

Full SAP Calculation Printout



Property Reference	1100-0025				Issued on Date	28/03/2024	
Assessment Reference	00001		Prop Type Ref				
Property	Stout House						
SAP Rating	93 A		DER	1.71	TER	11.94	
Environmental	98 A		% DER < TER				85.68
CO ₂ Emissions (t/year)	0.16		DFEE	40.78	TFEE	45.37	
Compliance Check	See BREL		% DFEE < TFEE				10.13
% DPER < TPER	73.85		DPER	16.37	TPER	62.59	
Assessor Details	Mr. Ikechukwu Diala-Uka				Assessor ID	W462-0001	
Client	Mesh Energy, Mesh Energy						

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)	
Ground floor	47.7600 (1b)	x	2.4800 (2b)	=	118.4448 (1b) -	(3b)
First floor	37.1300 (1c)	x	2.7000 (2c)	=	100.2510 (1c) -	(3c)
Second floor	44.6900 (1d)	x	2.6200 (2d)	=	117.0878 (1d) -	(3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.5800				(4)	
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	335.7836	(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	5.0000	(17)	
Infiltration rate	0.2500	(18)	
Number of sides sheltered	1	(19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2313 (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	0.2948	0.2891	0.2833	0.2544	0.2486	0.2197	0.2197	0.2139	0.2313	0.2486	0.2602	0.2717	(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) =												81.9000	(23c)
Effective ac	0.3853	0.3796	0.3738	0.3449	0.3391	0.3102	0.3102	0.3044	0.3217	0.3391	0.3507	0.3622	(25)

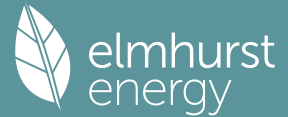
3. Heat losses and heat loss parameter

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	
Window (Uw = 0.80)			40.3500	0.7752	31.2791			(27)
Door			2.4300	1.0000	2.4300			(26)
Heatloss Floor 1			47.7600	0.1100	5.2536	110.0000	5253.6000	(28a)
External Wall 1	185.1700	42.7800	142.3900	0.1500	21.3585	70.0000	9967.3000	(29a)
External Roof 1	45.0000		45.0000	0.1100	4.9500	9.0000	405.0000	(30)
Total net area of external elements A _{um} (A, m ²)			277.9300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	65.2712			(33)
Party Wall 1			47.4200	0.0000	0.0000	140.0000	6638.8000	(32)
Internal Wall 1			178.0000			9.0000	1602.0000	(32c)
Internal Floor 1			37.1300			18.0000	668.3400	(32d)
Internal Floor 2			44.6900			18.0000	804.4200	(32d)
Internal Ceiling 1			37.1300			9.0000	334.1700	(32e)
Internal Ceiling 2			44.6900			9.0000	402.2100	(32e)

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Southeast	20.5000	36.7938	0.6800	0.7000	0.7700	248.8107 (77)
Northwest	15.7700	11.2829	0.6800	0.7000	0.7700	58.6941 (81)

Solar gains	322.6901	574.2002	850.8278	1163.4717	1402.9081	1436.6277	1366.8079	1181.4715	958.0409	652.1883	390.9772	273.2637 (83)
Total gains	1014.3874	1281.9565	1528.6436	1816.1369	2021.4060	2031.8123	1938.4548	1754.3736	1548.8173	1264.1448	1041.8438	950.0917 (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	52.4862	52.7310	52.9780	54.2490	54.5105	55.8569	55.8569	56.1342	55.3105	54.5105	53.9899	53.4792	
alpha	4.4991	4.5154	4.5319	4.6166	4.6340	4.7238	4.7238	4.7423	4.6874	4.6340	4.5993	4.5653	
util living area	0.9859	0.9623	0.9076	0.7708	0.5854	0.4049	0.2937	0.3370	0.5630	0.8571	0.9685	0.9891 (86)	
Living	19.9564	20.2000	20.4861	20.7705	20.8937	20.9290	20.9335	20.9330	20.9101	20.7082	20.2890	19.9298	
Non living	19.4774	19.7200	20.0008	20.2792	20.3899	20.4305	20.4336	20.4359	20.4119	20.2287	19.8200	19.4593	
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	16	
MIT	20.4661	20.2000	20.4861	20.7705	20.8937	20.9290	20.9335	20.9330	20.9101	20.7082	20.2890	20.1693 (87)	
Th 2	20.4675	20.4700	20.4724	20.4848	20.4873	20.4996	20.4996	20.5021	20.4947	20.4873	20.4823	20.4774 (88)	
util rest of house	0.9841	0.9578	0.8973	0.7504	0.5575	0.3742	0.2605	0.3010	0.5263	0.8380	0.9639	0.9877 (89)	
MIT 2	19.9610	19.7200	20.0008	20.2792	20.3899	20.4305	20.4336	20.4359	20.4119	20.2287	19.8200	19.6872 (90)	
Living area fraction									fLA = Living area / (4) =				0.2010 (91)
MIT	20.0625	19.8165	20.0983	20.3779	20.4911	20.5307	20.5341	20.5358	20.5120	20.3250	19.9143	19.7841 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.0625	19.8165	20.0983	20.3779	20.4911	20.5307	20.5341	20.5358	20.5120	20.3250	19.9143	19.7841 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9825	0.9513	0.8893	0.7459	0.5578	0.3761	0.2628	0.3034	0.5276	0.8314	0.9581	0.9855 (94)
Useful gains	996.6261	1219.5091	1359.4192	1354.7373	1127.4597	764.1913	509.4673	532.3441	817.1963	1051.0463	998.1941	936.2706 (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	2175.2866	2048.9745	1859.1950	1532.5273	1168.1555	769.0666	510.1538	533.6598	839.6938	1292.2517	1719.1644	2110.7238 (97)
Space heating kWh	876.9234	557.4008	371.8331	128.0088	30.2777	0.0000	0.0000	0.0000	0.0000	179.4568	519.0986	873.7932 (98a)
Space heating requirement - total per year (kWh/year)												3536.7924
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	876.9234	557.4008	371.8331	128.0088	30.2777	0.0000	0.0000	0.0000	0.0000	179.4568	519.0986	873.7932 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3536.7924
Space heating per m2										(98c) / (4) =		27.2943 (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 %)												279.5764 (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	876.9234	557.4008	371.8331	128.0088	30.2777	0.0000	0.0000	0.0000	0.0000	179.4568	519.0986	873.7932 (98)
Space heating efficiency (main heating system 1)	279.5764	279.5764	279.5764	279.5764	279.5764	0.0000	0.0000	0.0000	0.0000	279.5764	279.5764	279.5764 (210)
Space heating fuel (main heating system)	313.6615	199.3733	132.9988	45.7867	10.8299	0.0000	0.0000	0.0000	0.0000	64.1888	185.6733	312.5419 (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	328.2953	290.2857	307.7234	268.3428	258.7504	231.6065	227.1835	236.8933	240.3067	269.8682	289.3723	324.3671 (64)
Efficiency of water heater	182.2240	182.2240	182.2240	182.2240	182.2240	182.2240	182.2240	182.2240	182.2240	182.2240	182.2240	182.2240 (216)
Fuel for water heating, kWh/month	180.1603	159.3016	168.8710	147.2599	141.9958	127.0999	124.6727	130.0012	131.8744	148.0970	158.8004	178.0046 (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	33.6097	30.3572	33.6097	32.5256	33.6097	32.5256	33.6097	33.6097	32.5256	33.6097	32.5256	33.6097 (221)
Lighting	30.5117	24.4776	22.0394	16.1470	12.4724	10.1901	11.3777	14.7892	19.2097	25.2042	28.4681	31.3597 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-90.9277	-143.4949	-225.5564	-267.7529	-297.0639	-279.0453	-275.3969	-255.4199	-218.0710	-171.1692	-104.9262	-76.6997 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1265.0541 (211)

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	182.2240	
Water heating fuel used	1796.1388	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.9660)		
mechanical ventilation fans (SFP = 0.9660)	395.7277	(230a)
Total electricity for the above, kWh/year	395.7277	(231)
Electricity for lighting (calculated in Appendix L)	246.2470	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2405.5241	(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	1297.6435	(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	1265.0541	0.1574	199.0631 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1796.1388	0.1411	253.3675 (264)
Space and water heating			452.4306 (265)
Pumps, fans and electric keep-hot	395.7277	0.1387	54.8923 (267)
Energy for lighting	246.2470	0.1443	35.5410 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2405.5241	0.1333	-320.6827
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-320.6827 (269)
Total CO2, kg/year			222.1812 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7100 (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	1265.0541	1.5825	2001.9232 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1796.1388	1.5216	2733.0148 (278)
Space and water heating			4734.9380 (279)
Pumps, fans and electric keep-hot	395.7277	1.5128	598.6568 (281)
Energy for lighting	246.2470	1.5338	377.7018 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-2405.5241	1.4926	-3590.5689
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-3590.5689 (283)
Total Primary energy kWh/year			2120.7278 (286)
Dwelling Primary energy Rate (DPER)			16.3700 (287)

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

CALCULATION OF TARGET EMISSIONS

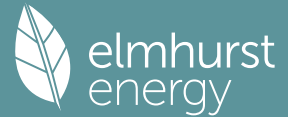
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.7600 (1b)	x 2.4800 (2b)	= 118.4448 (1b) - (3b)
First floor	37.1300 (1c)	x 2.7000 (2c)	= 100.2510 (1c) - (3c)
Second floor	44.6900 (1d)	x 2.6200 (2d)	= 117.0878 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	335.7836 (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	4 * 10 = 40.0000 (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) =	40.0000 / (5) = 0.1191 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)

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Infiltration rate													0.3691 (18)
Number of sides sheltered													1 (19)
Shelter factor													(20) = $1 - [0.075 \times (19)] = 0.9250$ (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.3414 (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)
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 infltr rate													
Effective ac	0.4353	0.4268	0.4183	0.3756	0.3670	0.3244	0.3244	0.3158	0.3414	0.3670	0.3841	0.4012	(22b)
	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.4300	1.0000	2.4300			(26)
TER Opening Type (Uw = 1.20)			29.9600	1.1450	34.3053			(27)
Heatloss Floor 1			47.7600	0.1300	6.2088			(28a)
External Wall 1	185.1700	32.3900	152.7800	0.1800	27.5004			(29a)
External Roof 1	45.0000		45.0000	0.1100	4.9500			(30)
Total net area of external elements Aum(A, m2)			277.9300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 75.3945			(33)
Party Wall 1			47.4200	0.0000	0.0000			(32)

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

201.2335 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	19.6500	0.0500	0.9825	
E3 Sill	18.5700	0.0500	0.9285	
E4 Jamb	55.6000	0.0500	2.7800	
E5 Ground floor (normal)	23.0400	0.1600	3.6864	
E6 Intermediate floor within a dwelling	48.2200	0.0000	0.0000	
E16 Corner (normal)	39.1800	0.0900	3.5262	
E15 Flat roof with parapet	21.1100	0.5600	11.8216	
E8 Balcony within a dwelling, wall insulation continuous	8.8200	0.0000	0.0000	
E17 Corner (inverted - internal area greater than external area)	7.8800	-0.0900	-0.7092	

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

23.0160 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 98.4105 (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	
	65.9044	65.4966	65.0970	63.2198	62.8686	61.2336	61.2336	60.9309	61.8634	62.8686	63.5791	64.3219	(38)
Heat transfer coeff	164.3149	163.9072	163.5075	161.6304	161.2791	159.6442	159.6442	159.3414	160.2739	161.2791	161.9896	162.7324	(39)
Average = Sum(39)m / 12 =													161.6287

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1.2681	1.2649	1.2618	1.2473	1.2446	1.2320	1.2320	1.2297	1.2369	1.2446	1.2501	1.2558	(40)
HLP (average)													1.2473
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8939 (42)
Hot water usage for mixer showers													
	72.7409	71.6478	70.0548	67.0070	64.7578	62.2495	60.8238	62.4047	64.1376	66.8308	69.9440	72.4622	(42a)
Hot water usage for baths													
	31.4042	30.9378	30.2810	29.0700	28.1632	27.1578	26.6147	27.2669	27.9770	29.0529	30.2888	31.2980	(42b)
Hot water usage for other uses													
	44.2664	42.6567	41.0470	39.4373	37.8276	36.2179	36.2179	37.8276	39.4373	41.0470	42.6567	44.2664	(42c)
Average daily hot water use (litres/day)													136.4235 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	148.4115	145.2422	141.3828	135.5143	130.7487	125.6252	123.6564	127.4992	131.5519	136.9306	142.8895	148.0266	(44)
Energy conte	235.0475	206.8230	217.3001	185.5123	176.0128	154.4709	149.5517	157.8706	162.2167	185.8136	203.5723	231.7739	(45)
Energy content (annual)													Total = Sum(45)m = 2265.9653
Distribution loss (46)m = 0.15 x (45)m													
	35.2571	31.0234	32.5950	27.8269	26.4019	23.1706	22.4328	23.6806	24.3325	27.8720	30.5358	34.7661	(46)

Water storage loss:

Store volume

300.0000 (47)

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

2.1127 (48)

Temperature factor from Table 2b

0.5400 (49)

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

1.1409 (55)

Total storage loss

35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 (56)

If cylinder contains dedicated solar storage

35.3664 31.9439 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 34.2256 35.3664 34.2256 35.3664 35.3664 (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 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 0.0000 (61)

Total heat required for water heating calculated for each month

293.6763 259.7780 275.9289 242.2499 234.6417 211.2084 208.1805 216.4994 218.9542 244.4424 260.3099 290.4027 (62)

WWHRS -33.2541 -29.4102 -30.7967 -25.5009 -23.7659 -20.3366 -19.0624 -20.2709 -21.0411 -24.8051 -28.1012 -32.6383 (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 260.4222 230.3678 245.1323 216.7490 210.8758 190.8718 189.1182 196.2285 197.9132 219.6373 232.2087 257.7644 (64)

Total per year (kWh/year) = Sum(64)m = 2647.2891 (64)

12Total per year (kWh/year)

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)

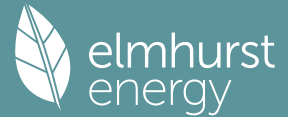
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month

125.0563 111.1327 119.1553 107.0729 105.4273 96.7516 96.6290 99.3950 99.3271 108.6861 113.0778 123.9679 (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	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	149.9101	165.9719	149.9101	154.9072	149.9101	154.9072	149.9101	149.9101	154.9072	149.9101	154.9072	149.9101 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	297.2136	300.2978	292.5258	275.9803	255.0945	235.4647	222.3509	219.2667	227.0387	243.5843	264.4701	284.0998 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695 (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)												
	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557 (71)
Water heating gains (Table 5)												
	168.0865	165.3760	160.1550	148.7124	141.7034	134.3772	129.8777	133.5955	137.9543	146.0834	157.0526	166.6235 (72)
Total internal gains												
	684.6187	701.0542	671.9994	649.0082	616.1164	591.1575	568.5471	569.1808	586.3085	608.9862	645.8382	670.0418 (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
Northeast		3.0300	11.2829	0.6300	0.7000	0.7700	10.4481 (75)
Southeast		15.2200	36.7938	0.6300	0.7000	0.7700	171.1439 (77)
Northwest		11.7100	11.2829	0.6300	0.7000	0.7700	40.3786 (81)
Solar gains							
	221.9706	394.9806	585.2728	800.3453	965.0596	988.2583	940.2280
Total gains							
	906.5893	1096.0347	1257.2722	1449.3535	1581.1760	1579.4159	1508.7751
							812.7301
							659.0263
							448.6286
							268.9441
							187.9712 (83)
							858.0130 (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
tau	44.0817	44.1914	44.2994	44.8139	44.9115	45.3715	45.3715	45.4577	45.1932	44.9115	44.7145	44.5104
alpha	3.9388	3.9461	3.9533	3.9876	3.9941	4.0248	4.0248	4.0305	4.0129	3.9941	3.9810	3.9674
util living area												
	0.9914	0.9815	0.9600	0.8989	0.7781	0.6023	0.4538	0.5102	0.7504	0.9349	0.9834	0.9931 (86)
MIT	19.2399	19.5080	19.8884	20.3746	20.7416	20.9323	20.9830	20.9732	20.8354	20.3400	19.7054	19.2004 (87)
Th 2	19.8659	19.8684	19.8709	19.8823	19.8845	19.8945	19.8945	19.8963	19.8906	19.8845	19.8801	19.8756 (88)
util rest of house												
	0.9891	0.9765	0.9490	0.8715	0.7220	0.5142	0.3453	0.3969	0.6696	0.9111	0.9780	0.9912 (89)
MIT 2	17.8329	18.1744	18.6538	19.2529	19.6650	19.8536	19.8884	19.8857	19.7745	19.2279	18.4358	17.7889 (90)
Living area fraction												
	fLA = Living area / (4) =											
MIT	18.1157	18.4424	18.9019	19.4783	19.8813	20.0704	20.1083	20.1042	19.9877	19.4514	18.6910	18.0725 (92)
Temperature adjustment												
	0.0000											
adjusted MIT	18.1157	18.4424	18.9019	19.4783	19.8813	20.0704	20.1083	20.1042	19.9877	19.4514	18.6910	18.0725 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9837	0.9678	0.9366	0.8596	0.7218	0.5289	0.3669	0.4191	0.6775	0.8993	0.9699	0.9865 (94)
Useful gains	891.7787	1060.6958	1177.6143	1245.8984	1141.2665	835.4180	553.5155	579.1177	843.6610	951.0806	887.2204	846.4632 (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	2270.1185	2219.7030	2027.8034	1709.7778	1319.4791	873.3113	560.0862	590.2366	943.6470	1427.5427	1877.6144	2257.5126 (97)
kWh												
Space heating	1025.4848	778.8529	632.5407	333.9932	132.5902	0.0000	0.0000	0.0000	0.0000	354.4878	713.0837	1049.8208 (98a)
requirement - total per year (kWh/year)												5020.8539
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	1025.4848	778.8529	632.5407	333.9932	132.5902	0.0000	0.0000	0.0000	0.0000	354.4878	713.0837	1049.8208 (98c)
Space heating												
requirement after solar contribution - total per year (kWh/year)												5020.8539
Space heating												
per m2										(98c) / (4) =		38.7471 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												
Fraction of space heat from main system(s)												
Efficiency of main space heating system 1 (in %)												
Efficiency of main space heating system 2 (in %)												
Efficiency of secondary/supplementary heating system, %												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement												
	1025.4848	778.8529	632.5407	333.9932	132.5902	0.0000	0.0000	0.0000	0.0000	354.4878	713.0837	1049.8208 (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)												
	1111.0344	843.8276	685.3095	361.8561	143.6514	0.0000	0.0000	0.0000	0.0000	384.0604	772.5717	1137.4006 (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												
	260.4222	230.3678	245.1323	216.7490	210.8758	190.8718	189.1182	196.2285	197.9132	219.6373	232.2087	257.7644 (64)
Efficiency of water heater												
	86.8170	86.5713	86.0882	85.0260	83.0493	79.8000	79.8000	79.8000	79.8000	85.1271	86.4062	86.8687 (216)
(217)m												86.8687 (217)

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Fuel for water heating, kWh/month	299.9667	266.1018	284.7454	254.9209	253.9163	239.1877	236.9902	245.9004	248.0115	258.0109	268.7409	296.7288	(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	31.1484	24.9884	22.4993	16.4839	12.7327	10.4027	11.6152	15.0978	19.6106	25.7301	29.0621	32.0141	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-45.5608	-64.6941	-93.6342	-105.9920	-114.8333	-107.2980	-105.8864	-99.6461	-88.8012	-74.2070	-50.2186	-39.3290	(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	-24.3692	-51.4126	-102.4870	-154.3970	-204.6498	-205.8802	-203.5453	-172.1934	-125.9557	-73.7858	-32.6142	-19.2668	(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												5439.7117	(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												3153.2214	(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)												251.3852	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2360.6577	(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												6569.6606	(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	5439.7117	0.2100	1142.3395	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3153.2214	0.2100	662.1765	(264)
Space and water heating			1804.5160	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	251.3852	0.1443	36.2826	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-990.1006	0.1345	-133.1274	
PV Unit electricity exported	-1370.5571	0.1258	-172.4109	
Total			-305.5383	(269)
Total CO2, kg/year			1547.1895	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.9400	(273)

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

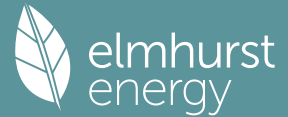
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5439.7117	1.1300	6146.8742	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3153.2214	1.1300	3563.1402	(278)
Space and water heating			9710.0144	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	251.3852	1.5338	385.5830	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-990.1006	1.4969	-1482.1100	
PV Unit electricity exported	-1370.5571	0.4618	-632.8591	
Total			-2114.9691	(283)
Total Primary energy kWh/year			8110.7291	(286)
Target Primary Energy Rate (TPER)			62.5900	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	47.7600 (1b)	x	2.4800 (2b)	=	118.4448 (1b) - (3b)	
First floor	37.1300 (1c)	x	2.7000 (2c)	=	100.2510 (1c) - (3c)	
Second floor	44.6900 (1d)	x	2.6200 (2d)	=	117.0878 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.5800				(4)	
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	335.7836 (5)	

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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)
													Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =													40.0000 / (5) =	0.1191 (8)
Pressure test													Yes	
Pressure Test Method													Blower Door	
Measured/design AP50													5.0000 (17)	
Infiltration rate													0.3691 (18)	
Number of sides sheltered													1 (19)	
Shelter factor													(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) =	0.3414 (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	0.4353	0.4268	0.4183	0.3756	0.3670	0.3244	0.3244	0.3158	0.3414	0.3670	0.3841	0.4012	(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	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)	

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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 (58)
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	101.8671	89.0779	93.1842	79.7156	75.5109	66.2386	64.5920	68.5105	70.6593	80.8561	88.3356	100.5682 (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	101.8671	89.0779	93.1842	79.7156	75.5109	66.2386	64.5920	68.5105	70.6593	80.8561	88.3356	100.5682 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											979.1161 (64)
Electric shower(s)	58.2533	51.9042	56.6774	54.0866	55.1015	52.5615	54.3135	55.1015	54.0866	56.6774	55.6117	58.2533 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											662.6284 (64a)
Heat gains from water heating, kWh/month	40.0301	35.2455	37.4654	33.4505	32.6531	29.7000	29.7264	30.9030	31.1865	34.3834	35.9868	39.7054 (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	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	149.9101	165.9719	149.9101	154.9072	149.9101	154.9072	149.9101	149.9101	154.9072	149.9101	154.9072	149.9101 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2136	300.2978	292.5258	275.9803	255.0945	235.4647	222.3509	219.2667	227.0387	243.5843	264.4701	284.0998 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695 (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)	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557 (71)
Water heating gains (Table 5)	53.8039	52.4487	50.3567	46.4591	43.8886	41.2500	39.9548	41.5363	43.3145	46.2142	49.9817	53.3675 (72)
Total internal gains	567.3361	585.1268	559.2011	543.7549	515.3016	498.0303	478.6242	477.1216	491.6688	506.1170	535.7673	553.7858 (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
Northeast				4.0800	11.2829		0.6800		0.7000		0.7700		15.1853 (75)
Southeast				20.5000	36.7938		0.6800		0.7000		0.7700		248.8107 (77)
Northwest				15.7700	11.2829		0.6800		0.7000		0.7700		58.6941 (81)
Solar gains	322.6901	574.2002	850.8278	1163.4717	1402.9081	1436.6277	1366.8079	1181.4715	958.0409	652.1883	390.9772	273.2637	(83)
Total gains	890.0262	1159.3271	1410.0289	1707.2266	1918.2097	1934.6580	1845.4322	1658.5931	1449.7097	1158.3054	926.7445	827.0495	(84)

7. Mean internal temperature (heating season)

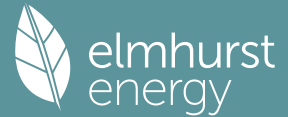
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	44.9311	45.0451	45.1573	45.6920	45.7935	46.2718	46.2718	46.3615	46.0864	45.7935	45.5887	45.3766
alpha	3.9954	4.0030	4.0105	4.0461	4.0529	4.0848	4.0848	4.0908	4.0724	4.0529	4.0392	4.0251
util living area	0.9919	0.9774	0.9424	0.8456	0.6843	0.5002	0.3690	0.4252	0.6731	0.9140	0.9824	0.9939 (86)
MIT	19.2654	19.6035	20.0429	20.5431	20.8474	20.9671	20.9925	20.9870	20.8951	20.4351	19.7509	19.2125 (87)
Th 2	19.8849	19.8874	19.8898	19.9014	19.9035	19.9136	19.9136	19.9154	19.9097	19.9035	19.8991	19.8946 (88)
util rest of house	0.9897	0.9715	0.9277	0.8103	0.6243	0.4220	0.2799	0.3287	0.5906	0.8850	0.9768	0.9922 (89)
MIT 2	18.3208	18.6560	19.0838	19.5541	19.8072	19.8988	19.9116	19.9116	19.8548	19.4734	18.8133	18.2754 (90)
Living area fraction	18.5106	18.8464	19.2765	19.7528	20.0162	20.1135	20.1288	20.1277	20.0638	19.6666	19.0017	18.4637 (92)
MIT	18.5106	18.8464	19.2765	19.7528	20.0162	20.1135	20.1288	20.1277	20.0638	19.6666	19.0017	18.4637 (93)
Temperature adjustment	18.5106	18.8464	19.2765	19.7528	20.0162	20.1135	20.1288	20.1277	20.0638	19.6666	19.0017	18.4637 (93)
adjusted MIT	18.5106	18.8464	19.2765	19.7528	20.0162	20.1135	20.1288	20.1277	20.0638	19.6666	19.0017	18.4637 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	877.4612	1117.8834	1294.0232	1374.1571	1210.1545	845.0916	549.5763	577.1435	874.3328	1016.3118	899.4865	818.0560 (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	2290.8750	2242.5918	2049.3745	1720.4342	1315.4023	863.0695	552.3873	582.3932	937.3239	1434.0977	1890.9880	2276.8636 (97)
Space heating kWh	1051.5799	755.8040	561.9814	249.3196	78.3043	0.0000	0.0000	0.0000	0.0000	310.8327	713.8810	1085.3529 (98a)
Space heating requirement - total per year (kWh/year)												4807.0559
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	1051.5799	755.8040	561.9814	249.3196	78.3043	0.0000	0.0000	0.0000	0.0000	310.8327	713.8810	1085.3529 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4807.0559
Space heating per m2												(98c) / (4) = 37.0972 (99)

8c. Space cooling requirement

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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												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1471.4566	1158.3807	1187.3872	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9263	0.9583	0.9379	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1362.9436	1110.0888	1113.6484	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	2198.1169	2096.6975	1881.2984	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	601.3247	734.0369	571.1316	0.0000	0.0000	0.0000	0.0000 (104)
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	150.3312	183.5092	142.7829	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling requirement												0.0000 (107)
Energy for space heating												476.6233 (107)
Energy for space cooling												37.0972 (99)
Total												3.6782 (108)
Fabric Energy Efficiency (DFEE)												40.7754 (109)
												40.8 (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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	47.7600 (1b)	x 2.4800 (2b)	= 118.4448 (1b) - (3b)
First floor	37.1300 (1c)	x 2.7000 (2c)	= 100.2510 (1c) - (3c)
Second floor	44.6900 (1d)	x 2.6200 (2d)	= 117.0878 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.5800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	335.7836 (5)

2. Ventilation rate

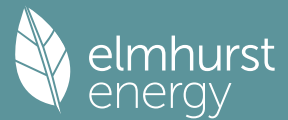
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	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) = 0.1191 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3691 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3414 (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	0.4353	0.4268	0.4183	0.3756	0.3670	0.3244	0.3244	0.3158	0.3414	0.3670	0.3841	0.4012 (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	0.5948	0.5911	0.5875	0.5705	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805 (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
TER Opaque door			2.4300	1.0000	2.4300		(26)
TER Opening Type (Uw = 1.20)			29.9600	1.1450	34.3053		(27)
Heatloss Floor 1			47.7600	0.1300	6.2088		(28a)
External Wall 1	185.1700	32.3900	152.7800	0.1800	27.5004		(29a)
External Roof 1	45.0000		45.0000	0.1100	4.9500		(30)
Total net area of external elements Aum(A, m ²)			277.9300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	75.3945	(33)
Party Wall 1			47.4200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							201.2335 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				19.6500	0.0500	0.9825	
E3 Sill				18.5700	0.0500	0.9285	
E4 Jamb				55.6000	0.0500	2.7800	
E5 Ground floor (normal)				23.0400	0.1600	3.6864	
E6 Intermediate floor within a dwelling				48.2200	0.0000	0.0000	
E16 Corner (normal)				39.1800	0.0900	3.5262	

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E15 Flat roof with parapet	21.1100	0.5600	11.8216										
E8 Balcony within a dwelling, wall insulation continuous	8.8200	0.0000	0.0000										
E17 Corner (inverted - internal area greater than external area)	7.8800	-0.0900	-0.7092										
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				23.0160 (36)									
Point Thermal bridges				0.0000									
Total fabric heat loss		(33) + (36) + (36a) =		98.4105 (37)									
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 65.9044	Feb 65.4966	Mar 65.0970	Apr 63.2198	May 62.8686	Jun 61.2336	Jul 61.2336	Aug 60.9309	Sep 61.8634	Oct 62.8686	Nov 63.5791	Dec 64.3219	(38)
Heat transfer coeff	164.3149	163.9072	163.5075	161.6304	161.2791	159.6442	159.6442	159.3414	160.2739	161.2791	161.9896	162.7324	(39)
Average = Sum(39)m / 12 =												161.6287	
HLP	Jan 1.2681	Feb 1.2649	Mar 1.2618	Apr 1.2473	May 1.2446	Jun 1.2320	Jul 1.2320	Aug 1.2297	Sep 1.2369	Oct 1.2446	Nov 1.2501	Dec 1.2558	(40)
HLP (average)												1.2473	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8939 (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	31.4042	30.9378	30.2810	29.0700	28.1632	27.1578	26.6147	27.2669	27.9770	29.0529	30.2888	31.2980	(42b)
Hot water usage for other uses	44.2664	42.6567	41.0470	39.4373	37.8276	36.2179	36.2179	37.8276	39.4373	41.0470	42.6567	44.2664	(42c)
Average daily hot water use (litres/day)													69.3588 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.6706	73.5945	71.3280	68.5073	65.9909	63.3757	62.8326	65.0945	67.4143	70.0999	72.9455	75.5644	(44)
Energy content (annual)	119.8437	104.7975	109.6285	93.7831	88.8364	77.9278	75.9906	80.6006	83.1285	95.1248	103.9242	118.3156	(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:													
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	101.8671	89.0779	93.1842	79.7156	75.5109	66.2386	64.5920	68.5105	70.6593	80.8561	88.3356	100.5682	(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	101.8671	89.0779	93.1842	79.7156	75.5109	66.2386	64.5920	68.5105	70.6593	80.8561	88.3356	100.5682	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		979.1161	(64)
Electric shower(s)	58.2533	51.9042	56.6774	54.0866	55.1015	52.5615	54.3135	55.1015	54.0866	56.6774	55.6117	58.2533	(64a)
													662.6284 (64a)
Heat gains from water heating, kWh/month	40.0301	35.2455	37.4654	33.4505	32.6531	29.7000	29.7264	30.9030	31.1865	34.3834	35.9868	39.7054	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	144.6947	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	149.9101	165.9719	149.9101	154.9072	149.9101	154.9072	149.9101	149.9101	154.9072	149.9101	154.9072	149.9101	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	297.2136	300.2978	292.5258	275.9803	255.0945	235.4647	222.3509	219.2667	227.0387	243.5843	264.4701	284.0998	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	37.4695	(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)	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	-115.7557	(71)
Water heating gains (Table 5)	53.8039	52.4487	50.3567	46.4591	43.8886	41.2500	39.9548	41.5363	43.3145	46.2142	49.9817	53.3675	(72)
Total internal gains	567.3361	585.1268	559.2011	543.7549	515.3016	498.0303	478.6242	477.1216	491.6688	506.1170	535.7673	553.7858	(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
Northeast				3.0300	11.2829		0.6300		0.7000		0.7700		10.4481 (75)
Southeast				15.2200	36.7938		0.6300		0.7000		0.7700		171.1439 (77)
Northwest				11.7100	11.2829		0.6300		0.7000		0.7700		40.3786 (81)
Solar gains	221.9706	394.9806	585.2728	800.3453	965.0596	988.2583	940.2280	812.7301	659.0263	448.6286	268.9441		187.9712 (83)
Total gains	789.3067	980.1074	1144.4739	1344.1002	1480.3612	1486.2887	1418.8522	1289.8517	1150.6951	954.7456	804.7114		741.7569 (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	

Full SAP Calculation Printout



tau	44.0817	44.1914	44.2994	44.8139	44.9115	45.3715	45.3715	45.4577	45.1932	44.9115	44.7145	44.5104
alpha	3.9388	3.9461	3.9533	3.9876	3.9941	4.0248	4.0248	4.0305	4.0129	3.9941	3.9810	3.9674
util living area	0.9947	0.9873	0.9701	0.9171	0.8050	0.6314	0.4799	0.5416	0.7843	0.9517	0.9892	0.9959 (86)
MIT	19.1315	19.4048	19.7960	20.3074	20.7045	20.9199	20.9793	20.9669	20.8047	20.2632	19.6063	19.0920 (87)
Th 2	19.8659	19.8684	19.8709	19.8823	19.8845	19.8945	19.8945	19.8963	19.8906	19.8845	19.8801	19.8756 (88)
util rest of house	0.9932	0.9838	0.9616	0.8932	0.7515	0.5418	0.3664	0.4235	0.7067	0.9329	0.9857	0.9947 (89)
MIT 2	18.1741	18.4470	18.8339	19.3320	19.6856	19.8561	19.8886	19.8859	19.7803	19.3029	18.6574	18.1417 (90)
Living area fraction	18.3665	18.6395	19.0272	19.5280	19.8903	20.0699	20.1078	20.1031	19.9862	19.4958	18.8481	18.3327 (91)
MIT	18.3665	18.6395	19.0272	19.5280	19.8903	20.0699	20.1078	20.1031	19.9862	19.4958	18.8481	18.3327 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3665	18.6395	19.0272	19.5280	19.8903	20.0699	20.1078	20.1031	19.9862	19.4958	18.8481	18.3327 (93)

8. Space heating requirement

Utilisation	Jan 0.9904	Feb 0.9785	Mar 0.9532	Apr 0.8841	May 0.7518	Jun 0.5569	Jul 0.3890	Aug 0.4466	Sep 0.7143	Oct 0.9243	Nov 0.9810	Dec 0.9924 (94)
Useful gains	781.7198	958.9917	1090.8984	1188.3440	1112.9691	827.7330	551.8791	576.0942	821.9389	882.5093	789.4077	736.0943 (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	2311.3303	2251.9965	2048.2937	1717.8035	1320.9315	873.2325	559.9931	590.0564	943.4031	1434.7137	1903.0672	2299.8469 (97)
Space heating kWh	1138.0302	868.8992	712.3021	381.2108	154.7240	0.0000	0.0000	0.0000	0.0000	410.8400	801.8349	1163.4320 (98a)
Space heating requirement - total per year (kWh/year)												5631.2732
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	1138.0302	868.8992	712.3021	381.2108	154.7240	0.0000	0.0000	0.0000	0.0000	410.8400	801.8349	1163.4320 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5631.2732
Space heating per m2										(98c) / (4) =		43.4579 (99)

8c. Space cooling requirement

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

Ext. temp.	Jan 4.3000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1500.6553	1181.3669	1210.9947	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8422	0.9010	0.8662	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1263.8614	1064.4378	1049.0000	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1674.0488	1598.0976	1450.3019	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	295.3349	397.0428	298.5686	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	73.8337	99.2607	74.6422	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												247.7366 (107)
Energy for space heating												43.4579 (99)
Energy for space cooling												1.9118 (108)
Total												45.3697 (109)
Fabric Energy Efficiency (TFEE)												45.4 (109)

Predicted Energy Assessment



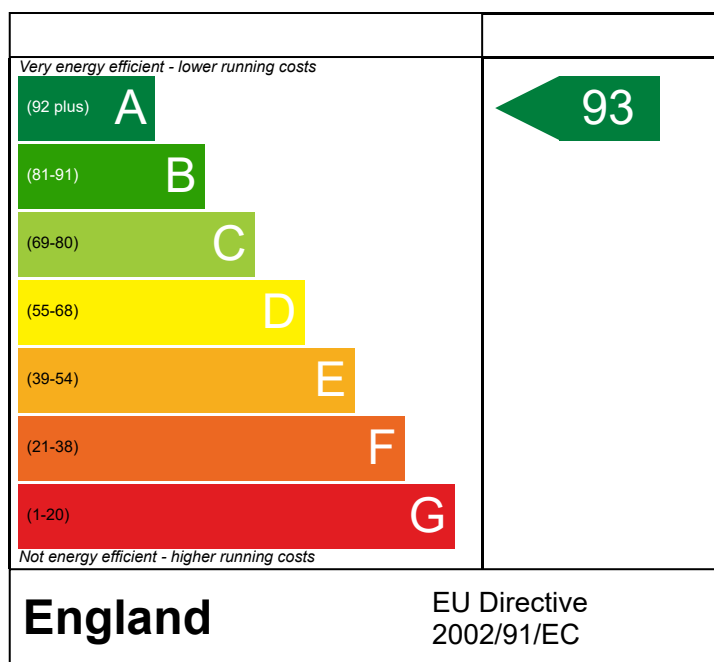
Stout House

Dwelling type: House, Semi-Detached
Date of assessment: 28/03/2024
Produced by: Ikechukwu Diala-Uka
Total floor area: 129.58 m²
DRRN: 1328-2278-9972

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

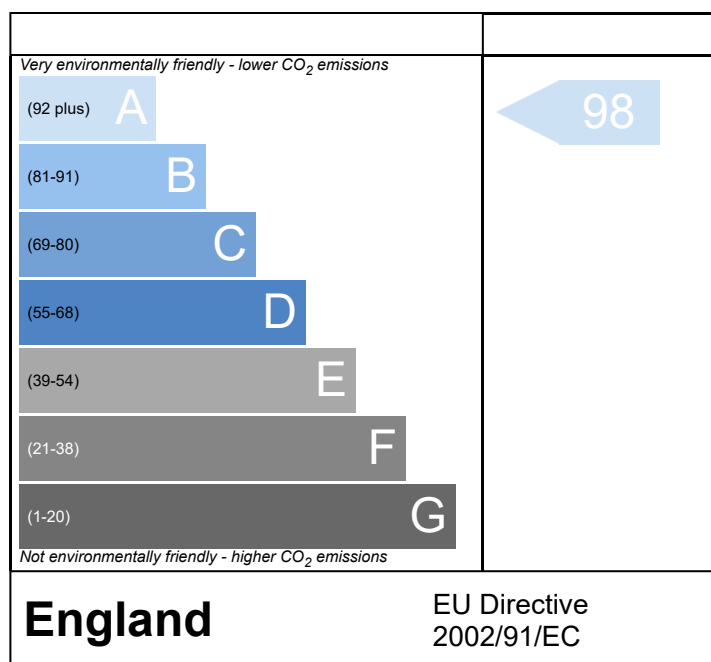
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.