (Table 5), Watts																
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)			
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289	(67)			
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	(68)			
Pumps, fans	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(69)			
Losses e.g. evaporation (negative values) (Table 5)	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)			
Water heating gains (Table 5)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)			
Total internal gains	50.2242	48.9593	47.0065	43.3683	40.9688	38.5058	37.2967	38.7729	40.4328	43.1395	46.6563	49.8168	(72)			
	467.9180	481.8806	460.9720	448.1487	425.1637	411.0629	395.4495	394.4728	406.2883	418.1800	442.2823	457.0807	(73)			
6. Solar gains																
[Jan]																
	Area															
	m2															
	Solar flux															
	Table 6a															
	W/m2															
	Specific data															
	or Table 6b															
	Specific data															
	or Table 6c															
	Access															
	factor															
	Table 6d															
Southeast	16.8700															
Southwest	4.6300															
Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629	(83)			
Total gains	621.4168	743.3457	818.7200	891.4158	921.6598	903.9685	870.6632	829.9752	793.6537	707.1547	626.1384	588.4436	(84)			

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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	28.6885	28.7268	28.7644	28.9423	28.9759	29.1330	29.1330	29.1623	29.0723	28.9759	28.9081	28.8376
alpha	2.9126	2.9151	2.9176	2.9295	2.9317	2.9422	2.9422	2.9442	2.9382	2.9317	2.9272	2.9225
util living area	0.9656	0.9429	0.9113	0.8491	0.7526	0.6091	0.4710	0.5074	0.6943	0.8701	0.9458	0.9703 (86)
MIT	18.7210	19.0594	19.4929	20.0337	20.4912	20.8087	20.9340	20.9161	20.7024	20.0984	19.3124	18.6537 (87)
Th 2	19.9589	19.9601	19.9614	19.9671	19.9681	19.9731	19.9731	19.9740	19.9712	19.9681	19.9660	19.9637 (88)
util rest of house	0.9599	0.9337	0.8965	0.8231	0.7077	0.5362	0.3739	0.4105	0.6281	0.8421	0.9355	0.9653 (89)
MIT 2	17.8919	18.2243	18.6477	19.1690	19.5896	19.8592	19.9457	19.9369	19.7795	19.2416	18.4818	17.8290 (90)
Living area fraction									fLA = Living area /	(4) =		0.4054 (91)
MIT	18.2280	18.5629	18.9904	19.5196	19.9551	20.2441	20.3464	20.3339	20.1537	19.5890	18.8185	18.1633 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2280	18.5629	18.9904	19.5196	19.9551	20.2441	20.3464	20.3339	20.1537	19.5890	18.8185	18.1633 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9473	0.9181	0.8798	0.8101	0.7070	0.5566	0.4105	0.4460	0.6408	0.8300	0.9208	0.9537 (94)
Useful gains	588.6584	682.4382	720.3333	722.1539	651.6543	503.1455	357.4320	370.1438	508.6096	586.9476	576.5321	561.1787 (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	1420.3195	1391.4281	1270.3565	1073.4461	833.4727	566.7862	376.2126	394.6457	609.1839	907.5697	1185.9321	1416.5620 (97)
Space heating kWh	618.7558	476.4412	409.2173	252.9304	135.2729	0.0000	0.0000	0.0000	0.0000	238.5429	438.7680	636.4052 (98a)
Space heating requirement - total per year (kWh/year)												3206.3335
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	618.7558	476.4412	409.2173	252.9304	135.2729	0.0000	0.0000	0.0000	0.0000	238.5429	438.7680	636.4052 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3206.3335
Space heating per m2										(98c) / (4) =		36.2093 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	943.9495	743.1092	762.4268	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7710	0.8367	0.8146	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	727.7515	621.7883	621.0372	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1009.9186	973.3036	928.0829	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	203.1603	261.5274	228.4420	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	50.7901	65.3818	57.1105	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												173.2824 (107)
Energy for space heating												36.2093 (99)
Energy for space cooling												1.9569 (108)
Total												38.1662 (109)
Fabric Energy Efficiency (DFEE)												38.2 (109)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

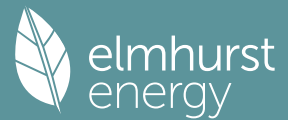
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500 (1b)	x 2.5000 (2b)	= 221.3750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.3750 (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	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	

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Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 30.0000 / (5) = 0.1355 (8)
 Pressure test Yes
 Pressure Test Method Blower Door
 Measured/design AP50 5.0000 (17)
 Infiltration rate 0.3855 (18)
 Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3277 (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	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			20.2500	1.1450	23.1870			(27)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870			(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888			(29a)
Roof	88.5000		88.5000	0.1100	9.7350			(30)
Total net area of external elements Aum (A, m2)			169.9500					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	45.4878		(33)
Main dwelling								
Party Wall			20.1300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							118.9378	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	11.7600	0.0500	0.5880	
E2 Other lintels (including other steel lintels)	3.6200	0.0500	0.1810	
E3 Sill	27.9600	0.0500	1.3980	
E4 Jamb	21.2800	0.0700	1.4896	
E7 Party floor between dwellings (in blocks of flats)	7.5000	0.0900	0.6750	
E16 Corner (normal)	2.5000	0.0600	0.1500	
E18 Party wall between dwellings	2.5000	0.0600	0.1500	
E25 Staggered party wall between dwellings	8.0500	0.0000	0.0000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.3000	0.0200	0.2260	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	18.9600	0.5600	10.6176	
E15 Flat roof with parapet	8.0500	0.1200	0.9660	
P4 Party wall - Roof (insulation at ceiling level)	13.6200	0.0400	0.5448	
R7 Flat ceiling (inverted)				

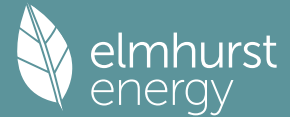
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 16.9860 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 62.4738 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	42.9030	42.6554	42.4127	41.2728	41.0595	40.0667	40.0667	39.8829	40.4491	41.0595	41.4910	41.9421	(38)
Heat transfer coeff	105.3768	105.1292	104.8865	103.7466	103.5334	102.5405	102.5405	102.3567	102.9230	103.5334	103.9648	104.4159	(39)
Average = Sum(39)m / 12 =												103.7456	
HLP	1.1900	1.1872	1.1845	1.1716	1.1692	1.1580	1.1580	1.1559	1.1623	1.1692	1.1741	1.1792	(40)
HLP (average)												1.1716	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6053	(42)
Hot water usage for mixer showers														
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245		(42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114		(42c)
Average daily hot water use (litres/day)													64.7435	(43)
Daily hot water use	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359		(44)
Energy conte	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422		(45)
Energy content (annual)										Total = Sum(45)m =		1075.2508		
Distribution loss (46)m = 0.15 x (45)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		(46)
Water storage loss (or HIU loss):														
Total storage 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		(56)
If cylinder contains dedicated solar storage														
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(57)
Primary 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		(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	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759		(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	95.0884	83.1505	86.9837	74.4113	70.4865	61.8313	60.2940	63.9516	65.9572	75.4755	82.4573	93.8759		(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		913.9632		(64)
Electric shower(s)	54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789		(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.5567		(64a)
Heat gains from water heating, kWh/month														

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37.3668 32.9006 34.9729 31.2251 30.4808 27.7242 27.7488 28.8471 29.1116 32.0958 33.5925 37.0637 (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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Water heating gains (Table 5)	50.2242	48.9593	47.0065	43.3683	40.9688	38.5058	37.2967	38.7729	40.4328	43.1395	46.6563	49.8168	(72)
Total internal gains	467.9180	481.8806	460.9720	448.1487	425.1637	411.0629	395.4495	394.4728	406.2883	418.1800	442.2823	457.0807	(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	
Southeast					15.8900	36.7938	0.6300	0.7000	0.7700		178.6779 (77)	
Southwest					4.3600	36.7938	0.6300	0.7000	0.7700		49.0268 (79)	
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	695.6227	869.7458	991.6661	1105.7045	1161.6810	1142.2540	1100.3958	1040.5103	980.9178	846.8537	715.0200	651.9484 (84)

7. Mean internal temperature (heating season)

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

Utilisation factor for gains for living area, nil _m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
tau	27.7626	27.8280	27.8924	28.1989	28.2570	28.5306	28.5306	28.5818	28.4246	28.2570	28.1397	28.0181	
alpha	2.8508	2.8552	2.8595	2.8799	2.8838	2.9020	2.9020	2.9055	2.8950	2.8838	2.8760	2.8679	
util living area	0.9559	0.9213	0.8732	0.7873	0.6694	0.5192	0.3912	0.4266	0.6144	0.8239	0.9286	0.9624	(86)
MIT	18.7643	19.1785	19.6604	20.2098	20.6192	20.8697	20.9574	20.9444	20.7786	20.2211	19.3970	18.6915	(87)
Th 2	19.9280	19.9302	19.9324	19.9428	19.9447	19.9538	19.9538	19.9554	19.9503	19.9447	19.9408	19.9367	(88)
util rest of house	0.9486	0.9092	0.8538	0.7553	0.6200	0.4490	0.3051	0.3388	0.5460	0.7897	0.9154	0.9562	(89)
MIT 2	17.9127	18.3170	18.7825	19.3051	19.6706	19.8793	19.9369	19.9320	19.8132	19.3308	18.5444	17.8474	(90)
Living area fraction	18.2580	18.6663	19.1384	19.6719	20.0552	20.2809	20.3506	20.3424	20.2046	19.6917	18.8901	18.1896	(91)
MIT	18.2580	18.6663	19.1384	19.6719	20.0552	20.2809	20.3506	20.3424	20.2046	19.6917	18.8901	18.1896	(92)
Temperature adjustment	18.2580	18.6663	19.1384	19.6719	20.0552	20.2809	20.3506	20.3424	20.2046	19.6917	18.8901	18.1896	(93)
adjusted MIT	18.2580	18.6663	19.1384	19.6719	20.0552	20.2809	20.3506	20.3424	20.2046	19.6917	18.8901	18.1896	(93)

8. Space heating requirement

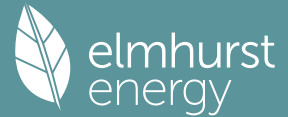
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9340	0.8915	0.8370	0.7462	0.6255	0.4718	0.3386	0.3723	0.5635	0.7804	0.8991	0.9427	(94)
Useful gains	649.6861	775.4064	829.9814	825.0802	726.6070	538.9287	372.5528	387.3726	552.7859	660.8604	642.8631	614.5980	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1470.8458	1447.2356	1325.6024	1117.5457	865.0403	582.5191	384.5911	403.5320	628.3023	941.2971	1225.7543	1460.7397	(97)
Space heating kWh	610.9428	451.4692	368.7420	210.5752	102.9944	0.0000	0.0000	0.0000	0.0000	208.6449	419.6816	629.5295	(98a)
Space heating requirement - total per year (kWh/year)												3002.5797	
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	610.9428	451.4692	368.7420	210.5752	102.9944	0.0000	0.0000	0.0000	0.0000	208.6449	419.6816	629.5295	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3002.5797	
Space heating per m ²												33.9083	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	963.8811	758.8000	777.9108	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8399	0.8909	0.8724	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	809.5662	676.0271	678.6535	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1288.4341	1241.8223	1174.1628	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	344.7849	420.9516	368.6589	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fc = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	86.1962	105.2379	92.1647	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												283.5989	(107)
Energy for space heating												33.9083	(99)
Energy for space cooling												3.2027	(108)
Total												37.1110	(109)
Fabric Energy Efficiency (TFEE)												37.1	(109)

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Plot Reference	B3.1-3.3 3B5P TOP				Issued on Date	19/12/2025	
Assessment Reference	3B5P			Plot Type Ref	3B5P		
Plot Address					SAP Version	10.2	
SAP Rating	77 C		DER	4.66		TER	12.46
Environmental	96 A		% DER < TER				62.60
CO ₂ Emissions (t/year)	0.36		DFEE	38.17		TFEE	37.11
Compliance Check	See BREL		% DFEE < TFEE				-2.84
% DPER < TPER	26.18		DPER	48.61		TPER	65.84
Assessor Details	Mr. Matthew Stainrod				Assessor ID	AU83-0001	
Client	ROK, Wilf Foster						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (5)

2. Ventilation rate

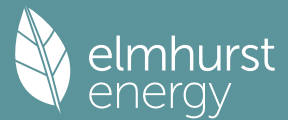
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.0000 (17)
Infiltration rate	0.1500 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1275 (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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
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)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												71.2000 (23c)
Effective ac	0.3066	0.3034	0.3002	0.2843	0.2811	0.2651	0.2651	0.2619	0.2715	0.2811	0.2874	0.2938 (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
Main dwelling							
Flat Door			1.8900	1.0000	1.8900		(26)
Glazing			21.5000	0.9615	20.6731		(27)
External Wall	47.4000	21.5000	25.9000	0.1600	4.1440	14.0000	362.6000 (29a)
Communal Wall	34.0500	1.8900	32.1600	0.2100	6.7536	14.0000	450.2400 (29a)
Roof	88.5000		88.5000	0.1300	11.5050	9.0000	796.5000 (30)
Total net area of external elements Aum(A, m ²)			169.9500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9657		(33)
Main dwelling							
Party Wall			20.1300	0.0000	0.0000	20.0000	402.6000 (32)
Party Floor			88.5000			80.0000	7080.0000 (32d)
Stud			160.0000			9.0000	1440.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10531.9400 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							118.9378 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	11.7600	0.0500	0.5880
E3 Sill	3.6200	0.0500	0.1810
E4 Jamb	27.9600	0.0500	1.3980
E7 Party floor between dwellings (in blocks of flats)	21.2800	0.0700	1.4896
E16 Corner (normal)	7.5000	0.0900	0.6750
E18 Party wall between dwellings	2.5000	0.0600	0.1500
E25 Staggered party wall between dwellings	2.5000	0.0600	0.1500
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	8.0500	0.0000	0.0000
E23 Balcony within or between dwellings, balcony support penetrates wall insulation	11.3000	0.0200	0.2260
E15 Flat roof with parapet	18.9600	0.5600	10.6176
P4 Party wall - Roof (insulation at ceiling level)	8.0500	0.1200	0.9660
R7 Flat ceiling (inverted)	13.6200	0.0400	0.5448
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			16.9860 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss			(33) + (36) + (36a) = 61.9517 (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	22.3955	22.1627	21.9298	20.7655	20.5327	19.3684	19.3684	19.1355	19.8341	20.5327	20.9984	21.4641	(38)
Heat transfer coeff	84.3472	84.1144	83.8815	82.7172	82.4843	81.3201	81.3201	81.0872	81.7858	82.4843	82.9501	83.4158	(39)
Average = Sum(39)m / 12 =												82.6590	
HLP	0.9525	0.9499	0.9473	0.9341	0.9315	0.9184	0.9184	0.9157	0.9236	0.9315	0.9368	0.9420	(40)
HLP (average)												0.9335	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6053 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245	(42b)
Hot water usage for other uses	41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114	(42c)
Average daily hot water use (litres/day)												64.7435	(43)
Daily hot water use	70.6351	68.6973	66.5818	63.9488	61.5999	59.1588	58.6517	60.7629	62.9282	65.4350	68.0913	70.5359	(44)
Energy conte	111.8687	97.8241	102.3338	87.5428	82.9253	72.7427	70.9341	75.2372	77.5968	88.7947	97.0086	110.4422	(45)
Energy content (annual)										Total = Sum(45)m =		1075.2508	
Distribution loss (46)m = 0.15 x (45)m	16.7803	14.6736	15.3501	13.1314	12.4388	10.9114	10.6401	11.2856	11.6395	13.3192	14.5513	16.5663	(46)
Water storage loss (or HIU loss):													
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)
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	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	(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	167.1455	147.7515	157.6106	141.0364	138.2021	126.2363	126.2109	130.5140	131.0904	144.0715	150.5022	165.7190	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1726.0905	(64)
Electric shower(s)	54.3789	48.4520	52.9078	50.4892	51.4367	49.0656	50.7011	51.4367	50.4892	52.9078	51.9129	54.3789	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												618.5567	(64a)
Heat gains from water heating, kWh/month	95.0125	84.5815	91.4744	84.5252	84.6533	79.2483	80.4823	82.0970	81.2182	86.9726	88.0285	94.5382	(65)

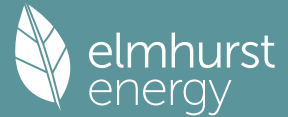
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	119.2289	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	225.9548	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(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)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Water heating gains (Table 5)	127.7050	125.8653	122.9494	117.3961	113.7813	110.0670	108.1751	110.3454	112.8030	116.8987	122.2618	127.0675	(72)
Total internal gains	545.3988	558.7866	536.9149	522.1766	497.9762	482.6241	466.3280	466.0452	478.6585	491.9392	517.8878	534.3314	(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
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Southeast				16.8700		36.7938		0.4000		0.7000		0.7700		120.4429 (77)
Southwest				4.6300		36.7938		0.4000		0.7000		0.7700		33.0558 (79)

Solar gains	153.4987	261.4651	357.7480	443.2671	496.4961	492.9057	475.2137	435.5024	387.3654	288.9746	183.8561	131.3629 (83)		
Total gains	698.8975	820.2517	894.6628	965.4437	994.4723	975.5297	941.5416	901.5477	866.0239	780.9138	701.7439	665.6943 (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	34.6845	34.7805	34.8770	35.3680	35.4678	35.9756	35.9756	36.0789	35.7708	35.4678	35.2687	35.0718		
alpha	3.3123	3.3187	3.3251	3.3579	3.3645	3.3984	3.3984	3.4053	3.3847	3.3645	3.3512	3.3381		
util living area	0.9480	0.9156	0.8704	0.7842	0.6627	0.5021	0.3711	0.4015	0.5887	0.8057	0.9162	0.9544 (86)		
MIT	19.3567	19.6702	20.0346	20.4598	20.7604	20.9317	20.9813	20.9753	20.8789	20.4928	19.8706	19.3068 (87)		
Th 2	20.1231	20.1253	20.1275	20.1386	20.1408	20.1519	20.1519	20.1542	20.1475	20.1408	20.1364	20.1319 (88)		
util rest of house	0.9405	0.9040	0.8528	0.7558	0.6199	0.4440	0.3029	0.3321	0.5309	0.7738	0.9028	0.9477 (89)		
MIT 2	18.6311	18.9367	19.2887	19.6954	19.9639	20.1111	20.1438	20.1429	20.0700	19.7356	19.1447	18.5889 (90)		
Living area fraction										fLA = Living area / (4) =		0.4054 (91)		
MIT	18.9253	19.2341	19.5911	20.0053	20.2868	20.4438	20.4834	20.4804	20.3979	20.0426	19.4390	18.8800 (92)		
Temperature adjustment												0.0000		
adjusted MIT	18.9253	19.2341	19.5911	20.0053	20.2868	20.4438	20.4834	20.4804	20.3979	20.0426	19.4390	18.8800 (93)		

8. Space heating requirement														

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9278	0.8902	0.8405	0.7510	0.6275	0.4645	0.3299	0.3593	0.5485	0.7699	0.8900	0.9358 (94)		
Useful gains	648.4093	730.1559	751.9833	725.0540	624.0614	453.1310	310.6280	323.8872	475.0171	601.1995	624.5257	622.9363 (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	1233.6016	1205.7032	1098.0987	918.5976	708.2796	475.2208	315.7949	330.8681	515.0810	778.8659	1023.5212	1224.5417 (97)		
Space heating kWh	435.3831	319.5678	257.5099	139.3514	62.6584	0.0000	0.0000	0.0000	0.0000	132.1839	287.2767	447.5944 (98a)		
Space heating requirement - total per year (kWh/year)												2081.5255		
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	435.3831	319.5678	257.5099	139.3514	62.6584	0.0000	0.0000	0.0000	0.0000	132.1839	287.2767	447.5944 (98c)		
Space heating requirement after solar contribution - total per year (kWh/year)												2081.5255		
Space heating per m2										(98c) / (4) =		23.5068 (99)		

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-Space and Water														1.0000 (303a)
Factor for control and charging method (Table 4c(3)) for space heating														1.0500 (305)
Factor for charging method (Table 4c(3)) for water heating														1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system														1.5000 (306)
Efficiency of secondary/supplementary heating system, %														0.0000 (208)
Space heating:														
Space heating requirement														
435.3831 319.5678 257.5099 139.3514 62.6584 0.0000 0.0000 0.0000 0.0000 132.1839 287.2767 447.5944 (98)														
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50														
307a 685.7283 503.3192 405.5781 219.4784 98.6869 0.0000 0.0000 0.0000 0.0000 208.1896 452.4609 704.9612														
Space heating requirement														
685.7283 503.3192 405.5781 219.4784 98.6869 0.0000 0.0000 0.0000 0.0000 208.1896 452.4609 704.9612 (307)														
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 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (309)														
Water heating														
Annual water heating requirement														
167.1455 147.7515 157.6106 141.0364 138.2021 126.2363 126.2109 130.5140 131.0904 144.0715 150.5022 165.7190 (64)														
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50														
310a 250.7182 221.6273 236.4159 211.5546 207.3032 189.3545 189.3164 195.7709 196.6357 216.1073 225.7534 248.5785														
Water heating fuel														
250.7182 221.6273 236.4159 211.5546 207.3032 189.3545 189.3164 195.7709 196.6357 216.1073 225.7534 248.5785 (310)														
Cooling System Energy Efficiency Ratio														0.0000 (314)
Space coolin 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (315)														
Pumps and Fa 20.8737 18.8536 20.8737 20.2003 20.8737 20.2003 20.8737 20.8737 20.2003 20.8737 20.2003 20.8737 (331)														
Lighting 28.3716 22.7608 20.4936 15.0145 11.5976 9.4753 10.5797 13.7519 17.8624 23.4364 26.4714 29.1602 (332)														
Electricity generated by PVs (Appendix M) (negative quantity)														
(333a)m -13.1364 -22.4678 -39.7083 -53.3554 -64.4292 -62.8241 -61.7681 -54.4254 -42.4416 -28.7016 -15.5605 -10.8064 (333a)														
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334a)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 (334a)														
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(335a)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 (335a)														
Electricity generated by PVs (Appendix M) (negative quantity)														
(333b)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 (333b)														
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(334b)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 (334b)														
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(335b)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 (335b)														
Annual totals kWh/year														
Space heating fuel - community heating														3278.4026 (307)
Space heating fuel - secondary														0.0000 (309)
Water heating fuel - community heating														2589.1358 (310)
Efficiency of water heater														0.0000 (311)
Electricity used for heat distribution														32.7840 (313)
Space cooling fuel														0.0000 (321)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9100)														
mechanical ventilation fans (SFP = 0.9100)														245.7705 (330a)
Total electricity for the above, kWh/year														245.7705 (331)
Electricity for lighting (calculated in Appendix L)														228.9753 (332)

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Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-469.6249 (333)
Wind generation	0.0000 (334)
Hydro-electric generation (Appendix N)	0.0000 (335a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (335)
Appendix Q - special features	
Energy saved or generated	-0.0000 (336)
Energy used	0.0000 (337)
Total delivered energy for all uses	6491.2160 (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			280.0000 (367)
Space and Water heating from Heat pump	2095.5494	0.1557	182.2551 (367)
Electrical energy for heat distribution (space & water)	32.7840	0.0000	8.7408 (372)
Overall CO2 factor for heat network			0.0547 (386)
Total CO2 associated with community systems			320.9122 (373)
Energy for instantaneous electric shower(s)	618.5567	0.1391	86.0549 (264a)
Space and water heating			320.9122 (376)
Pumps, fans and electric keep-hot	245.7705	0.1387	34.0914 (378)
Energy for lighting	228.9753	0.1443	33.0482 (379)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	0.1312	-61.6291
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-61.6291 (380)
Total CO2, kg/year			412.4776 (383)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.6600 (384)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Heat pump			280.0000 (467a)
Space and Water heating from Heat pump	2095.5494	1.5763	1845.5818 (467)
Electrical energy for heat distribution (space & water)	32.7840	0.0000	91.0178 (472)
Overall CO2 factor for heat network			0.5695 (486)
Total CO2 associated with community systems			3341.6553 (473)
Energy for instantaneous electric shower(s)	618.5567	1.5143	936.7015 (278a)
Space and water heating			3341.6553 (476)
Pumps, fans and electric keep-hot	245.7705	1.5128	371.8017 (478)
Energy for lighting	228.9753	1.5338	351.2100 (479)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-469.6249	1.4848	-697.3059
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-697.3059 (480)
Total Primary energy kWh/year			4304.0625 (483)
Dwelling Primary energy Rate (DPER)			48.6100 (484)

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

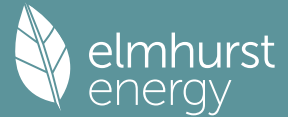
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	88.5500 (1b)	2.5000 (2b)	221.3750 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.5500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	221.3750 (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	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	30.0000 / (5) = 0.1355 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3855 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3277 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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													
Effective ac	0.4178	0.4096	0.4014	0.3605	0.3523	0.3113	0.3113	0.3031	0.3277	0.3523	0.3687	0.3850	(22b)
	0.5873	0.5839	0.5806	0.5650	0.5620	0.5485	0.5485	0.5459	0.5537	0.5620	0.5680	0.5741	(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	
Main dwelling								
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			20.2500	1.1450	23.1870			(27)
External Wall	47.4000	20.2500	27.1500	0.1800	4.8870			(29a)
Communal Wall	34.0500	1.8900	32.1600	0.1800	5.7888			(29a)
Roof	88.5000		88.5000	0.1100	9.7350			(30)
Total net area of external elements Aum(A, m2)			169.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	45.4878			(33)
Main dwelling								
Party Wall			20.1300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								118.9378 (35)
List of Thermal Bridges								
K1 Element				Length	Psi-value		Total	
E2 Other lintels (including other steel lintels)				11.7600	0.0500		0.5880	
E3 Sill				3.6200	0.0500		0.1810	
E4 Jamb				27.9600	0.0500		1.3980	
E7 Party floor between dwellings (in blocks of flats)				21.2800	0.0700		1.4896	
E16 Corner (normal)				7.5000	0.0900		0.6750	
E18 Party wall between dwellings				2.5000	0.0600		0.1500	
E25 Staggered party wall between dwellings				2.5000	0.0600		0.1500	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)				8.0500	0.0000		0.0000	
E23 Balcony within or between dwellings, balcony support penetrates wall insulation				11.3000	0.0200		0.2260	
E15 Flat roof with parapet				18.9600	0.5600		10.6176	
P4 Party wall - Roof (insulation at ceiling level)				8.0500	0.1200		0.9660	
R7 Flat ceiling (inverted)				13.6200	0.0400		0.5448	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.9860 (36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	62.4738	(37)

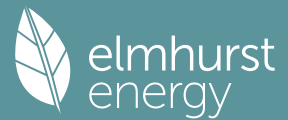
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6053 (42)
Hot water usage for mixer showers													
67.9029	66.8824	65.3954	62.5503	60.4507	58.1093	56.7784	58.2541	59.8718	62.3858	65.2920	67.6427	67.6427	(42a)
Hot water usage for baths													
29.3237	28.8882	28.2749	27.1442	26.2974	25.3586	24.8515	25.4604	26.1235	27.1281	28.2822	29.2245	29.2245	(42b)
Hot water usage for other uses													
41.3114	39.8091	38.3069	36.8047	35.3024	33.8002	33.8002	35.3024	36.8047	38.3069	39.8091	41.3114	41.3114	(42c)
Average daily hot water use (litres/day)													127.3477 (43)
Daily hot water use	Jan 138.5379	Feb 135.5798	Mar 131.9773	Apr 126.4992	May 122.0506	Jun 117.2681	Jul 115.4301	Aug 119.0170	Sep 122.8000	Oct 127.8209	Nov 133.3834	Dec 138.1786	(44)
Energy conte	219.4102	193.0638	202.8441	173.1710	164.3036	144.1948	139.6027	147.3679	151.4247	173.4517	190.0290	216.3544	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
32.9115	28.9596	30.4266	25.9757	24.6455	21.6292	20.9404	22.1052	22.7137	26.0178	28.5044	32.4532	32.4532	(46)
Water storage loss (or HIU 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													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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													
266.0051	235.1495	249.4390	218.2629	210.8985	189.2866	186.1976	193.9628	196.5165	220.0466	235.1209	262.9493	262.9493	(62)
WWHRS	-31.0424	-27.4541	-28.7484	-23.8048	-22.1852	-18.9840	-17.7945	-18.9227	-19.6416	-23.1553	-26.2321	-30.4675	(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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818	(64)
12Total per year (kWh/year)													2375.4027 (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	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	110.2298	97.8623	104.7216	93.6528	91.9069	84.0182	83.6938	86.2758	86.4222	94.9486	99.2581	109.2137	(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	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	130.2674	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	119.2289	132.0035	119.2289	123.2032	119.2289	123.2032	119.2289	119.2289	123.2032	119.2289	123.2032	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	236.3847	238.8376	232.6563	219.4970	202.8858	187.2736	176.8437	174.3907	180.5720	193.7313	210.3425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	36.0267	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	-104.2139	(71)
Water heating gains (Table 5)	148.1584	145.6284	140.7548	130.0734	123.5307	116.6920	112.4917	115.9620	120.0308	127.6191	137.8585	(72)
Total internal gains	568.8522	581.5497	557.7203	537.8539	510.7257	489.2490	470.6445	471.6619	485.8863	505.6596	536.4845	(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			
Southeast				15.8900	36.7938	0.6300	0.7000	0.7700	178.6779 (77)			
Southwest				4.3600	36.7938	0.6300	0.7000	0.7700	49.0268 (79)			
Solar gains	227.7046	387.8652	530.6941	657.5558	736.5173	731.1912	704.9463	646.0375	574.6295	428.6737	272.7377	194.8677 (83)
Total gains	796.5568	969.4149	1088.4144	1195.4096	1247.2429	1220.4402	1175.5908	1117.6994	1060.5158	934.3333	809.2222	751.9243 (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	27.7626	27.8280	27.8924	28.1989	28.2570	28.5306	28.5306	28.5818	28.4246	28.2570	28.1397	28.0181
alpha	2.8508	2.8552	2.8595	2.8799	2.8838	2.9020	2.9020	2.9055	2.8950	2.8838	2.8760	2.8679
util living area	0.9400	0.9015	0.8493	0.7601	0.6404	0.4926	0.3687	0.4008	0.5820	0.7926	0.9072	0.9477 (86)
MIT	18.9356	19.3269	19.7801	20.2881	20.6626	20.8866	20.9635	20.9528	20.8085	20.3091	19.5410	18.8660 (87)
Th 2	19.9280	19.9302	19.9324	19.9428	19.9447	19.9538	19.9538	19.9554	19.9503	19.9447	19.9408	19.9367 (88)
util rest of house	0.9307	0.8870	0.8276	0.7263	0.5905	0.4243	0.2866	0.3171	0.5142	0.7553	0.8910	0.9394 (89)
MIT 2	17.5554	18.0415	18.5987	19.2117	19.6359	19.8714	19.9354	19.9302	19.8001	19.2544	18.3241	17.4739 (90)
Living area fraction	fLA = Living area / (4) = 0.4054 (91)											
MIT	18.1149	18.5626	19.0776	19.6481	20.0521	20.2830	20.3522	20.3448	20.2089	19.6820	18.8175	18.0383 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.1149	18.5626	19.0776	19.6481	20.0521	20.2830	20.3522	20.3448	20.2089	19.6820	18.8175	18.0383 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9100	0.8644	0.8073	0.7159	0.5959	0.4466	0.3186	0.3490	0.5318	0.7449	0.8698	0.9199	(94)
Useful gains	724.8748	837.9856	878.7191	855.8093	743.2023	544.9909	374.5019	390.1281	563.9342	695.9613	703.8625	691.7089	(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	1455.7730	1436.3397	1319.2260	1115.0759	864.7254	582.7365	384.7565	403.7716	628.7498	940.2902	1218.2051	1444.9365	(97)
Space heating kWh	543.7882	402.0940	327.7372	186.6719	90.4132	0.0000	0.0000	0.0000	0.0000	181.7807	370.3267	560.4014	(98a)
Space heating requirement - total per year (kWh/year)												2663.2131	
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	543.7882	402.0940	327.7372	186.6719	90.4132	0.0000	0.0000	0.0000	0.0000	181.7807	370.3267	560.4014	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2663.2131	
Space heating per m2											(98c) / (4) =	30.0758	(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 %)												92.3000 (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	543.7882	402.0940	327.7372	186.6719	90.4132	0.0000	0.0000	0.0000	0.0000	181.7807	370.3267	560.4014	(98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000	(210)
Space heating fuel (main heating system)	589.1530	435.6381	355.0782	202.2447	97.9558	0.0000	0.0000	0.0000	0.0000	196.9455	401.2207	607.1521	(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	234.9628	207.6954	220.6907	194.4581	188.7133	170.3026	168.4031	175.0402	176.8749	196.8913	208.8887	232.4818	(64)
Efficiency of water heater (217)m	85.8777	85.5150	84.9449	83.9682	82.5087	79.8000	79.8000	79.8000	79.8000	83.8811	85.3293	85.9575	(216)
Fuel for water heating, kWh/month	273.6015	242.8758	259.8046	231.5854	228.7193	213.4118	211.0314	219.3486	221.6478	234.7266	244.8030	270.4613	(217)
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	(219)

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Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.7734	19.8742	17.8945	13.1103	10.1267	8.2736	9.2380	12.0078	15.5970	20.4641	23.1142	25.4619	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.4742	-34.6442	-52.0992	-61.3675	-68.6030	-64.9056	-64.0952	-59.2939	-51.2635	-40.8188	-26.3459	-20.1168	(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	-8.9395	-19.1731	-38.8060	-59.3268	-79.4824	-80.2573	-79.3312	-66.7079	-48.2796	-27.7782	-12.0484	-7.0433	(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												2885.3879	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	
Water heating fuel used												2852.0171	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												199.9357	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1094.2014	(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												4929.1392	(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	2885.3879	0.2100	605.9315	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2852.0171	0.2100	598.9236	(264)
Space and water heating			1204.8551	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.9357	0.1443	28.8569	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	0.1336	-75.7786	
PV Unit electricity exported	-527.1737	0.1254	-66.0937	
Total			-141.8724	(269)
Total CO2, kg/year			1103.7689	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.4600	(273)

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	2885.3879	1.1300	3260.4884	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2852.0171	1.1300	3222.7793	(278)
Space and water heating			6483.2677	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.9357	1.5338	306.6680	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-567.0278	1.4939	-847.0623	
PV Unit electricity exported	-527.1737	0.4602	-242.5960	
Total			-1089.6584	(283)
Total Primary energy kWh/year			5830.3781	(286)
Target Primary Energy Rate (TPER)			65.8400	(287)