



27 Aylmer Road
London N2 0BS

Energy Statement for Planning

Client:
Mr S Sinha
27 Aylmer Road
London
N2 0BS

Architect:
Chassay Studio
108 Palace Gardens Terrace
London
W8 4RT

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INTRODUCTION

The energy statement has been prepared in support of the planning application for the construction of a new 3 storey residential property in North London. The property replaces an existing residential property on the site with a new energy strategy which compliments planning requirements and embraces the requirements for energy conservation and sustainability.

National Planning Policy Framework

The NPPF has been updated and meeting the challenge of climate change and has been the focus of the policy update for new developments. It suggests that new development should focus on the mitigation of emissions through orientation & design and increase the use of renewable and low carbon technologies

London Plan 2021

The London plan 2021 makes no specific reference to single residential schemes and concentrates on major developments which should be zero carbon.

Local Planning

Haringey Councils Development plan, Policy SP4 has been replaced with the governments technical housing standards and this standard has been applied to the development of this project.

Aside from SP4 there are additional policies which shall be followed

Policy DM21

Policy DM21 requires that proposals should apply the energy hierarchy to minimise energy use in order to meet, and if possible, exceed, minimum carbon dioxide reduction requirements. Proposals should also apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems.

Policy DM22

Policy DM22 supports proposals that contribute to the provision of decentralised energy networks and states that new development should have the ability to connect to DE networks, where reasonably possible. All minor new-build development located within 25 metres of a DE network 'connection zone' should be designed for connection to a DE (Decentralised Energy) network.

This report sets out that the development will meet the current Building Regulations for energy efficiency as a baseline and include the use of low carbon and renewable energy technology to offset the energy demand even further. A detailed design SAP calculation has been produced and has set the energy savings that can be achieved from maximising the potential of the building fabric and using suitable technologies.

EXISTING AND PROPOSED DEVELOPMENT

The proposal is for the development of a new residential property on the located on the southern side of Aylmer Road with the main frontage facing in northerly direction.

The current house is constructed in the optimum orientation for energy reduction which will assist in the installation of renewable energy solutions.

Access to the property is from Aylmer Road



Fig 1: Site Plan

SAP 2012 and Building Regulations 2022

The Standard Assessment Procedure (SAP) 2012 is the UK government methodology for assessing and calculating the energy performance of residential dwellings.

This considers the many factors which make up the construction of a dwelling and includes the following:

- The construction materials making up the building U-Values (thermal insulation)
- Ventilation systems
- Fuel used for space heating
- Efficiency of controls systems
- Heat recovery systems
- Lighting
- Application of renewables

In addition to the SAP the Approved Document Part L which forms part of the Building Regulations documentation references the conservation of fuel and power and is divided into four separate documents.

- Part L1A – Newly constructed Dwellings
- Part L1B - Existing Dwellings
- Part L2A – Newly constructed non-Dwellings
- Part L2B – Existing non-Dwellings

Part L1A is the reference document which will be used in the detailed design of the property and sets out the energy efficiency required as calculated using the SAP methodology.

A detailed SAP calculation has been completed setting out the compliance with the AD Part L1A and show the achieved Dwelling Emission Rate (DER) under the Target Emission Rate (TER).

The results show that there is a 72% improvement in the Dwelling Emission Rate over the Target Emission Rate.

ENERGY PLAN

By adopting a sustainable approach to the design, construction, and operation of the house it follows the widely known and accepted base principles adopted within all councils for sustainable & energy efficient design. The three main environmental statements of **Be Lean, Be Clean & Be Green** and each has been applied throughout the design process so far to reduce the overall carbon footprint of the house through minimising the energy absorbed within the general operation.

Be Lean

During this planning process the redevelopment of the house considers the orientation of the building to maximise the use of natural resources available and reduce the amount of CO₂ being generated. These principles will use passive and active measures to minimise heat loss and air infiltration through the building fabric.

The architect has designed the house to maximise the use of natural daylight with portions of glazing used on the south elevation to bring the light into the living spaces. This maximisation allows the house to benefit from the winter sun which will passively support the heating system and to assist in heating the space during the winter months. This will reduce the demand for a mechanical heating system and utilise a glazing system to the maximised area available. The glazing will be of the highest specification possible to meet the budget and will meet the requirements of Building Regulations using a U-Value of 1.2W/m²K.

The principal rooms that will be most intensively used in daylight hours are located on the south side of the house to get the most benefit from the warmth from southerly sunshine. Conversely, rooms that will be less intensively used in daylight hours, including the integrated garage, cycle store, bathrooms and shower rooms are located on the north side of the house.

In addition to the maximising of the daylight itself the building fabric is proposed to also meet the requirements of Building Regulations minimum U-values for the walls, roof, and floor using high levels of insulation. Consideration of the materials being used has been given to select those with a low environmental impact over the full life cycle of the building. These materials for the main structure and finishing elements shall be responsibly sourced wherever feasible and it is the intent to select suppliers who can provide an environmental management system (EMS) certificate.

The building shall also take into consideration the required air tightness of the building and the required levels as noted within Building regulations. The aim of the project is to exceed these requirements to further improve energy efficiency.

Be Clean

Due to current legislation the use of fossil fuels has been acknowledged by government as significantly contributing to the global warming effect of the planet and having a detrimental effect on the environment. As such the government has taken steps to ensure that the reliance on such fossil fuels is

considered during planning process and alternative solutions sought out to reduce this reliance and therefore impact into the global warming effect.

The prime uses of fossil fuels such as Gas & Oil are used for the general heating and cooking facilities within the house using gas cooking or gas boilers for hot water and heating. As these items are generating most of the CO₂ emissions alternative solutions have been considered.

The use of electricity as a fuel has recently been significantly de-carbonised using alternative energy systems such as nuclear, wind, hydro electric or solar photovoltaic power.

Therefore, avoiding the use of fossil fuels can be achieved using electrically operated heat pumps systems in lieu of conventional combustion boilers which either use the heat stored within the mass of the earth/ground or by using air.

The project envisages using an Air to Water heat pump rated at 14kW and as provided by a mainstream Heat Pump manufacturer such as Mitsubishi, Daikin or Samsung.

Supplementing the heating system within the house is the need to ensure the building is of a sufficient air tightness to minimise the air infiltration and therefore heat loss. The building will be designed to an air tightness of 5m³/(h.m²)@50Pa or better through robust detailing of the construction.

To achieve good air quality within the house it is proposed to use a mixture of systems which include Mechanical Ventilation with Heat Recovery (MVHR) and Positive Input Ventilation (PIV). These systems have been proposed to respond to the architectural make-up of the space and are independent of each other. They provide fresh air into the main space within the house and will remove any pollutants and therefore reducing the risks associated with health issues stemming from poor ventilation.

The house will utilise an MVHR system with an overall efficiency of 88% or better as noted in the SAP calculations. The units will be provided by industry known manufacturers such as Nuaire, Titon or Vent Axia.

Be Green

Once the building has been optimised in terms of orientation and construction, and the systems employed are as efficient as possible, the addition of renewable 'Green' energy is then considered to further reduce the reliance on 'grid' energy. Diverse options that have been considered include PV's, Solar thermal, Wind and GSHP.

Due to the location of the property being within a built-up area the use of wind turbines was not deemed to be an appropriate solution and therefore discounted.

The use of solar thermal panels has been considered in relation to heating the domestic hot water but with the prospect of maximising the use of solar electric panels discounted on terms of practicality.

GSHP was being considered however the area is not available to meet the demand using 'Slinky' pipework installed below ground level. The use of boreholes was technically viable but on cost grounds discounted as being excessive and outside the client's budget.

The best solution which meets the budget, and offers a practical installation is to install an array of Photovoltaic panels on the main house roof. The rear slope of the pitched roof faces almost due south offering the perfect orientation for the proposed array of PV panels to capture the energy from incident sunlight.

It is calculated that the PV panel array will provide at least 7.2kWp of energy to reduce the overall demand on the electrical infrastructure. If possible, the array will be enlarged if space is available.

It is also proposed to install rainwater harvesting using rain butts to aid with the watering of the gardens as required. These units will be placed in line with the main downpipes connected to the system.

Planning policy requires consideration for the property to have a connection to a future de-centralised heat network. In reviewing the London Heat map there doesn't appear to be any local energy distribution within the area or close to the property and it would be impractical to make provision at this stage.

SUMMARY

As stated previously the detailed design of the project at 27 Aylmer Road will meet or exceed the requirements of Building Regulations and general planning policy through the coherent and sensible design of the building.

The building has been modelled using proprietary energy software to produce a compliant scheme which demonstrates a PEA (Predicted Energy Assessment) giving an Energy Efficiency Rating of B and an Environmental Impact (CO²) Rating of A.

Low Carbon technology is being used where practicable and the main heating source will be an Air source heat pump.

On site renewable energy will be provided through PV panels providing 7.2kWp with additional battery storage as option to improve the energy efficiency.

To meet the aspirations of the client the building shall adopt a low energy approach and first meet the 'Be Lean' criteria through low building fabric u-values and the use of advanced heating controls.

Predicted Energy Assessment



27 Aylmer Road, London

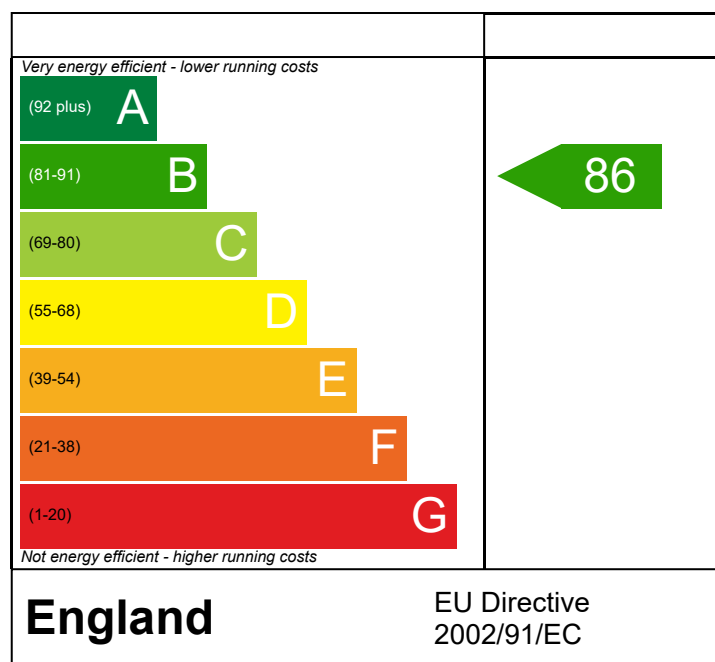
Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Detached
18/01/2024
Peter Kinsella
733 m²
0294-2297-8001

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.

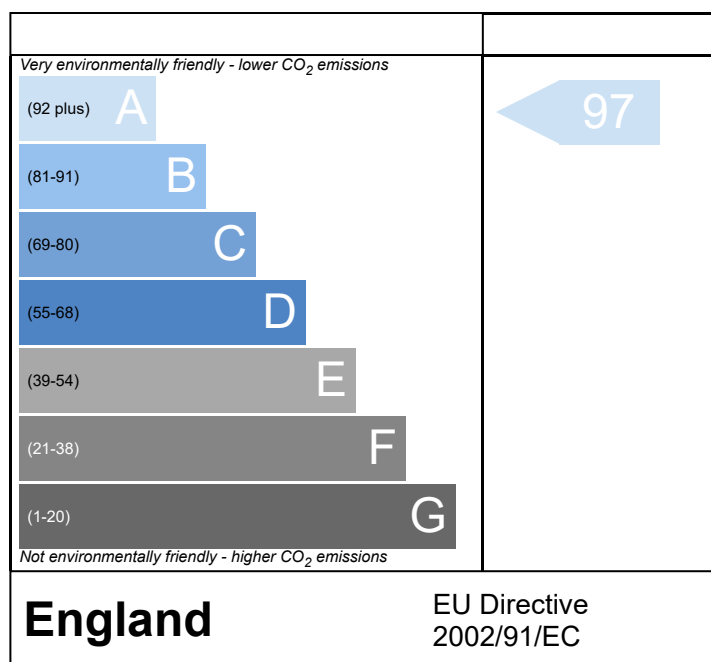
The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating



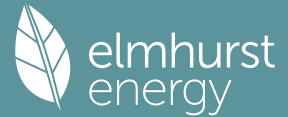
The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

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.

Full SAP Calculation Printout



Property Reference	11860 1	Issued on Date	18/01/2024
Assessment Reference	v1	Prop Type Ref	Detached house
Property	27 Aylmer Road, London		
SAP Rating	86 B	DER	2.06
Environmental	97 A	% DER < TER	72.05
CO ₂ Emissions (t/year)	1.19	DFEE	38.96
Compliance Check	See BREL	% DFEE < TFEE	1.96
% DPER < TPER	38.55	DPER	24.09
Assessor Details	Mr. Peter Kinsella	Assessor ID	L770-0002
Client	Chassay Studio, Mr Sid Sinha		

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)
Basement floor	220.0000 (1a)	x 2.6500 (2a)	= 583.0000 (1a) - (3a)
Ground floor	225.0000 (1b)	x 3.0000 (2b)	= 675.0000 (1b) - (3b)
First floor	187.0000 (1c)	x 3.1000 (2c)	= 579.7000 (1c) - (3c)
Second floor	101.0000 (1d)	x 2.5000 (2d)	= 252.5000 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	733.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 2090.2000 (5)

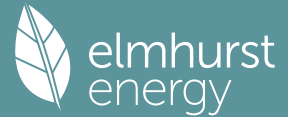
2. Ventilation rate

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	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2125 (21)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000	(22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750	(22a)
Adj infilt rate	0.2709 0.2656 0.2603 0.2338 0.2284 0.2019 0.2019 0.1966 0.2125 0.2284 0.2391 0.2497	(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) =		70.4000 (23c)
Effective ac	0.4189 0.4136 0.4083 0.3817 0.3764 0.3499 0.3499 0.3446 0.3605 0.3764 0.3871 0.3977	(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
Front door			2.4500	1.1000	2.6950		(26)
Windows (Uw = 1.20)			99.0400	1.1450	113.4046		(27)
Sliders (Uw = 1.20)			31.5900	1.1450	36.1718		(27)
V53 x 2			2.0800	1.5918	3.3109		(27a)
V54 x 2			2.0800	1.5918	3.3109		(27a)
V55			1.1200	1.5918	1.7828		(27a)
V56			1.1200	1.5918	1.7828		(27a)
Heatloss Floor 1			234.0000	0.1300	30.4200	75.0000	(28a)
Exposed over garage			31.0000	0.1300	4.0300		(28b)
External Wall 1	370.0000	91.5600	278.4400	0.1800	50.1192	150.0000	41766.0000 (29a)
Basement wall retaining	52.7000		52.7000	0.1800	9.4860	150.0000	7905.0000 (29a)
Ground Garage wall	32.3500		32.3500	0.1800	5.8230	150.0000	4852.5000 (29a)

Full SAP Calculation Printout



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)	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932 (71)
Water heating gains (Table 5)	172.2258	169.2007	163.5505	151.4064	143.9136	136.1037	131.4135	135.4514	140.1646	148.8289	160.4830	170.6918 (72)
Total internal gains	1391.5994	1437.7772	1371.0186	1329.7245	1256.3175	1211.5250	1160.6590	1156.8641	1194.1863	1232.0006	1309.5689	1356.7604 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				25.4700	10.6334	0.5000		0.0000		0.7700		104.2705 (74)
East				21.7000	19.6403	0.5000		0.0000		0.7700		164.0846 (76)
South				36.8800	46.7521	0.5000		0.0000		0.7700		663.8232 (78)
West				14.9900	19.6403	0.5000		0.0000		0.7700		113.3469 (80)
North				4.1600	15.2954	0.6300		0.7000		1.0000		25.2543 (82)
East				1.1200	25.9287	0.6300		0.7000		1.0000		11.5260 (82)
West				1.1200	25.9287	0.6300		0.7000		1.0000		11.5260 (82)
South				23.4900	46.7521	0.6300		0.7000		0.7700		335.6260 (78)
West				8.1000	19.6403	0.6300		0.7000		0.7700		48.6188 (80)
Solar gains	1478.0765	2567.0724	3635.5749	4698.2112	5429.6963	5461.5248	5236.0912	4681.1554	4003.0001	2871.1431	1779.5761	1258.8807 (83)
Total gains	2869.6759	4004.8496	5006.5934	6027.9358	6686.0139	6673.0498	6396.7502	5838.0195	5197.1864	4103.1437	3089.1449	2615.6411 (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	36.5977	36.8008	37.0062	38.0682	38.2880	39.4260	39.4260	39.6618	38.9628	38.2880	37.8509	37.4238
alpha	3.4398	3.4534	3.4671	3.5379	3.5525	3.6284	3.6284	3.6441	3.5975	3.5525	3.5234	3.4949
util living area	0.9929	0.9783	0.9459	0.8648	0.7294	0.5519	0.4129	0.4646	0.7036	0.9211	0.9843	0.9948 (86)
Living	19.2442	19.5509	19.9400	20.3990	20.7029	20.8608	20.9004	20.8934	20.7810	20.3349	19.7107	19.2207
Non living	18.0529	18.4465	18.9409	19.5228	19.8804	20.0660	20.1005	20.1002	19.9837	19.4587	18.6677	18.0348
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	16	0	0	0	0	0	0	0	0	0	0	0
16 / 9	15	28	20	0	0	0	0	0	0	0	0	31
MIT	20.5188	20.1793	20.2365	20.3990	20.7029	20.8608	20.9004	20.8934	20.7810	20.3349	19.7107	19.9922 (87)
Th 2	20.1625	20.1667	20.1709	20.1923	20.1965	20.2180	20.2180	20.2223	20.2094	20.1965	20.1880	20.1795 (88)
util rest of house	0.9917	0.9747	0.9370	0.8435	0.6901	0.4947	0.3436	0.3924	0.6489	0.9039	0.9812	0.9939 (89)
MIT 2	19.7119	19.4074	19.3842	19.5228	19.8804	20.0660	20.1005	20.1002	19.9837	19.4587	18.6677	19.2329 (90)
Living area fraction	19.7427	19.4369	19.4168	19.5563	19.9118	20.0964	20.1310	20.1305	20.0141	19.4921	18.7075	19.2619 (92)
MIT	19.7427	19.4369	19.4168	19.5563	19.9118	20.0964	20.1310	20.1305	20.0141	19.4921	18.7075	19.2619 (93)
Temperature adjustment	19.7427	19.4369	19.4168	19.5563	19.9118	20.0964	20.1310	20.1305	20.0141	19.4921	18.7075	19.2619 (93)
adjusted MIT	19.7427	19.4369	19.4168	19.5563	19.9118	20.0964	20.1310	20.1305	20.0141	19.4921	18.7075	19.2619 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9910	0.9709	0.9272	0.8242	0.6750	0.4854	0.3357	0.3836	0.6341	0.8852	0.9732	0.9927 (94)
Useful gains	2843.7210	3888.4751	4642.3089	4968.1645	4512.8204	3239.0231	2147.6745	2239.6390	3295.6643	3631.9207	3006.3718	2596.5135 (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	10254.8513	9600.0766	8482.7942	6803.0321	5212.3922	3388.0740	2176.6061	2285.8728	3688.9167	5644.2100	7452.8494	9781.1636 (97)
Space heating kWh	5513.8810	3838.1962	2857.3210	1321.1047	520.4814	0.0000	0.0000	0.0000	0.0000	1497.1432	3201.4638	5345.3797 (98a)
Space heating requirement - total per year (kWh/year)												24094.9711
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	5513.8810	3838.1962	2857.3210	1321.1047	520.4814	0.0000	0.0000	0.0000	0.0000	1497.1432	3201.4638	5345.3797 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												24094.9711
Space heating per m2										(98c) / (4) =		32.8717 (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 %)	295.0131 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5513.8810	3838.1962	2857.3210	1321.1047	520.4814	0.0000	0.0000	0.0000	0.0000	0.0000	1497.1432	3201.4638	5345.3797 (98)
Space heating efficiency (main heating system 1)	295.0131	295.0131	295.0131	295.0131	295.0131	0.0000	0.0000	0.0000	0.0000	295.0131	295.0131	295.0131 (210)
Space heating fuel (main heating system)	1869.0292	1301.0257	968.5404	447.8122	176.4265	0.0000	0.0000	0.0000	0.0000	507.4836	1085.1938	1811.9127 (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	308.1797	272.2420	288.7679	253.1559	244.8285	220.0193	216.8585	225.8935	228.8127	255.8271	272.8105	304.7474 (64)
Water heating requirement	308.1797	272.2420	288.7679	253.1559	244.8285	220.0193	216.8585	225.8935	228.8127	255.8271	272.8105	304.7474 (64)
Efficiency of water heater	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159 (216)

Full SAP Calculation Printout



(217)m	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	169.4159	(217)
Fuel for water heating, kWh/month	181.9072	160.6945	170.4491	149.4286	144.5133	129.8693	128.0036	133.3367	135.0597	151.0054	161.0300	179.8812	(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	364.5026	329.2281	364.5026	352.7444	364.5026	352.7444	364.5026	364.5026	352.7444	364.5026	352.7444	364.5026	(231)
Lighting	107.2732	86.0586	77.4862	56.7697	43.8506	35.8263	40.0020	51.9961	67.5377	88.6132	100.0884	110.2547	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-118.7001	-187.0169	-297.4751	-353.4415	-386.9586	-352.4230	-348.6603	-318.6139	-265.7316	-216.7019	-134.2094	-99.6441	(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	-27.1664	-67.9365	-164.4493	-300.9882	-448.6726	-479.3817	-467.8866	-377.3863	-254.3659	-117.0402	-41.1570	-20.7979	(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												8167.4242	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												169.4159	
Water heating fuel used												1825.1785	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.7000, SFP = 1.6830)													
mechanical ventilation fans (SFP = 1.6830)												4291.7241	(230a)
Total electricity for the above, kWh/year												4291.7241	(231)
Electricity for lighting (calculated in Appendix L)												865.7566	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-5846.8050	(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												9303.2783	(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	8167.4242	0.1563	1276.5518	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1825.1785	0.1410	257.2613	(264)
Space and water heating			1533.8132	(265)
Pumps, fans and electric keep-hot	4291.7241	0.1387	595.3150	(267)
Energy for lighting	865.7566	0.1443	124.9554	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-3079.5763	0.1336	-411.4803	
PV Unit electricity exported	-2767.2287	0.1211	-335.0826	
Total			-746.5629	(269)
Total CO2, kg/year			1507.5207	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.0600	(273)

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

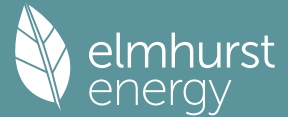
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	8167.4242	1.5786	12893.1843	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1825.1785	1.5212	2776.4421	(278)
Space and water heating			15669.6264	(279)
Pumps, fans and electric keep-hot	4291.7241	1.5128	6492.5201	(281)
Energy for lighting	865.7566	1.5338	1327.9263	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-3079.5763	1.4938	-4600.2353	
PV Unit electricity exported	-2767.2287	0.4442	-1229.2887	
Total			-5829.5241	(283)
Total Primary energy kWh/year			17660.5488	(286)
Dwelling Primary energy Rate (DPER)			24.0900	(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)	
Basement floor	220.0000 (1a)	x	2.6500 (2a)	=	583.0000 (1a) - (3a)	
Ground floor	225.0000 (1b)	x	3.0000 (2b)	=	675.0000 (1b) - (3b)	
First floor	187.0000 (1c)	x	3.1000 (2c)	=	579.7000 (1c) - (3c)	
Second floor	101.0000 (1d)	x	2.5000 (2d)	=	252.5000 (1d) - (3d)	

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume

733.0000

(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 2090.2000 (4)
(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)
													Air changes per hour
Infiltration due to chimneys, flues and fans													40.0000 / (5) = 0.0191 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													5.0000 (17)
Infiltration rate													0.2691 (18)
Number of sides sheltered													2 (19)
													(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Shelter factor													(21) = (18) x (20) = 0.2288 (21)
Infiltration rate adjusted to include shelter factor													

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.2917	0.2860	0.2802	0.2516	0.2459	0.2173	0.2173	0.2116	0.2288	0.2459	0.2574	0.2688	(22b)
	0.5425	0.5409	0.5393	0.5317	0.5302	0.5236	0.5236	0.5224	0.5262	0.5302	0.5331	0.5361	(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			2.4500	1.0000	2.4500			(26)
TER Opening Type (Uw = 1.20)			130.6300	1.1450	149.5763			(27)
V53 x 2			2.0800	1.8519	3.8519			(27a)
V54 x 2			2.0800	1.8519	3.8519			(27a)
V55			1.1200	1.8519	2.0741			(27a)
V56			1.1200	1.8519	2.0741			(27a)
Heatloss Floor 1			234.0000	0.1300	30.4200			(28a)
Exposed over garage			31.0000	0.1300	4.0300			(28b)
External Wall 1	370.0000	91.5600	278.4400	0.1800	50.1192			(29a)
Basement wall retaining	52.7000		52.7000	0.1800	9.4860			(29a)
Ground Garage wall	32.3500		32.3500	0.1800	5.8230			(29a)
Stud wall	40.0000		40.0000	0.1800	7.2000			(29a)
Dormer wall	21.0000	4.6200	16.3800	0.1800	2.9484			(29a)
Basement wall exposed	90.6000	36.9000	53.7000	0.1800	9.6660			(29a)
Basement garage wall	12.2000		12.2000	0.1800	2.1960			(29a)
Plant room wall	15.9000		15.9000	0.1800	2.8620			(29a)
Pitched roof	67.2000	6.4000	60.8000	0.1100	6.6880			(30)
Flat roof	38.9500		38.9500	0.1100	4.2845			(30)
Ceiling voids	133.0000		133.0000	0.1100	14.6300			(30)
Flat roof terrace	40.0000		40.0000	0.1100	4.4000			(30)
bay	2.1600		2.1600	0.1100	0.2376			(30)
Dormer roof	18.4000		18.4000	0.1100	2.0240			(30)
Total net area of external elements Aum(A, m2)			1199.4600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	320.8929		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 119.3598 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E1 Steel lintel with perforated steel base plate	65.6500	0.0500	3.2825	
E3 Sill	64.7500	0.0500	3.2375	
E4 Jamb	199.3000	0.0500	9.9650	
E5 Ground floor (normal)	68.0000	0.1600	10.8800	
E6 Intermediate floor within a dwelling	185.0000	0.0000	0.0000	
E16 Corner (normal)	60.0000	0.0900	5.4000	
R11 Upstands or kerbs of rooflights	16.8000	0.0800	1.3440	
E16 Corner (normal)	28.8000	0.0900	2.5920	
E14 Flat roof	19.8000	0.0800	1.5840	
R4 Ridge (vaulted ceiling)	12.0000	0.0800	0.9600	
E14 Flat roof	27.2000	0.0800	2.1760	
E11 Eaves (insulation at rafter level)	33.0000	0.0400	1.3200	
E14 Flat roof	30.0000	0.0800	2.4000	
R8 Roof to wall (rafter)	33.0000	0.0600	1.9800	
E17 Corner (inverted - internal area greater than external area)	41.9000	-0.0900	-3.7710	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 43.3500 (36)

Point Thermal Bridges

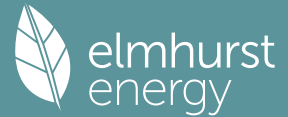
Total fabric heat loss (33) + (36) + (36a) = 364.2429 (37)

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	374.2241	373.0848	371.9680	366.7224	365.7410	361.1723	361.1723	360.3263	362.9321	365.7410	367.7264	369.8021	(38)
Average = Sum(39)m / 12 =	738.4670	737.3276	736.2109	730.9653	729.9839	725.4152	725.4152	724.5692	727.1750	729.9839	731.9693	734.0450	(39)
												730.9606	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0075	1.0059	1.0044	0.9972	0.9959	0.9897	0.9897	0.9885	0.9921	0.9959	0.9986	1.0014	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												3.6948 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	99.4579	97.9809	95.9008	92.0656	89.1938	86.0094	84.2894	86.3549	88.6039	92.0112	95.9254	99.1217 (42b)
Hot water usage for other uses	52.4688	50.5608	48.6528	46.7449	44.8369	42.9290	42.9290	44.8369	46.7449	48.6528	50.5608	52.4688 (42c)
Average daily hot water use (litres/day)												139.9121 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	151.9267	148.5417	144.5536	138.8105	134.0307	128.9384	127.2184	131.1918	135.3487	140.6641	146.4862	151.5905 (44)
Energy conte	240.6148	211.5213	222.1736	190.0246	180.4311	158.5448	153.8596	162.4429	166.8985	190.8798	208.6965	237.3540 (45)
Energy content (annual)	Total = Sum(45)m =											2323.4415
Distribution loss (46)m = 0.15 x (45)m	36.0922	31.7282	33.3260	28.5037	27.0647	23.7817	23.0789	24.3664	25.0348	28.6320	31.3045	35.6031 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b												2.1127 (48)
Enter (49) or (54) in (55)												0.5400 (49)
Total storage loss												1.1409 (55)
	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	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 (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												
	299.2436	264.4764	280.8024	246.7621	239.0599	215.2824	212.4884	221.0717	223.6361	249.5086	265.4341	295.9828 (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	299.2436	264.4764	280.8024	246.7621	239.0599	215.2824	212.4884	221.0717	223.6361	249.5086	265.4341	295.9828 (64)
										Total per year (kWh/year) = Sum(64)m =		3013.7485 (64)
												3014 (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 (64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000 (64a)
Heat gains from water heating, kWh/month												
	126.9075	112.6949	120.7758	108.5732	106.8964	98.1062	98.0614	100.9153	100.8838	110.3706	114.7816	125.8233 (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	184.7415	184.7415	184.7415	184.7415	184.7415	184.7415	184.7415	184.7415	184.7415	184.7415	184.7415	184.7415 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	386.1206	427.4906	386.1206	398.9913	386.1206	398.9913	386.1206	386.1206	398.9913	386.1206	398.9913	386.1206 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	754.8306	762.6634	742.9251	700.9044	647.8610	598.0076	564.7024	556.8697	576.6080	618.6286	671.6721	721.5255 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	41.4741	41.4741	41.4741	41.4741	41.4741	41.4741	41.4741	41.4741	41.4741	41.4741	41.4741	41.4741 (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)	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932	-147.7932 (71)
Water heating gains (Table 5)	170.5745	167.7007	162.3330	150.7961	143.6779	136.2586	131.8029	135.6389	140.1164	148.3476	159.4189	169.1173 (72)
Total internal gains	1392.9482	1439.2772	1372.8011	1332.1143	1259.0819	1211.6799	1161.0484	1157.0516	1194.1381	1234.5192	1311.5048	1358.1858 (73)

6. Solar gains

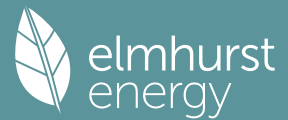
[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				25.4700	10.6334		0.6300		0.7000		0.7700		82.7699 (74)
East				21.7000	19.6403		0.6300		0.7000		0.7700		130.2503 (76)
South				60.3700	46.7521		0.6300		0.7000		0.7700		862.5689 (78)
West				23.0900	19.6403		0.6300		0.7000		0.7700		138.5936 (80)
North				4.1600	15.2954		0.6300		0.7000		1.0000		25.2543 (82)
East				1.1200	25.9287		0.6300		0.7000		1.0000		11.5260 (82)
West				1.1200	25.9287		0.6300		0.7000		1.0000		11.5260 (82)

Solar gains	1262.4892	2189.9011	3095.9000	3994.5343	4612.8973	4638.9286	4447.8260	3978.4875	3406.4101	2447.6509	1519.4728	1075.6358	(83)
Total gains	2655.4374	3629.1784	4468.7012	5326.6486	5871.9792	5850.6085	5608.8744	5135.5390	4600.5483	3682.1701	2830.9776	2433.8216	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	32.9100	32.9609	33.0109	33.2478	33.2925	33.5022	33.5022	33.5413	33.4211	33.2925	33.2022	33.1083
alpha	3.1940	3.1974	3.2007	3.2165	3.2195	3.2335	3.2335	3.2361	3.2281	3.2195	3.2135	3.2072
util living area	0.9942	0.9842	0.9632	0.9117	0.8151	0.6693	0.5254	0.5821	0.7955	0.9474	0.9881	0.9956 (86)
MIT	18.4730	18.8352	19.3374	19.9568	20.4759	20.8094	20.9358	20.9098	20.6442	19.9261	19.0711	18.4115 (87)
Th 2	20.0771	20.0784	20.0797	20.0856	20.0868	20.0920	20.0920	20.0929	20.0900	20.0868	20.0845	20.0821 (88)
util rest of house	0.9931	0.9814	0.9565	0.8949	0.7787	0.6029	0.4320	0.4887	0.7422	0.9341	0.9856	0.9948 (89)
MIT 2	17.0616	17.5246	18.1631	18.9412	19.5663	19.9383	20.0549	20.0371	19.7735	18.9163	17.8318	16.9858 (90)
Living area fraction												0.0382 (91)
MIT	17.1155	17.5746	18.2080	18.9800	19.6011	19.9716	20.0886	20.0704	19.8068	18.9549	17.8792	17.0403 (92)
Temperature adjustment												0.0000
adjusted MIT	17.1155	17.5746	18.2080	18.9800	19.6011	19.9716	20.0886	20.0704	19.8068	18.9549	17.8792	17.0403 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9875	0.9697	0.9372	0.8691	0.7561	0.5932	0.4316	0.4862	0.7227	0.9114	0.9759	0.9903	(94)
Useful gains	2622.2974	3519.2421	4188.1149	4629.3180	4439.9242	3470.7393	2420.9534	2497.0201	3324.9805	3355.9402	2762.6974	2410.2630	(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	9463.8432	9345.3674	8619.5248	7368.1564	5767.6426	3896.6227	2530.6624	2659.4731	4149.8155	6098.9168	7890.0281	9425.3593	(97)
Space heating kWh	5090.1101	3915.1562	3296.9689	1971.9637	987.8225	0.0000	0.0000	0.0000	0.0000	2040.7746	3691.6781	5219.2316	(98a)
Space heating requirement - total per year (kWh/year)												26213.7057	
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	5090.1101	3915.1562	3296.9689	1971.9637	987.8225	0.0000	0.0000	0.0000	0.0000	2040.7746	3691.6781	5219.2316	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												26213.7057	
Space heating per m2											(98c) / (4) =	35.7622	(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	5090.1101	3915.1562	3296.9689	1971.9637	987.8225	0.0000	0.0000	0.0000	0.0000	2040.7746	3691.6781	5219.2316	(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)	5514.7455	4241.7727	3572.0140	2136.4720	1070.2302	0.0000	0.0000	0.0000	0.0000	2211.0234	3999.6513	5654.6388	(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	299.2436	264.4764	280.8024	246.7621	239.0599	215.2824	212.4884	221.0717	223.6361	249.5086	265.4341	295.9828	(64)
Efficiency of water heater (217)m	88.2474	88.1708	88.0209	87.6999	86.8905	79.8000	79.8000	79.8000	79.8000	87.7222	88.1333	88.2658	(216)
Fuel for water heating, kWh/month	339.0963	299.9593	319.0180	281.3709	275.1277	269.7774	266.2762	277.0322	280.2457	284.4305	301.1736	335.3314	(217)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)
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	(221)
Lighting	80.2282	64.3621	57.9509	42.4573	32.7953	26.7940	29.9169	38.8872	50.5106	66.2726	74.8547	82.4580	(222)
Electricity generated by PVs (Appendix M) (negative quantity)	-178.1589	-238.2796	-324.8046	-345.1898	-355.4379	-325.0084	-319.9766	-309.4153	-289.6149	-261.4884	-190.7552	-155.4879	(223a)
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	(223b)
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	(223c)
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	(223d)
Electricity generated by PVs (Appendix M) (negative quantity)	-143.9644	-296.5503	-578.6013	-854.2567	-1116.2179	-1117.6047	-1105.3788	-942.7764	-699.6337	-420.2204	-190.8032	-114.4257	(223e)
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	(223f)
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	(223g)
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	(223h)
Annual totals kWh/year													
Space heating fuel - main system 1												28400.5479	(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												3528.8392	(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)												647.4878	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-10874.0512	(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												21788.8237	(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	28400.5479	0.2100	5964.1151 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3528.8392	0.2100	741.0562 (264)
Space and water heating			6705.1713 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	647.4878	0.1443	93.4525 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3293.6176	0.1358	-447.3566

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PV Unit electricity exported	-7580.4336	0.1264	-958.0871
Total			-1405.4437 (269)
Total CO2, kg/year			5405.1093 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.3700 (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	28400.5479	1.1300	32092.6191 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3528.8392	1.1300	3987.5883 (278)
Space and water heating			36080.2075 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	647.4878	1.5338	993.1384 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-3293.6176	1.5021	-4947.1980
PV Unit electricity exported	-7580.4336	0.4640	-3516.9925
Total			-8464.1905 (283)
Total Primary energy kWh/year			28739.2561 (286)
Target Primary Energy Rate (TPER)			39.2100 (287)