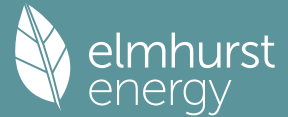


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Property Reference	York				Issued on Date	28/08/2025
Assessment Reference	Proposed		Prop Type Ref			
Property						
SAP Rating	86 B	DER	3.01	TER	10.24	
Environmental	97 A	% DER < TER				70.61
CO ₂ Emissions (t/year)	0.35	DFEE	37.45	TFEE	39.97	
Compliance Check	See BREL	% DFEE < TFEE				6.31
% DPER < TPER	41.10	DPER	31.50	TPER	53.47	
Assessor Details	Mr. Michael Woodbridge				Assessor ID	M818-0001
Client						

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	59.8000 (1b)	x 2.4000 (2b)	= 143.5200 (1b) - (3b)
First floor	59.8000 (1c)	x 2.7000 (2c)	= 161.4600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	119.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 304.9800 (5)

2. Ventilation rate

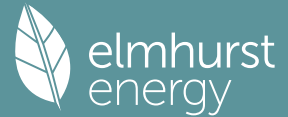
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (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) =	50.0000 / (5) = 0.1639 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3639 (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) = 0.3094 (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	0.3944	0.3867	0.3790	0.3403	0.3326	0.2939	0.2939	0.2862	0.3094	0.3326	0.3480	0.3635 (22b)
Effective ac	0.5778	0.5748	0.5718	0.5579	0.5553	0.5432	0.5432	0.5409	0.5478	0.5553	0.5606	0.5661 (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							
Front Door			2.2300	1.2000	2.6760		(26)
Window			15.0900	1.0536	15.8994		(27)
Patio Doors			5.0400	1.0536	5.3103		(27)
Ground Floor			59.8000	0.1200	7.1760	75.0000	4485.0000 (28a)
External Wall Stone	136.6300	17.8600	118.7700	0.1800	21.3786	9.0000	1068.9300 (29a)
External Wall Cladding	25.6500	4.5000	21.1500	0.1800	3.8070	9.0000	190.3500 (29a)
Plane Ceiling	59.8000		59.8000	0.0800	4.7840	9.0000	538.2000 (30)
Total net area of external elements Aum(A, m ²)			281.8800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.0314		(33)
Main dwelling							
Int W T			242.9100			9.0000	2186.1900 (32c)
Int F			59.8000			18.0000	1076.4000 (32d)
Int C			59.8000			9.0000	538.2000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	10083.2700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							84.3083 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				14.2700	0.1830	2.6114	

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E3 Sill	9.3800	0.0330	0.3095	
E4 Jamb	35.0800	0.0330	1.1576	
E5 Ground floor (normal)	31.8000	0.1710	5.4378	
E6 Intermediate floor within a dwelling	31.8000	0.0670	2.1306	
E10 Baves (insulation at ceiling level)	13.1500	0.0350	0.4603	
E12 Gable (insulation at ceiling level)	18.6500	0.1080	2.0142	
E16 Corner (normal)	25.5000	0.0460	1.1730	
E17 Corner (inverted - internal area greater than external area)	5.1000	0.0310	0.1581	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				15.4525 (36)
Point Thermal bridges				0.0000
Total fabric heat loss		(33) + (36) + (36a) =		76.4839 (37)

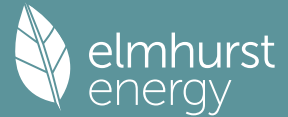
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	58.1503	57.8463	57.5484	56.1488	55.8869	54.6679	54.6679	54.4422	55.1375	55.8869	56.4167	56.9705 (38)
Average = Sum(39)m / 12 =	134.6342	134.3302	134.0323	132.6327	132.3708	131.1518	131.1518	130.9261	131.6214	132.3708	132.9006	133.4544 (39)
												132.6314
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1257	1.1232	1.1207	1.1090	1.1068	1.0966	1.0966	1.0947	1.1005	1.1068	1.1112	1.1158 (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												2.8618 (42)
Hot water usage for mixer showers												
	72.2021	71.1170	69.5359	66.5106	64.2781	61.7884	60.3732	61.9424	63.6625	66.3357	69.4259	71.9254 (42a)
Hot water usage for baths												
	31.1725	30.7095	30.0576	28.8555	27.9554	26.9574	26.4183	27.0657	27.7705	28.8385	30.0653	31.0671 (42b)
Hot water usage for other uses												
	43.9372	42.3395	40.7418	39.1441	37.5464	35.9487	35.9487	37.5464	39.1441	40.7418	42.3395	43.9372 (42c)
Average daily hot water use (litres/day)												135.4126 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	147.3118	144.1660	140.3352	134.5102	129.7799	124.6944	122.7402	126.5544	130.5771	135.9160	141.8307	146.9297 (44)
Energy content (annual)	233.3058	205.2905	215.6900	184.1378	174.7087	153.3263	148.4436	156.7008	161.0147	184.4367	202.0639	230.0565 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2249.1754
	34.9959	30.7936	32.3535	27.6207	26.2063	22.9990	22.2665	23.5051	24.1522	27.6655	30.3096	34.5085 (46)
Water storage loss:												
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1286 (55)
Total storage loss												
	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (56)
If cylinder contains dedicated solar storage												
	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (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												
	291.5548	257.9025	273.9390	240.5078	232.9577	209.6963	206.6926	214.9498	217.3847	242.6857	258.4339	288.3055 (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	291.5548	257.9025	273.9390	240.5078	232.9577	209.6963	206.6926	214.9498	217.3847	242.6857	258.4339	288.3055 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2935.0104 (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)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month	124.1734	110.3487	118.3161	106.3218	104.6898	96.0770	95.9567	98.7022	98.6334	107.9244	112.2822	123.0930 (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	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.3815	168.7081	152.3815	157.4609	152.3815	157.4609	152.3815	152.3815	157.4609	152.3815	157.4609	152.3815 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	284.6915	287.6457	280.2012	264.3527	244.3469	225.5442	212.9829	210.0287	217.4732	233.3216	253.3275	272.1302 (68)
Pumps, fans	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088 (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)	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702 (71)
Total internal gains	166.8997	164.2094	159.0271	147.6692	140.7121	133.4403	128.9741	132.6643	136.9908	145.0597	155.9476	165.4476 (72)
	669.8991	686.4895	657.5361	635.4092	603.3669	582.3717	560.2648	561.0008	577.8512	596.6892	632.6623	655.8856 (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			
North	8.6900		10.6334		0.6300		0.0000		0.7700		44.8253 (74)	
East	0.6600		19.6403		0.6300		0.0000		0.7700		6.2881 (76)	
South	2.8500		46.7521		0.6300		0.0000		0.7700		64.6364 (78)	
West	2.8900		19.6403		0.6300		0.0000		0.7700		27.5345 (80)	
North	5.0400		10.6334		0.6300		0.0000		0.7700		25.9976 (74)	

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Solar gains	169.2818	307.3681	473.7931	680.7358	851.2091	884.9417	836.5153	702.6678	544.1068	353.7988	206.1581	142.7073 (83)
Total gains	839.1809	993.8576	1131.3293	1316.1450	1454.5760	1467.3135	1396.7801	1263.6686	1121.9580	950.4880	838.8204	798.5929 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	20.8038	20.8509	20.8973	21.1178	21.1596	21.3562	21.3562	21.3930	21.2800	21.1596	21.0752	20.9878
alpha	2.3869	2.3901	2.3932	2.4079	2.4106	2.4237	2.4237	2.4262	2.4187	2.4106	2.4050	2.3992
util living area	0.9382	0.9092	0.8638	0.7729	0.6459	0.4979	0.3832	0.4317	0.6297	0.8233	0.9123	0.9442 (86)
Living	18.2233	18.6049	19.1602	19.8759	20.4418	20.7908	20.9197	20.8910	20.6129	19.8626	18.9320	18.1614
Non living	16.7357	17.2152	17.9090	18.7882	19.4510	19.8348	19.9555	19.9359	19.6626	18.7955	17.6405	16.6622
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	19.5796	18.6049	19.1602	19.8759	20.4418	20.7908	20.9197	20.8910	20.6129	19.8626	18.9320	18.5585 (87)
Th 2	19.9799	19.9820	19.9840	19.9935	19.9953	20.0036	20.0036	20.0052	20.0004	19.9953	19.9917	19.9879 (88)
util rest of house	0.9303	0.8980	0.8468	0.7448	0.6026	0.4363	0.3056	0.3513	0.5699	0.7946	0.8996	0.9371 (89)
MIT 2	18.6866	17.2152	17.9090	18.7882	19.4510	19.8348	19.9555	19.9359	19.6626	18.7955	17.6405	17.2615 (90)
Living area fraction									flA = Living area / (4) =			0.1321 (91)
MIT	18.8045	17.3988	18.0743	18.9319	19.5819	19.9611	20.0829	20.0620	19.7881	18.9365	17.8112	17.4328 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8045	17.3988	18.0743	18.9319	19.5819	19.9611	20.0829	20.0620	19.7881	18.9365	17.8112	17.4328 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9194	0.8598	0.8066	0.7104	0.5830	0.4336	0.3120	0.3561	0.5559	0.7575	0.8621	0.9125 (94)
Useful gains	771.5725	854.4749	912.4795	934.9866	848.0599	636.1562	435.8540	450.0543	623.6910	719.9741	723.1525	728.7173 (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	1952.8060	1678.9659	1551.3324	1330.5581	1043.3318	703.1149	456.7826	479.4570	748.6781	1103.5030	1423.5193	1765.9790 (97)
Space heating kWh	878.8377	554.0580	475.3065	284.8115	145.2823	0.0000	0.0000	0.0000	0.0000	285.3455	504.2641	771.7227 (98a)
Space heating requirement - total per year (kWh/year)												3899.6283
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	878.8377	554.0580	475.3065	284.8115	145.2823	0.0000	0.0000	0.0000	0.0000	285.3455	504.2641	771.7227 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3899.6283
Space heating per m2										(98c) / (4) =		32.6056 (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 %)												333.3960 (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	878.8377	554.0580	475.3065	284.8115	145.2823	0.0000	0.0000	0.0000	0.0000	285.3455	504.2641	771.7227 (98)
Space heating efficiency (main heating system 1)	333.3960	333.3960	333.3960	333.3960	333.3960	0.0000	0.0000	0.0000	0.0000	333.3960	333.3960	333.3960 (210)
Space heating fuel (main heating system)	263.6018	166.1862	142.5652	85.4274	43.5765	0.0000	0.0000	0.0000	0.0000	85.5876	151.2508	231.4733 (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	291.5548	257.9025	273.9390	240.5078	232.9577	209.6963	206.6926	214.9498	217.3847	242.6857	258.4339	288.3055 (64)
Efficiency of water heater (217)m	297.0884	297.0884	297.0884	297.0884	297.0884	297.0884	297.0884	297.0884	297.0884	297.0884	297.0884	297.0884 (216)
Fuel for water heating, kWh/month	98.1374	86.8100	92.2079	80.9550	78.4136	70.5838	69.5728	72.3521	73.1717	81.6881	86.9889	97.0437 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	34.1285	27.3791	24.6519	18.0610	13.9508	11.3980	12.7264	16.5423	21.4868	28.1918	31.8426	35.0770 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1169.6687 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												297.0884
Water heating fuel used												987.9250 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	275.4362 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2433.0299 (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	1169.6687	0.1552	181.5465 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	987.9250	0.1409	139.2070 (264)
Space and water heating			320.7535 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	275.4362	0.1443	39.7540 (268)
Total CO2, kg/year			360.5075 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0100 (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	1169.6687	1.5746	1841.7246 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	987.9250	1.5210	1502.6625 (278)
Space and water heating			3344.3871 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	275.4362	1.5338	422.4732 (282)
Total Primary energy kWh/year			3766.8603 (286)
Dwelling Primary energy Rate (DPER)			31.5000 (287)

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

1. Overall dwelling characteristics

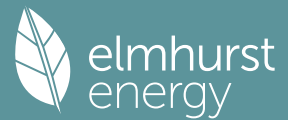
	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	59.8000 (1b)	x 2.4000 (2b)	= 143.5200 (1b) - (3b)
First floor	59.8000 (1c)	x 2.7000 (2c)	= 161.4600 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	119.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	304.9800 (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	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1312 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3812 (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) = 0.3240 (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	0.4131	0.4050	0.3969	0.3564	0.3483	0.3078	0.3078	0.2997	0.3240	0.3483	0.3645	0.3807 (22b)
Effective ac	0.5853	0.5820	0.5788	0.5635	0.5606	0.5474	0.5474	0.5449	0.5525	0.5606	0.5664	0.5725 (25)

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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			2.2300	1.0000	2.2300			(26)					
TER Opening Type			20.1300	1.1450	23.0496			(27)					
Ground Floor			59.8000	0.1300	7.7740			(28a)					
External Wall Stone	136.6300	17.8600	118.7700	0.1800	21.3786			(29a)					
External Wall Cladding	25.6500	4.5000	21.1500	0.1800	3.8070			(29a)					
Plane Ceiling	59.8000		59.8000	0.1100	6.5780			(30)					
Total net area of external elements Aum(A, m2)			281.8800					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.8172			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							84.3083	(35)					
List of Thermal Bridges													
K1 Element				Length	Psi-value		Total						
E2 Other lintels (including other steel lintels)				14.2700	0.0500		0.7135						
E3 Sill				9.3800	0.0500		0.4690						
E4 Jamb				35.0800	0.0500		1.7540						
E5 Ground floor (normal)				31.8000	0.1600		5.0880						
E6 Intermediate floor within a dwelling				31.8000	0.0000		0.0000						
E10 Eaves (insulation at ceiling level)				13.1500	0.0600		0.7890						
E12 Gable (insulation at ceiling level)				18.6500	0.0600		1.1190						
E16 Corner (normal)				25.5000	0.0900		2.2950						
E17 Corner (inverted - internal area greater than external area)				5.1000	-0.0900		-0.4590						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.7685	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	76.5857	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 58.9083	Feb 58.5748	Mar 58.2480	Apr 56.7129	May 56.4257	Jun 55.0887	Jul 55.0887	Aug 54.8411	Sep 55.6037	Oct 56.4257	Nov 57.0067	Dec 57.6142	(38)
Heat transfer coeff	135.4940	135.1606	134.8337	133.2986	133.0114	131.6744	131.6744	131.4268	132.1894	133.0114	133.5925	134.1999	(39)
Average = Sum(39)m / 12 =												133.2973	
HLP	Jan 1.1329	Feb 1.1301	Mar 1.1274	Apr 1.1145	May 1.1121	Jun 1.1010	Jul 1.1010	Aug 1.0989	Sep 1.1053	Oct 1.1121	Nov 1.1170	Dec 1.1221	(40)
HLP (average)												1.1145	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

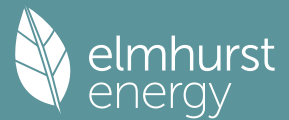
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8618	(42)
Hot water usage for mixer showers														
	72.2021	71.1170	69.5359	66.5106	64.2781	61.7884	60.3732	61.9424	63.6625	66.3357	69.4259	71.9254	(42a)	
Hot water usage for baths														
	31.1725	30.7095	30.0576	28.8555	27.9554	26.9574	26.4183	27.0657	27.7705	28.8385	30.0653	31.0671	(42b)	
Hot water usage for other uses														
	43.9372	42.3395	40.7418	39.1441	37.5464	35.9487	35.9487	37.5464	39.1441	40.7418	42.3395	43.9372	(42c)	
Average daily hot water use (litres/day)													135.4126	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	147.3118	144.1660	140.3352	134.5102	129.7799	124.6944	122.7402	126.5544	130.5771	135.9160	141.8307	146.9297	(44)	
Energy conte	233.3058	205.2905	215.6900	184.1378	174.7087	153.3263	148.4436	156.7008	161.0147	184.4367	202.0639	230.0565	(45)	
Energy content (annual)										Total = Sum(45)m =		2249.1754		
Distribution loss (46)m = 0.15 x (45)m														
	34.9959	30.7936	32.3535	27.6207	26.2063	22.9990	22.2665	23.5051	24.1522	27.6655	30.3096	34.5085	(46)	
Water storage loss:														
Store volume													250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													1.0208	(55)
Total storage loss														
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)	
If cylinder contains dedicated solar storage														
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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														
	288.2126	254.8837	270.5968	237.2734	229.6155	206.4619	203.3504	211.6076	214.1503	239.3435	255.1995	284.9633	(62)	
WWHRS	-33.0078	-29.1923	-30.5685	-25.3120	-23.5898	-20.1860	-18.9211	-20.1207	-20.8852	-24.6213	-27.8930	-32.3965	(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														
	255.2049	225.6914	240.0283	211.9614	206.0256	186.2760	184.4292	191.4869	193.2651	214.7222	227.3065	252.5668	(64)	
12Total per year (kWh/year)													2588.9642	(64)
Electric shower(s)													2589	(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														
	121.4996	107.9337	115.6424	103.7343	102.0161	93.4895	93.2829	96.0285	96.0459	105.2506	109.6947	120.4192	(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	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	(66)	
	148.3680	164.2645	148.3680	153.3136	148.3680	153.3136	148.3680	148.3680	153.3136	148.3680	153.3136	148.3680	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	284.6915	287.6457	280.2012	264.3527	244.3469	225.5442	212.9829	210.0287	217.4732	233.3216	253.3275	272.1302	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	(69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)														
	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	(71)	
Water heating gains (Table 5)														
	163.3059	160.6156	155.4333	144.0754	137.1184	129.8465	125.3803	129.0705	133.3970	141.4659	152.3538	161.8538	(72)	
Total internal gains														
	665.2918	681.4522	652.9288	630.6681	598.7596	574.6306	552.6575	553.3935	570.1101	592.0819	627.9212	651.2783	(73)	

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6. Solar gains

[Jan]					Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
North					13.7300	10.6334	0.6300		0.7000		0.7700	44.6184 (74)
East					0.6600	19.6403	0.6300		0.7000		0.7700	3.9615 (76)
South					2.8500	46.7521	0.6300		0.7000		0.7700	40.7209 (78)
West					2.8900	19.6403	0.6300		0.7000		0.7700	17.3467 (80)
Solar gains	106.6476	193.6419	298.4897	428.8635	536.2617	557.5133	527.0046	442.6807	342.7873	222.8932	129.8796	89.9056 (83)
Total gains	771.9393	875.0941	951.4185	1059.5316	1135.0213	1132.1439	1079.6621	996.0742	912.8974	814.9751	757.8008	741.1838 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	20.6718	20.7228	20.7731	21.0123	21.0577	21.2715	21.2715	21.3115	21.1886	21.0577	20.9661	20.8712
alpha	2.3781	2.3815	2.3849	2.4008	2.4038	2.4181	2.4181	2.4208	2.4126	2.4038	2.3977	2.3914
util living area	0.9476	0.9284	0.8990	0.8355	0.7359	0.5977	0.4740	0.5200	0.7067	0.8620	0.9275	0.9520 (86)
MIT	18.0980	18.4129	18.9114	19.6111	20.2326	20.6814	20.8702	20.8336	20.4886	19.6994	18.7994	18.0522 (87)
Th 2	19.9741	19.9763	19.9785	19.9890	19.9909	20.0001	20.0001	20.0017	19.9965	19.9909	19.9870	19.9828 (88)
util rest of house	0.9407	0.9191	0.8854	0.8121	0.6960	0.5328	0.3843	0.4305	0.6493	0.8375	0.9166	0.9457 (89)
MIT 2	16.5754	16.9737	17.6025	18.4762	19.2240	19.7344	19.9193	19.8920	19.5376	18.6021	17.4741	16.5222 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.7765	17.1638	17.7754	18.6261	19.3573	19.8595	20.0449	20.0164	19.6633	18.7470	17.6492	16.7243 (91)
Temperature adjustment	0.0000											
adjusted MIT	16.7765	17.1638	17.7754	18.6261	19.3573	19.8595	20.0449	20.0164	19.6633	18.7470	17.6492	16.7243 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9093	0.8834	0.8462	0.7733	0.6671	0.5228	0.3886	0.4320	0.6274	0.7987	0.8811	0.9159 (94)
Useful gains	701.9589	773.0974	805.0531	819.3400	757.1621	591.8451	419.5387	430.2687	572.7682	650.9076	667.7165	678.8213 (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	1690.4944	1657.5865	1520.3032	1296.4791	1018.5032	692.5448	453.6061	475.2965	735.4053	1083.6480	1409.2917	1680.7610 (97)
Space heating kWh	735.4703	594.3767	532.1461	343.5401	194.4378	0.0000	0.0000	0.0000	0.0000	321.9589	533.9341	745.4431 (98a)
Space heating requirement - total per year (kWh/year)	4001.3071											
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	735.4703	594.3767	532.1461	343.5401	194.4378	0.0000	0.0000	0.0000	0.0000	321.9589	533.9341	745.4431 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4001.3071											
Space heating per m ²	(98c) / (4) = 33.4557 (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	735.4703	594.3767	532.1461	343.5401	194.4378	0.0000	0.0000	0.0000	0.0000	321.9589	533.9341	745.4431 (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)	796.8259	643.9617	576.5397	372.1995	210.6585	0.0000	0.0000	0.0000	0.0000	348.8179	578.4768	807.6307 (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	255.2049	225.6914	240.0283	211.9614	206.0256	186.2760	184.4292	191.4869	193.2651	214.7222	227.3065	252.5668 (64)
Efficiency of water heater	86.2929	86.1267	85.7923	85.1363	83.9301	79.8000	79.8000	79.8000	79.8000	84.9661	85.9069	79.8000 (216)
Fuel for water heating, kWh/month	295.7426	262.0457	279.7784	248.9673	245.4728	233.4285	231.1143	239.9585	242.1868	252.7152	264.5962	292.5399 (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	30.8279	24.7313	22.2678	16.3143	12.6017	10.2957	11.4957	14.9425	19.4088	25.4654	28.7632	31.6847 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-53.6441	-74.4736	-105.4095	-116.6033	-124.0838	-115.1543	-113.6430	-108.0337	-97.9708	-84.1676	-58.5285	-46.5077 (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	-33.9149	-70.9029	-140.1527	-209.4280	-275.9390	-276.9742	-273.7945	-232.3348	-170.9249	-101.1333	-45.1860	-26.8598 (233b)

Full SAP Calculation Printout



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	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	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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													4335.1107	(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													3088.5463	(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)													248.7991	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-2955.7648	(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													4802.6912	(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	4335.1107	0.2100	910.3732 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3088.5463	0.2100	648.5947 (264)
Space and water heating			1558.9680 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	248.7991	0.1443	35.9094 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1098.2198	0.1349	-148.1912
PV Unit electricity exported	-1857.5450	0.1260	-234.1257
Total			-382.3168 (269)
Total CO2, kg/year			1224.4898 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.2400 (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	4335.1107	1.1300	4898.6750 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3088.5463	1.1300	3490.0573 (278)
Space and water heating			8388.7323 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	248.7991	1.5338	381.6163 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1098.2198	1.4987	-1645.9310
PV Unit electricity exported	-1857.5450	0.4627	-859.4133
Total			-2505.3443 (283)
Total Primary energy kWh/year			6395.1052 (286)
Target Primary Energy Rate (TPER)			53.4700 (287)