

Sustainability Statement for Planning

Collins Court,
Cascade Avenue,
London

Job number: S10559

Date: January 2023

Contents:

Contents:	2
1 - Introduction	3
2 - Planning Policies	3
3 - Existing and Proposed Development	5
4 – Sustainability Statement.....	5
5 Conclusion	18
Appendix A Site Plan	19
Appendix B SAP Worksheet Improvement over Part L1 2023	20

Report Details:

Revision	Issue Date	Author	Checked	Description
0	10/01/2023	CT	PK	First Issue
1	21/12/2023	CT	PK	Second Issue
2	05/03/2024	CT	PK	Third Issue

This document has been prepared solely as a Sustainable Statement for ROK Enterprise One, Base Energy Services Ltd. accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

1 - Introduction

This Sustainability Statement (SS) has been prepared in support of the planning application for the proposed construction of eight dwellings consisting of two runs of four terrace houses and the conversion of an existing tennis pavilion into a bungalow, which will create a ninth dwelling.

2 - Planning Policies

National Planning Policy Framework 2021

The NPPF was updated in July 2021 to place greater emphasis on beauty, place-making, the environment, and sustainable development. The strengthened environmental objectives aim to protect and enhance the natural, built, and historic environment, and encourage effective land use, greater biodiversity, prudent use of natural resources, minimisation of waste and pollution, and adaptation to climate change alongside a move to a low carbon economy.

The London Plan has recently been updated for energy assessments. However, the below guidance has been used which refers to sustainability measure.

The London Plan 2021 (previously London Plan 2016).

All planning applications across the area are to take into account the requirements of The London Plan.

Within the Plan, Policy 5.3 Sustainable Design and Construction SPG sets out the following:

Strategic

A - The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

Planning Decisions

B - Development proposals should demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

C - Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in this Plan and the following sustainable design principles:

a minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)

-
- b** avoiding internal overheating and contributing to the urban heat island effect
 - c** efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
 - d** minimising pollution (including noise, air and urban runoff)
 - e** minimising the generation of waste and maximising reuse or recycling
 - f** avoiding impacts from natural hazards (including flooding)
 - g** ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
 - h** securing sustainable procurement of materials, using local supplies where feasible, and
 - i** promoting and protecting biodiversity and green infrastructure.

LDF Preparation

D - Within LDFs boroughs should consider the need to develop more detailed policies and proposals based on the sustainable design principles outlined above and those which are outlined in the Mayor's supplementary planning guidance that are specific to their local circumstances".

Haringey Council

The Core strategy sets out to promote Sustainable Development. Furthermore, Sustainable Design and Construction Policy UD2, requires a sustainability statement to be provided for all planning applications in line with the key principals of the Sustainable Design and Construction.

3 - Existing and Proposed Development

The site is located on land to The Chine and Cascade Avenue in London (see Figure 1). The site is currently overgrown tennis courts and a derelict pavilion.

Proposals are for the construction of nine dwellings consisting of two runs of four terrace houses and the conversion of an existing tennis pavilion into a bungalow.

Given the scale and nature of the development, this constrains the development proposals in terms of the layout, positioning and orientation of the proposed dwellings. Subsequently, these constraints will impact on the feasibility of certain sustainability and energy efficient measures that can feasibly be incorporated into the new dwellings.



4 – Sustainability Statement

Energy	
Issue	Compliance
Energy Demand	Throughout the new development of Collins Court, best efforts have been made to reduce the need for energy and reduce heat demand. A preliminary Energy assessment has been carried out on a sample dwelling to show how the dwellings can be improved beyond building regulations. As the drawings supplied are at a planning stage, assumptions have been made about the construction, heating and ventilation. Therefore the energy strategy which has been used is a guide only.
Maximise use of passive energy	Through the use of passive and active design measures the design team have enabled the development to require less energy through the use of optimised insulation, cross ventilation, improved window u-values, higher air tightness, reduced cold bridging and light coloured materials.
Increased Energy Efficiency	An Energy Statement has been carried out for the proposed dwellings which show the dwellings will go beyond building regulations Part L1 2021. The dwellings will incorporate: - • Low fabric element u-values, External wall u-value 0.17W/m²k, Floor 0.10W/m²k, Roof 0.10W/m²k • Air Source Heat Pump (winter efficiency 380% and Summer 176%) • Triple Glazed windows with a u-value 1.0 W/m²k with a G-value • Time and temperature zone control, • Mechanical Ventilations with Heat recovery system with an 88% efficiency and SFP 1.09 • Solar PV panels 3.2kWp for all the dwellings, totalling 28.8kWp for the total development • 5kW batteries for all plots

	This has shown to be an improvement over building regulations Part L1 2021 baseline, by achieving a potential of 85% improvement in CO2 emissions.
Renewable Energy Sources	The feasibility of several renewable technologies has been reviewed and shown that an ASHP and Solar PV with battery storage would be feasible for this development. Consultation should be gained from an M&E consultant or ASHP/PV specialist to ensure feasibility for the development.
Responsible Travel Provisions	The site is in an urban area and therefore has good access to public transport. There are 2 underground stations, Highgate approximately 1200m and East Finchley approximately 1800m away, Hornsey main station is approximately 2000m away and several bus nodes located along B550 (Muswell Hill Road) and Muswell Hill. There will also be cycle storage for 2 cycles provided for each dwelling to promote healthier travel methods and reduce CO2 emissions from vehicles.

<u>Water</u>	
Issue	Compliance
Water Saving Measures	Initial advice from the design team suggests that water saving measures can be incorporated in order to reduce water usage. It has been identified that there is the opportunity to have low flow rates and dual flush toilets.
Water Consumption Targets	Water efficient fixtures, fittings and appliances will be provided to ensure that internal water use targets are achieved to comply with the local council of Haringey target of 105 L/person/day. In comparison, Building Regulations Approved Document G requires internal water use to be at 125litres/person/day or less.
Reusing Water	In order to provide a simple level of rainwater harvesting, each dwelling should have a water butt; this will afford the opportunity to reduce the impact on potable water supply by enabling future occupants of the dwelling to reuse collected water, for example washing the bins. If this supply is used frequently it may also ensure that some additional storage is available during an extreme rainfall event.
Metering	A water meter could be provided. During detailed design, consideration will be given to the provision of digital meters with connectivity to a central building management / billing system, rather than standard analogue meters.

<u>Materials and Waste</u>	
Issue	Compliance
Design Stage Choosing materials that minimise the use of resources are sustainably sourced, do not cause harm to health and are robust.	The contractor and developer will need to design and choose materials that will influence the construction process and the embodied carbon of the development. Ensuring that materials are responsibly sourced, sourcing materials from local sources, minimising the harmful effects of some materials on human health, ensuring that specified materials are robust and sensitive to the building type and age. The developer will aim to use the BRE green guide document to compare the environmental impact of different construction materials and where possible priorities the use of the highest rated products from D to A+. It is intended that insulation materials will have an Ozone Depletion Potential (ODP) of zero, and a Global Warming Potential (GWP) of less than five. Where specified by the developer (e.g. low VOC paint), finishes and other materials will not contain or emit toxic substances. Where timber is installed it will be 100% legally sourced.
Construction Stage Management of materials resulting from demolition through the waste hierarchy	The Contractor will need to reduce waste during the construction phase of the development via the hierarchy of, Reduce, Reuse (prioritising on-site reuse of demolition materials, followed by offsite reuse), Recycle (prioritising on-site recycling, then off-site recycling), Resource recovery (for energy generation processes – fuels, heat and power); and Disposal. A Site Waste Management Plan (SWMP) will be prepared and incorporate non-hazardous waste, demolition and excavation waste if applicable. The development will target the diversion of 95% of construction and extraction waste from land fill. The BRE Smartwaste tool can be used as an easy tool by contractors.

Storage for Recyclables & Waste	Sufficient internal and external space will be provided to facilitate recycling and composting and the good management of waste for the building occupiers. The dwellings will be fitted with internal waste storage facilities in the kitchen for the segregation of recyclable materials, in compliance with BS5096.
--	---

Nature Conservation and Biodiversity	
Issue	Compliance
Protecting Species Promoting the Protection and Planting of Trees	The existing site is a building with hardstanding areas and is considered to be of low ecological value. Existing trees (and the space they require) have been considered throughout this development. It has not been necessary to remove any trees on site. However, there are features of ecological significance (Trees) next to the construction zone to the rear of the site. These will have to be adequately protected. Located at the base of the south facing wall of the tennis pavilion there are 3 colonies of Jersey Cudweed which is a protected species under Schedule 8 of the wildlife and Countryside act 1981. On the Mitigation and Enhancement plan it has stated that the most suitable option for maintaining the colony on the development would be through the incorporation of a biodiverse/brown roof. With the Jersey Cudweed being relocated to surroundings that mimic those in which it was found, such as close to wall edge south facing in a sheltered location. The project has had a biodiversity net gain report carried out and is targeting to achieve a gain in biodiversity.

Designing development proposals	The green space has been reduced in compared to the previous site, however there will be new gardens to the dwellings. Efforts will be made to improve the ecological value of the site with planting of native plant species and bird boxes relevant to the native birds in the area. There is also the opportunity of planting not native varieties of plants taking into consideration the affects of climate change. Developers should adhere to the following hierarchy when considering biodiversity on their development by; avoiding adverse impact to the biodiversity interest, minimise impact, seek mitigation, and seek appropriate compensation where the benefits of the proposal clearly outweigh the biodiversity impacts
--	--

<u>Increased Green Cover and Trees</u>	
Issue	Compliance
Promoting Urban Greening	To help the city to adapt to future climates. Green infrastructure is a network of mainly vegetated spaces and other environmental features which can promote urban cooling, reduced runoff, reduced energy demand, improved air quality, improved biodiversity, enhanced aesthetic and an increased health and well-being. The development will look to encompass ecological features such as native plant species and trees in the rear garden.

Tackling Increased Temperatures and Drought

Issue	Compliance
Preventing Developments from Overheating	Overheating within buildings can result from either too much heat entering a building and not being released or too much heat being generated within a building and not being released. Therefore, if the internal environment becomes too hot it is likely occupiers will try to find a way to cool their environment. In order to continue minimising CO ₂ emissions the design team have considered the internal comfort and implemented the following measures to reduce over heating, via cross ventilation, as well as mechanical ventilation. The dwellings are orientated where summer over heating should be reduced with less windows facing in a south direction.
Promoting Heat and Drought Resistant Planting	London's water demand already outstrips mains water supply. Therefore it is essential that landscaping does not use excessive amounts of water. have ensured the landscaping of the development does not require excessive amounts of water. Consideration will be given the including plant species which are heat and drought resistant. Advice from an ecologist should ideally be sought before any plant species are selected.

Flooding

Issue	Compliance
Surface Water Flooding	The proposals will result in a decrease in hardstanding areas of ~1ha and will therefore provide significant betterment in terms of surface water management when compared with the existing situation.

Flooding Resilience and Resistance	It is understood that the site is at low risk of flooding from all sources. However, should it come to light that there are some localised risks, flood resilient construction techniques could be incorporated into the dwellings in line with best practice guidance The development site is located in a flood zone 1 area, which is low risk.
Flooding and Basement Developments	The proposals include lower ground floor development, and it is important to note that the site slopes which can increase velocities of overland flows of surface water. The site is underlain by London Clay and it is therefore unlikely that groundwater would be a problem. However, it is strongly recommended that advice is sought from a structural / geotechnical engineer as to whether measures such as tanking would be required to protect against flooding.

Land Contamination

Issue	Compliance
Responsible Person/Organisation	The current site is not identified as being contaminated as a result of previous uses.
Bioremediation	Bioremediation is not required.

<u>Air Pollution</u>	
Issue	Compliance
Assessment Requirements	An air quality test should not be needed for the proposed development being located on a residential road.
Construction and Demolition	To recognise and encourage construction-sites which are managed in an environmentally and socially considerate, responsible and accountable manner. For the proposed development, the contractor will comply with 'The Control of Dust and Emissions during Construction Demolition SPG'. Control measures will be implemented by the contractor on site to prevent air and dust pollution. An example of this could be using dust sheets on materials and skips, damping down in waste areas.
Design and Occupation	Ventilation pathways will need to be designed to reduce the build-up of air pollutants in the dwellings, through cross ventilation, and either naturally ventilated or mechanical ventilation. Where there is mechanical ventilation, exhaust flues will be positioned away from intake flues for fresh air. In naturally ventilated buildings/spaces: openable windows/ventilators are over 10m from sources of external pollution.

Noise	
Issue	Compliance
Sources of Noise	The proposed site is located within an existing residential area, with few commercial units in the vicinity. The area is identified having a low potential for noise pollution from residential dwellings.
Mitigation of Noise Emitted by Development	Noise attenuation measures will be incorporated on-site where required, to ensure that any noise generated by equipment or services will not generate a source of noise pollution or negatively impact the surrounding area. The developer will comply with the council's construction noise rules which states what hours of the day the site can work within.
Mitigation of Noise impacts on the Development	For the occupiers of the dwellings, the specification of the partition walls, floors and external walls will be designed to go beyond Document E of the building regulations. The following should be followed, and best efforts will be made here were possible to avoid impacts of external noise to the occupiers. Locate noise sensitive areas/rooms away from the parts of the site most exposed to noises, create setbacks, design the building so its shape and orientation reflect noise and protect the most sensitive uses, position non-residential uses closer to the noise source in mixed use developments, design in lobbies, balconies, winter gardens and dual facades; and carefully locate noise generating equipment for the building such as plant and services away from sensitive uses.

<u>Light Pollution</u>	
Issue	Compliance
Type of Light Pollution	Light pollution comprises any adverse effect of lighting for building occupiers, and for this development includes; Glare, 'Light Trespass' and 'Sky Glow' and Poor Artificial Lighting
Potential Effects	Light pollution can have a detrimental impact on the quality of life of residents; by significantly changing the character of the locality, altering wildlife and ecological patterns and wasting energy
Lighting Design to Minimise Impacts	To minimise obtrusive light where applicable, lights will be designed to be used only in appropriate areas, and that upward lighting is minimised, this will help to reduce light pollution and effect to neighbours. Where there is external lighting, it will have to be designed to the following standards. First to be energy efficient going beyond Part L of the building regulations, with the aim to achieve no less than 80 lumens per circuit watt. Second all external lights will be automatically controlled for the prevention of operation during daylight hours and presence detection in areas of intermitted pedestrian traffic. The ILP Guidance for the reduction of obtrusive light, 2001 will be used to design the lighting strategy. All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. If safety or security lighting is provided and will be used between 23:00 and 07:00, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 2 of the ILP's Guidance notes. Illuminated advertisements, where specified, must be designed in compliance with ILE Technical Report 5 – The Brightness of Illuminated Advertisements

<u>Water Pollution</u>	
Issue	Compliance
How Sustainable Drainage Contributes to Water Quality	Surface water runoff will be managed through a combination of SuDS, in line with the London Plan Drainage Hierarchy, and based on a desktop study of underlying ground conditions. Through a combination of SuDS, water quality will be improved.
Connection of New Developments to the Sewer Network	It is proposed that surface water runoff from hardstanding areas will ultimately connect into the public sewer system, via attenuation storage with a controlled outlet.

5 Conclusion

The proposed development is to be located on land off Cascade Avenue and The Chine, where the existing site is currently an overgrown tennis court with a disused pavilion. Proposals are for the construction of eight dwellings consisting of two runs of four terrace houses and the conversion of an existing tennis pavilion into a bungalow, which will create a ninth dwelling.

Haringey Council Local Plan sets out Policy UD2: Sustainable Design and Construction, requires a sustainability statement to be provided for all planning applications in line with the key principals of the Sustainable Design and Construction of the London Plan Policy 5.3 to promote Sustainable Development.

Given the scale and nature of the development, this constrains the development proposals in terms of the layout, positioning and orientation of the proposed dwelling. Subsequently, these constraints will impact on the feasibility of certain sustainability and energy efficient measures that can feasibly be incorporated into the development (as discussed in Section 4 of this report).

The above sustainability statement sets out what the requirements are of the planning policies and what can be achieved for the proposed development.

The main features of the site to meet the building environmental standards are:

- The energy efficiency measures of the building are to go beyond current Part L1 2021, with a potentially a 84% saving in CO₂.
- The development is to take a fabric first approach, which is to be designed to be highly insulated, with low u-values, good air tightness and Mechanical ventilation with heat recovery
- The development has also reviewed feasible renewable and low carbon technology and is incorporating an ASHP with solar PV.
- Water efficiency is a big driver of sustainability and indoor fittings which will have water efficiency will be installed. These will help to go beyond building regulations and aim for 105L/person/day
- The location lends itself to good transport links
- 2 Cycle storage per dwelling

Appendix A Site Plan



Adjacent Properties and Boundaries are shown for illustrative purposes only and have not been surveyed unless otherwise stated.

All areas shown are approximate and should be verified before forming the basis of a decision.

Do not scale other than for Planning Application purposes.

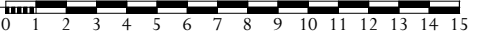
All dimensions must be checked by the contractor before commencing work on site.

No deviation from this drawing will be permitted without the prior written consent of the Architect.

The copyright of this drawing remains with the Architect and may not be reproduced in any form without prior written consent.

Ground Floor Slabs, Foundations, Sub-Structures, etc. All work below ground level is shown provisionally. Inspection of ground condition is essential prior to work commencing.

Reassessment is essential when the ground conditions are apparent, and redesign may be necessary in the light of soil conditions found. The responsibility for establishing the soil and sub-soil conditions rests with the contractor.



Rev	Date	Description	Initials
PROJECT		The Grove Cascade Avenue	
TITLE:		Site Layout	
SCALE:		1:250 @A3	
DATE:		August 2022	
DRAWING No:		SK_6299 - 01	
DRAWN BY:		MB/SDR/CL	

ADAM ARCHITECTURE

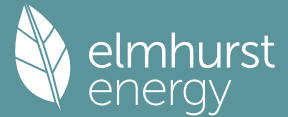
OLD HYDE HOUSE, 75 HYDE STREET
WINCHESTER, HANTS, SO23 7DW, TEL. 01962 843843

WEST WING, SOMERSET HOUSE, STRAND
LONDON, WC2R 1LA, TEL. 020 7841 0140

www.adamarchitecture.com contact@adamarchitecture.com

Appendix B SAP Worksheet Improvement over Part L1 2021

Full SAP Calculation Printout



Property Reference	S10559 01 04				Issued on Date	06/03/2024	
Assessment Reference	Be green			Prop Type Ref			
Property	End Terrace, The Grove, The Chine						
SAP Rating	90 B		DER	1.81		TER	11.15
Environmental	98 A		% DER < TER				83.77
CO ₂ Emissions (t/year)	0.3		DFEE	38.74		TFEE	43.94
Compliance Check	See BREL		% DFEE < TFEE				11.83
% DPER < TPER	66.32		DPER	19.86		TPER	58.97
Assessor Details	Mr. Peter Kinsella					Assessor ID	L770-0002
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Basement floor	41.4500 (1a)	x 2.6500 (2a)	= 109.8425 (1a) - (3a)
Ground floor	60.2700 (1b)	x 3.0000 (2b)	= 180.8100 (1b) - (3b)
First floor	65.5800 (1c)	x 3.0000 (2c)	= 196.7400 (1c) - (3c)
Second floor	44.1500 (1d)	x 2.9500 (2d)	= 130.2425 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	211.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 617.6350 (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) =	
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000 (17)	
Infiltration rate	0.2000 (18)	
Number of sides sheltered	1 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	
Wind speed	Jan 5.1000	Feb 5.0000
Wind factor	1.2750	1.2500
Adj infilt rate	0.2359	0.2313
Balanced mechanical ventilation with heat recovery	0.2266	0.2035
If mechanical ventilation	0.1989	0.1758
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.1758	0.1758
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.1711	0.1711
Effective ac	0.1850	0.1850
	0.1989	0.2081
	0.2174	0.2174
	0.5000	0.5000
	0.5000	0.5000
	70.4000	70.4000
	0.3654	0.3654

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
Triple glazed windows (Uw = 1.00)			28.4300	0.9615	27.3365		(27)
Front door			2.2000	1.0000	2.2000		(26)
RL20			0.4500	1.3258	0.5966		(27a)
RL21			0.4500	1.3258	0.5966		(27a)
Heat Loss Floor 1			41.4500	0.1000	4.1450		(28)
Heat Loss Floor 2			20.8100	0.1000	2.0810		(28a)
Exposed floor			5.3200	0.1000	0.5320		(28b)
External Wall 1	167.5800	28.7900	138.7900	0.1700	23.5943		(29a)
Basement wall	41.2900		41.2900	0.1700	7.0193		(29a)
Dormer wall	3.0700	1.8400	1.2300	0.1700	0.2091		(29a)
External Roof 1	21.9300		21.9300	0.1000	2.1930		(30)
Pitched roof	62.7700	0.9000	61.8700	0.1000	6.1870		(30)

Full SAP Calculation Printout



Bay window roof	1.2000	1.2000	0.1000	0.1200	(30)
Total net area of external elements Aum(A, m2)		365.4200			(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =	76.8104		(33)
Party Wall 1		103.9300	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					250.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)					18.2710 (36)
Point Thermal bridges					0.0000
Total fabric heat loss				(33) + (36) + (36a) =	95.0814 (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	78.2412	77.2986	76.3559	71.6426	70.6999	65.9866	65.9866	65.0439	67.8719	70.6999	72.5852	74.4706	(38)
Average = Sum(39)m / 12 =	173.3227	172.3800	171.4373	166.7240	165.7813	161.0680	161.0680	160.1253	162.9533	165.7813	167.6667	169.5520	(39)
												166.4883	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8197	0.8152	0.8108	0.7885	0.7840	0.7617	0.7617	0.7573	0.7706	0.7840	0.7929	0.8019	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0168 (42)
Hot water usage for mixer showers													
	102.8526	101.3069	99.0546	94.7451	91.5648	88.0182	86.0023	88.2376	90.6879	94.4959	98.8980	102.4585	(42a)
Hot water usage for baths													
	32.2905	31.8109	31.1356	29.8904	28.9581	27.9242	27.3658	28.0364	28.7665	29.8728	31.1436	32.1813	(42b)
Hot water usage for other uses													
	45.5252	43.8697	42.2143	40.5588	38.9033	37.2479	37.2479	38.9033	40.5588	42.2143	43.8697	45.5252	(42c)
Average daily hot water use (litres/day)												166.1516	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	180.6683	176.9876	172.4044	165.1944	159.4262	153.1903	150.6160	155.1774	160.0133	166.5830	173.9113	180.1650	(44)
Energy conte	286.1344	252.0280	264.9792	226.1428	214.6184	188.3654	182.1570	192.1420	197.3124	226.0515	247.7685	282.0949	(45)
Energy content (annual)										Total = Sum(45)m =		2759.7944	
Distribution loss (46)m = 0.15 x (45)m													
	42.9202	37.8042	39.7469	33.9214	32.1928	28.2548	27.3235	28.8213	29.5969	33.9077	37.1653	42.3142	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0206	(55)
Total storage loss													
	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386	(56)
If cylinder contains dedicated solar storage													
	31.6386	28.5768	31.6386	30.6180	31.6386	30.6180	31.6386	31.6386	30.6180	31.6386	30.6180	31.6386	(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													
	341.0354	301.6160	319.8802	279.2728	269.5194	241.4954	237.0580	247.0430	250.4424	280.9525	300.8985	336.9959	(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	341.0354	301.6160	319.8802	279.2728	269.5194	241.4954	237.0580	247.0430	250.4424	280.9525	300.8985	336.9959	(64)
12Total per year (kWh/year)												3406.2094	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month													
	139.0605	123.4697	132.0264	117.6965	115.2814	105.1355	104.4880	107.8080	108.1104	119.0829	124.8870	137.7174	(65)

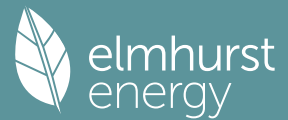
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	212.6714	235.4577	212.6714	219.7605	212.6714	219.7605	212.6714	212.6714	219.7605	212.6714	219.7605	212.6714	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	381.8014	385.7633	375.7794	354.5249	327.6950	302.4786	285.6325	281.6706	291.6545	312.9089	339.7389	364.9553	(68)
Pumps, fans	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	(69)
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Water heating gains (Table 5)	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	(71)
Total internal gains	186.9093	183.7347	177.4548	163.4673	154.9481	146.0215	140.4409	144.9032	150.1533	160.0577	173.4542	185.1040	(72)
	849.6343	873.2078	834.1579	806.0050	763.5667	736.5128	706.9970	707.4975	729.8204	753.8903	801.2058	830.9829	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF factor Table 6d			Gains W
North					3.4600	10.6334	0.4000	0.0000	0.7700			11.3318 (74)
East					15.3000	19.6403	0.4000	0.0000	0.7700			92.5528 (76)
Southwest					1.7500	36.7938	0.4000	0.0000	0.7700			19.8319 (79)
West					6.1700	19.6403	0.4000	0.0000	0.7700			37.3236 (80)
Northwest					1.7500	11.2829	0.4000	0.0000	0.7700			6.0815 (81)
West					0.9000	25.5349	0.6300	0.7000	1.0000			9.1213 (82)
Solar gains	176.2428	340.0745	554.5894	809.6819	999.0997	1027.1806	976.0056	832.7630	644.4510	401.5328	218.7613	145.6507 (83)

Full SAP Calculation Printout



Total gains 1025.8771 1213.2823 1388.7472 1615.6868 1762.6665 1763.6934 1683.0026 1540.2605 1374.2714 1155.4231 1019.9671 976.6336 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	84.7208	85.1841	85.6525	88.0739	88.5747	91.1666	91.1666	91.7033	90.1119	88.5747	87.5787	86.6049
alpha	6.6481	6.6789	6.7102	6.8716	6.9050	7.0778	7.0778	7.1136	7.0075	6.9050	6.8386	6.7737
util living area	0.9993	0.9978	0.9910	0.9476	0.8081	0.5790	0.4206	0.4769	0.7726	0.9783	0.9980	0.9995 (86)
Living	20.1970	20.3199	20.5040	20.7568	20.9072	20.9521	20.9557	20.9555	20.9300	20.7131	20.4207	20.1940
Non living	19.2745	19.4350	19.6728	20.0014	20.1698	20.2280	20.2301	20.2341	20.2045	19.9566	19.5805	19.2835
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5892	20.3199	20.5040	20.7568	20.9072	20.9521	20.9557	20.9555	20.9300	20.7131	20.4207	20.3068 (87)
Th 2	20.2363	20.2402	20.2440	20.2633	20.2672	20.2866	20.2866	20.2905	20.2788	20.2672	20.2595	20.2517 (88)
util rest of house	0.9991	0.9970	0.9880	0.9310	0.7627	0.5169	0.3527	0.4041	0.7085	0.9685	0.9972	0.9994 (89)
MIT 2	19.8529	19.4350	19.6728	20.0014	20.1698	20.2280	20.2301	20.2341	20.2045	19.9566	19.5805	19.4580 (90)
Living area fraction									fLA = Living area / (4) =			0.1145 (91)
MIT	19.9372	19.5363	19.7679	20.0879	20.2542	20.3109	20.3132	20.3167	20.2876	20.0432	19.6767	19.5552 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9372	19.5363	19.7679	20.0879	20.2542	20.3109	20.3132	20.3167	20.2876	20.0432	19.6767	19.5552 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9990	0.9961	0.9855	0.9264	0.7619	0.5190	0.3552	0.4068	0.7093	0.9646	0.9964	0.9992 (94)
Useful gains	1024.8775	1208.5270	1368.5646	1496.7240	1342.9068	915.4292	597.8221	626.5393	974.8259	1114.5587	1016.2868	975.8368 (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	2710.2783	2523.0114	2274.6205	1865.2927	1418.1273	919.8436	598.0767	627.1628	1008.2877	1565.5107	2108.7002	2603.5008 (97)
Space heating kWh	1253.9382	883.3335	674.1056	265.3695	55.9641	0.0000	0.0000	0.0000	0.0000	335.5083	786.5377	1210.9820 (98a)
Space heating requirement - total per year (kWh/year)												5465.7388
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	1253.9382	883.3335	674.1056	265.3695	55.9641	0.0000	0.0000	0.0000	0.0000	335.5083	786.5377	1210.9820 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5465.7388
Space heating per m2										(98c) / (4) =		25.8488 (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 %)												378.6731 (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	1253.9382	883.3335	674.1056	265.3695	55.9641	0.0000	0.0000	0.0000	0.0000	335.5083	786.5377	1210.9820 (98)
Space heating efficiency (main heating system 1)	378.6731	378.6731	378.6731	378.6731	378.6731	0.0000	0.0000	0.0000	0.0000	378.6731	378.6731	378.6731 (210)
Space heating fuel (main heating system)	331.1400	233.2707	178.0178	70.0788	14.7790	0.0000	0.0000	0.0000	0.0000	88.6010	207.7089	319.7962 (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	341.0354	301.6160	319.8802	279.2728	269.5194	241.4954	237.0580	247.0430	250.4424	280.9525	300.8985	336.9959 (64)
Efficiency of water heater (217)m	175.4415	175.4415	175.4415	175.4415	175.4415	175.4415	175.4415	175.4415	175.4415	175.4415	175.4415	175.4415 (216)
Fuel for water heating, kWh/month	194.3870	171.9183	182.3287	159.1829	153.6235	137.6501	135.1208	140.8122	142.7498	160.1403	171.5093	192.0845 (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	76.7326	69.3068	76.7326	74.2573	76.7326	74.2573	76.7326	76.7326	74.2573	76.7326	74.2573	76.7326 (231)
Lighting	59.4449	47.6889	42.9386	31.4587	24.2996	19.8530	22.1669	28.8134	37.4257	49.1045	55.4635	61.0971 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-48.3552	-88.2841	-165.8575	-231.4997	-282.3728	-274.9064	-269.5590	-235.3091	-178.6667	-115.6183	-58.7117	-39.2057 (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	-1.1655	-4.6132	-16.9879	-44.9803	-83.3181	-93.7336	-90.4180	-63.7194	-33.3013	-10.0880	-2.1139	-0.7917 (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												1443.3925 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												175.4415
Water heating fuel used												1941.5074 (219)
Space cooling fuel												0.0000 (221)

Full SAP Calculation Printout



Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 1.1990)	
mechanical ventilation fans (SFP = 1.1990)	903.4641 (230a)
Total electricity for the above, kWh/year	903.4641 (231)
Electricity for lighting (calculated in Appendix L)	479.7548 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-2433.5770 (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	2334.5418 (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	1443.3925	0.1566	226.0485 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1941.5074	0.1410	273.8194 (264)
Space and water heating			499.8679 (265)
Pumps, fans and electric keep-hot	903.4641	0.1387	125.3216 (267)
Energy for lighting	479.7548	0.1443	69.2434 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1988.3461	0.1307	-259.8031
PV Unit electricity exported	-445.2308	0.1156	-51.4565
Total			-311.2595 (269)
Total CO2, kg/year			383.1734 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8100 (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	1443.3925	1.5798	2280.2350 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1941.5074	1.5215	2954.0055 (278)
Space and water heating			5234.2404 (279)
Pumps, fans and electric keep-hot	903.4641	1.5128	1366.7605 (281)
Energy for lighting	479.7548	1.5338	735.8639 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1988.3461	1.4827	-2948.0958
PV Unit electricity exported	-445.2308	0.4236	-188.5934
Total			-3136.6891 (283)
Total Primary energy kWh/year			4200.1757 (286)
Dwelling Primary energy Rate (DPER)			19.8600 (287)

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

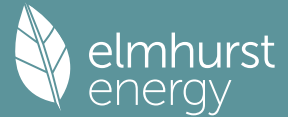
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Basement floor	41.4500 (1a)	x 2.6500 (2a)	= 109.8425 (1a) - (3a)
Ground floor	60.2700 (1b)	x 3.0000 (2b)	= 180.8100 (1b) - (3b)
First floor	65.5800 (1c)	x 3.0000 (2c)	= 196.7400 (1c) - (3c)
Second floor	44.1500 (1d)	x 2.9500 (2d)	= 130.2425 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	211.4500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	617.6350 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0648 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3148 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)

Full SAP Calculation Printout



Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.2912 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.3712	0.3639	0.3567	0.3203	0.3130	0.2766	0.2766	0.2693	0.2912	0.3130	0.3276	0.3421	(22b)
	0.5689	0.5662	0.5636	0.5513	0.5490	0.5383	0.5383	0.5363	0.5424	0.5490	0.5536	0.5585	(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			2.2000	1.0000	2.2000			(26)
TER Opening Type (Uw = 1.20)			28.4300	1.1450	32.5534			(27)
RL20			0.4500	1.4151	0.6368			(27a)
RL21			0.4500	1.4151	0.6368			(27a)
Heat Loss Floor 1			41.4500	0.1300	5.3885			(28)
Heat Loss Floor 2			20.8100	0.1300	2.7053			(28a)
Exposed floor			5.3200	0.1300	0.6916			(28b)
External Wall 1	167.5800	28.7900	138.7900	0.1800	24.9822			(29a)
Basement wall	41.2900		41.2900	0.1800	7.4322			(29a)
Dormer wall	3.0700	1.8400	1.2300	0.1800	0.2214			(29a)
External Roof 1	21.9300		21.9300	0.1100	2.4123			(30)
Pithced roof	62.7700	0.9000	61.8700	0.1100	6.8057			(30)
Bay window roof	1.2000		1.2000	0.1100	0.1320			(30)
Total net area of external elements Aum(A, m2)			365.4200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	86.7982			(33)
Party Wall 1			103.9300	0.0000	0.0000			(32)

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

250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	20.1400	0.0500	1.0070	
E3 Sill	19.1400	0.0500	0.9570	
E4 Jamb	63.1400	0.0500	3.1570	
E5 Ground floor (normal)	16.6100	0.1600	2.6576	
E20 Exposed floor (normal)	8.3000	0.3200	2.6560	
E21 Exposed floor (inverted)	8.3000	0.3200	2.6560	
E22 Basement floor	15.5800	0.0700	1.0906	
E6 Intermediate floor within a dwelling	43.3000	0.0000	0.0000	
E11 Eaves (insulation at rafter level)	24.7000	0.0400	0.9880	
E13 Gable (insulation at rafter level)	4.8800	0.0800	0.3904	
E14 Flat roof	23.4900	0.0800	1.8792	
E16 Corner (normal)	33.3500	0.0900	3.0015	
E17 Corner (inverted - internal area greater than external area)	18.0000	-0.0900	-1.6200	
E18 Party wall between dwellings	18.0000	0.0600	1.0800	
P1 Party wall - Ground floor	10.2200	0.0800	0.8176	
P2 Party wall - Intermediate floor within a dwelling	26.2500	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	4.5700	0.1200	0.5484	
P5 Party wall - Roof (insulation at rafter level)	8.1400	0.0800	0.6512	
R1 Head of roof window	1.1000	0.0800	0.0880	
R2 Sill of roof window	1.1000	0.0600	0.0660	
R3 Jamb of roof window	3.2800	0.0800	0.2624	
R4 Ridge (vaulted ceiling)	9.6700	0.0800	0.7736	
R5 Ridge (inverted)	12.9700	0.0400	0.5188	

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

23.6263 (36)

Point Thermal bridges

Total fabric heat loss (33) + (36) + (36a) = 110.4245 (37)

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

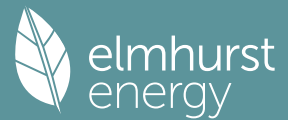
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	115.9537	115.4083	114.8738	112.3631	111.8933	109.7065	109.7065	109.3016	110.5488	111.8933	112.8436	113.8371	(38)
Average = Sum(39)m / 12 =	226.3782	225.8328	225.2983	222.7876	222.3178	220.1311	220.1311	219.7261	220.9734	222.3178	223.2681	224.2616	(39)
												222.7853	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0706	1.0680	1.0655	1.0536	1.0514	1.0411	1.0411	1.0391	1.0450	1.0514	1.0559	1.0606	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0168 (42)
Hot water usage for mixer showers													
Hot water usage for baths	74.8019	73.6778	72.0397	68.9055	66.5926	64.0133	62.5471	64.1728	65.9549	68.7243	71.9258	74.5153	(42a)
Hot water usage for other uses	32.2905	31.8109	31.1356	29.8904	28.9581	27.9242	27.3658	28.0364	28.7665	29.8728	31.1436	32.1813	(42b)
Average daily hot water use (litres/day)	45.5252	43.8697	42.2143	40.5588	38.9033	37.2479	37.2479	38.9033	40.5588	42.2143	43.8697	45.5252	(42c)
												140.2897	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	152.6176	149.3584	145.3896	139.3548	134.4540	129.1854	127.1608	131.1125	135.2802	140.8114	146.9391	152.2218	(44)
Energy content (annual)	241.7089	212.6844	223.4583	190.7697	181.0010	158.8485	153.7900	162.3447	166.8140	191.0797	209.3417	238.3426	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2330.1835	
Water storage loss:	36.2563	31.9027	33.5188	28.6155	27.1501	23.8273	23.0685	24.3517	25.0221	28.6620	31.4013	35.7514	(46)
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6525	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8924	(55)
Total storage loss	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(56)
If cylinder contains dedicated solar storage	27.6637	24.9865	27.6637	26.7713	27.6637	26.7713	27.6637	27.6637	26.7713	27.6637	26.7713	27.6637	(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	292.6350	258.6821	274.3844	240.0530	231.9270	208.1318	204.7161	213.2708	216.0973	242.0058	258.6250	289.2686	(62)

Full SAP Calculation Printout



WWHRS	-34.1963	-30.2435	-31.6692	-26.2234	-24.4393	-20.9128	-19.6025	-20.8452	-21.6372	-25.5079	-28.8974	-33.5630 (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	258.4387	228.4386	242.7152	213.8296	207.4878	187.2189	185.1136	192.4255	194.4601	216.4979	229.7276	255.7056 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											2612.0592 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	121.1091	107.5158	115.0408	102.8576	100.9237	92.2438	91.8760	94.7205	94.8923	104.2749	109.0328	119.9898 (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	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	150.8406	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	206.7324	228.8823	206.7324	213.6235	206.7324	213.6235	206.7324	206.7324	213.6235	206.7324	213.6235	206.7324	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	381.8014	385.7633	375.7794	354.5249	327.6950	302.4786	285.6325	281.6706	291.6545	312.9089	339.7389	364.9553	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	38.0841	(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)	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	-120.6725	(71)
Water heating gains (Table 5)	162.7810	159.9937	154.6247	142.8577	135.6501	128.1163	123.4893	127.3125	131.7949	140.1544	151.4344	161.2766	(72)
Total internal gains	822.5670	845.8915	808.3887	782.2583	741.3297	712.4706	684.1064	683.9677	705.3250	731.0479	776.0490	804.2164	(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				3.4600	10.6334	0.6300	0.7000	0.7700	11.2440 (74)			
East				15.3000	19.6403	0.6300	0.7000	0.7700	91.8355 (76)			
Southwest				1.7500	36.7938	0.6300	0.7000	0.7700	19.6782 (79)			
West				6.1700	19.6403	0.6300	0.7000	0.7700	37.0343 (80)			
Northwest				1.7500	11.2829	0.6300	0.7000	0.7700	6.0344 (81)			
West				0.9000	25.5349	0.6300	0.7000	1.0000	9.1213 (82)			
Solar gains	174.9477	337.5799	550.5304	803.7668	991.8080	1019.6866	968.8839	826.6822	639.7382	398.5900	217.1545	144.5797 (83)
Total gains	997.5146	1183.4714	1358.9191	1586.0252	1733.1377	1732.1572	1652.9903	1510.6499	1345.0632	1129.6379	993.2034	948.7962 (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	64.8650	65.0217	65.1759	65.9104	66.0497	66.7058	66.7058	66.8288	66.4516	66.0497	65.7686	65.4772
alpha	5.3243	5.3348	5.3451	5.3940	5.4033	5.4471	5.4471	5.4553	5.4301	5.4033	5.3846	5.3651
util living area	0.9994	0.9983	0.9946	0.9756	0.9079	0.7464	0.5723	0.6424	0.8922	0.9892	0.9985	0.9995 (86)
MIT	19.5681	19.7368	20.0139	20.4074	20.7450	20.9400	20.9883	20.9791	20.8322	20.3833	19.9108	19.5471 (87)
Th 2	20.0249	20.0270	20.0291	20.0389	20.0407	20.0493	20.0493	20.0508	20.0460	20.0407	20.0370	20.0331 (88)
util rest of house	0.9992	0.9977	0.9926	0.9658	0.8709	0.6608	0.4557	0.5230	0.8344	0.9834	0.9979	0.9994 (89)
MIT 2	18.3331	18.5508	18.9064	19.4100	19.8122	20.0128	20.0453	20.0428	19.9189	19.3863	18.7812	18.3121 (90)
Living area fraction	fLA = Living area / (4) =											0.1145 (91)
MIT	18.4745	18.6866	19.0332	19.5242	19.9190	20.1189	20.1533	20.1500	20.0235	19.5005	18.9106	18.4535 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4745	18.6866	19.0332	19.5242	19.9190	20.1189	20.1533	20.1500	20.0235	19.5005	18.9106	18.4535 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9986	0.9964	0.9895	0.9587	0.8652	0.6676	0.4689	0.5362	0.8328	0.9787	0.9967	0.9990 (94)
Ext temp.	996.1475	1179.2510	1344.6424	1520.5950	1499.5908	1156.4001	775.1328	809.9729	1120.1120	1105.5252	989.9732	947.8092 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	3208.7972	3113.4646	2823.7121	2366.9302	1827.2335	1214.8875	782.1860	823.9743	1308.9345	1978.7306	2636.9250	3196.5110 (97)
Space heating requirement - total per year (kWh/year)	1646.2113	1299.7916	1100.4278	609.3614	243.7662	0.0000	0.0000	0.0000	0.0000	649.6648	1185.8053	1673.0341 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	1646.2113	1299.7916	1100.4278	609.3614	243.7662	0.0000	0.0000	0.0000	0.0000	649.6648	1185.8053	1673.0341 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8408.0626 (99)
Space heating per m2	(98c) / (4) =											39.7638 (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)

Full SAP Calculation Printout



Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1646.2113	1299.7916	1100.4278	609.3614	243.7662	0.0000	0.0000	0.0000	0.0000	649.6648	1185.8053	1673.0341 (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)	1783.5442	1408.2249	1192.2295	660.1965	264.1021	0.0000	0.0000	0.0000	0.0000	703.8622	1284.7295	1812.6047 (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 requirement	258.4387	228.4386	242.7152	213.8296	207.4878	187.2189	185.1136	192.4255	194.4601	216.4979	229.7276	255.7056 (64)
Efficiency of water heater (217)m	87.4616	87.3278	87.0264	86.2726	84.4221	79.8000	79.8000	79.8000	79.8000	86.3654	87.2039	79.8000 (216)
Fuel for water heating, kWh/month	295.4883	261.5876	278.8985	247.8536	245.7743	234.6102	231.9719	241.1348	243.6843	250.6767	263.4374	292.2623 (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	42.9549	34.4600	31.0274	22.7320	17.5589	14.3457	16.0178	20.8205	27.0438	35.4829	40.0779	44.1488 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-42.6765	-62.2996	-92.6407	-107.7971	-119.2755	-112.3072	-110.8256	-103.0889	-90.0197	-72.7650	-47.6350	-36.6437 (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	-18.0145	-38.4672	-77.5692	-118.1896	-157.9978	-159.4943	-157.7243	-132.8354	-96.3637	-55.6751	-24.2541	-14.2105 (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												9109.4936 (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												3087.3799 (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)												346.6707 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-2048.7701 (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												10580.7741 (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	9109.4936	0.2100	1912.9937 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3087.3799	0.2100	648.3498 (264)
Space and water heating			2561.3434 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	346.6707	0.1443	50.0353 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-997.9745	0.1339	-133.6263
PV Unit electricity exported	-1050.7956	0.1255	-131.8312
Total			-265.4575 (269)
Total CO2, kg/year			2357.8505 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1500 (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	9109.4936	1.1300	10293.7277 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3087.3799	1.1300	3488.7393 (278)
Space and water heating			13782.4670 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	346.6707	1.5338	531.7352 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-997.9745	1.4948	-1491.7961
PV Unit electricity exported	-1050.7956	0.4605	-483.8876
Total			-1975.6837 (283)
Total Primary energy kWh/year			12468.6192 (286)
Target Primary Energy Rate (TPER)			58.9700 (287)