Sustainability Statement for Planning

Langford
Maryland Road
London
N22 5AR

Job number: 13080

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1 - Introduction

This Sustainability Statement (SS) has been prepared in support of the planning application for the demolition of the existing building, and the construction of a new building (including lower ground floor) to comprise 6no. flats.

2 - Planning Policies

National Planning Policy Framework 2025

The NPPF was updated in February 2025 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 2021 is the latest strategy for Greater London which sets out the below policies.

Chapter 8 Green Infrastructure and Natural Environment G1- G7

Chapter 9 Sustainable Infrastructure SI1 - SI17.

Chapter 10 Transport T1 – T9

Only some of the above policies will be relevant to the proposed development, as they can vary depending on the size and type of project, therefore we would taylor the guidance to the site.

The proposed development will use the above policies as a guide to implement the sustainable design principles within the development.

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 at Langford, Maryland Road, London, N22 5AR (see Figure 1). The site is currently comprised of an existing building (the latest use being a Church)

Proposals are for the construction of a new residential development containing 8 flats, consisting of 2 different.

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.

Figure 1: Site Location and proposals

4 – Sustainability Statement

Energy	
Issue	Compliance
Energy Demand	Throughout the new development at Langford, Maryland Road, London, N22 5AR, best efforts have been made to reduce the need for energy and reduce heat demand. A preliminary Energy assessment has been carried out on the dwellings to show how the dwellings can be improved beyond Part L 2021 building. As the drawings supplied are at a planning stage, assumptions have been made about the construction, heating and ventilation. Therefore, the energy strategy which have been used, should be used as a guide to design the dwellings.
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 0.11W/m2k, Roof 0.10W/m2k • High efficiency ASHP heating system • Time and temperature zone control • Mechanical ventilation with heat recovery • Waste Water Heat Recovery • Solar PV panels, totalling 22kWp for the total development

	This has shown to be an improvement over building regulations Part L1 2021 baseline, by achieving a potential of 100% improvement in CO2 emissions, with a 23% saving through energy efficient measures and a 77% saving from low and zero carbon technology.
Renewable Energy Sources	The feasibility of several renewable technologies has been reviewed and show that Solar panels and ASHP are potentially feasible. Low carbon technology included in the Be Green assessment: • Solar PV totalling 22kWp to be displayed as follows: o 2.8kWp for Flat 1 displayed at 30° angle on South pitch with little or no shading. o 2.7kWp for Flat 2 displayed at 30° angle on East pitch with little or no shading. o 2.8kWp for Flat 3 displayed at 30° angle on North pitch with little or no shading. o 2.7kWp for Flat 4 displayed at 30° angle on West pitch with little or no shading. o 2.8kWp for Flat 5 displayed at 30° angle on South pitch with little or no shading. o 2.7kWp for Flat 6 displayed at 30° angle on East pitch with little or no shading. o 2.8kWp for Flat 7 displayed at 30° angle on North pitch with little or no shading. o 2.7kWp for Flat 8 displayed at 30° angle on West pitch with little or no shading. • Low carbon Air Source Heat Pumps
Responsible Travel Provisions	The site is in an urban area and therefore has good access to public transport. There are 2 trains stations, Bowes Park approximately 950m and Bounds Green underground approximately 1400m away, and several bus nodes located along A105 (High Road) and Wolves Lane There will also be short stay cycle storage for 2 cycles and long stay wall mounted cycle storage for 16 cycles provided for the dwellings to promote healthier travel methods and reduce CO2 emissions from vehicles. This is a car free development.

Water	
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	A preliminary feasibility study of the potential to include rainwater harvesting has been carried out and stated in the FRA and Suds Report. These are summarised below: • Rainwater reuse would not be a feasible solution, given the proposed site layout. • The British Geology Survey (BGS) Geology Maps indicate that the site is underlain by London Clay. Given the underlying clay, we do not recommend a strategy based on infiltration. • A rainwater butt will be installed and to be designed into the development for the watering of the garden areas.

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.

Materials and Waste	
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 aim to design and choose materials that will influence the construction process and reduce 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. Where feasible the developer use materials and products with Environmental Product Declaration (EPD) certificates. 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 to be installed it will be 100% legally sourced and FSC certified. Setting a specific percentage target for responsible sourced, low-impact materials can be challenging due to various factors such as project scope, budget, and material availability. However, establishing ambitious goals demonstrates a commitment to sustainability. The client will aim to target a minimum 90% for responsibly sourced materials. Key considerations when setting targets: • Material availability: Consider the regional availability of sustainable materials. • Cost implications: Assess the financial impact of using low-impact materials. • Life cycle assessment: Evaluate the overall environmental impact of materials beyond sourcing. • Minimising the harmful effects of some materials on human health, ensuring that specified materials are robust and sensitive to the building type and age.

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. Where feasible, the project will prioritize the reuse of demolition materials to minimize waste and reduce the environmental impact of the development. Suitable materials, including bricks, timber and metals, will be assessed for their suitability for reuse in accordance with Building Regulations. By salvaging and reusing materials, the project aims to conserve resources, reduce landfill waste, and contribute to a more sustainable construction process. A Site Waste Management Plan (SWMP) should 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. Note: It is essential to conduct thorough inspections of reclaimed materials to ensure they meet the required standards for safety and performance.
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 comprised of an existing building (the latest use being a Church) with front and rear garden, there are hardstanding areas to the rear and is considered to be of low ecological value. Existing trees (and the space they require) have been considered throughout this development. There are no trees on the site and there is the proposal for 4 trees (2 to the rear and 2 at the front of the site to be planted. Whilst measures to enhance the ecological potential of the site will be investigated where possible, opportunities to enhance the ecological value of the site further are limited due to the scale of the development.
Designing development proposals	The green space has been reduced in compared to the previous site. Efforts will be made to improve the ecological value of the site with planting of trees, 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 ***A separate Biodiversity report is to be carried out***

Increased Green Cover and Trees	
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 front and rear of the development.

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.

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.

Further details are provided in a separate Overheating Report that has been carried out by Base Energy.

Flooding	
Issue	Compliance
Surface Water Flooding	Surface water flooding is the most likely form of flooding that development may be exposed to. Surface water flooding is likely to increase due to the anticipated increased intensity in rainfall events as well as the continuing urbanisation of London. The site is located within a residential area. As such, it is unlikely that there will be any significant pollution of surface water runoff associated with the current land use.
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 which can increase velocities of overland flows of surface water therefore more investigative works may be required to assess the impact of any potential standing groundwater and/or through flow. 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.

Further details are provided in a separate Surface Water and Flood Report that has been carried out by Base Energy.

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.

Air Pollution	
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.

Light Pollution	
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

Water Pollution	
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. Based on the review of underlying ground conditions, and in line with the London Plan hierarchy, the following are proposed to manage flows from hardstanding areas: - Rainwater recycling (water butt) - Rain planter - Attenuation storage with a controlled outlet into the public sewer system. Storage will be provided for surface water runoff from roof and hardstanding areas (~265m2) in up to the 1 in 100 year plus 40% allowance for climate change. Flows will be restricted to 0.5l/s; this is the existing 1 in 100 year greenfield rate of runoff

5 Conclusion

The proposed development is to be located at Langford, Maryland Road, London, N22 5AR where the site is currently comprised of an existing building (the latest use being a Church). Proposals are for the construction of a new residential development containing 8 flats, consisting of 2 different types.

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.

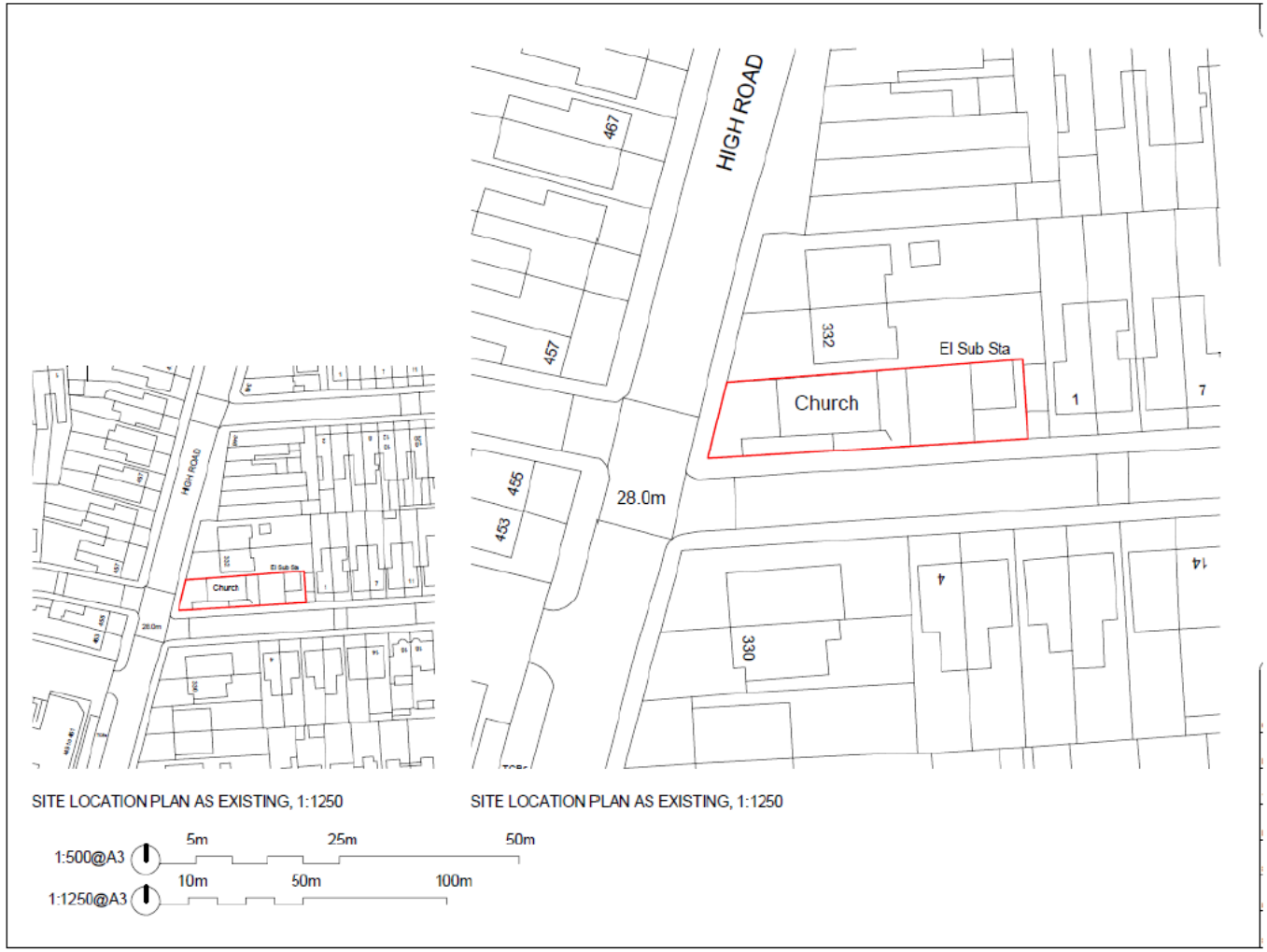
Given the scale and nature of the development, this constrains the development proposals in terms of the layout, positioning and orientation of the proposed dwelling. Subsequently, these constraints will impact on the feasibility of certain sustainability and energy efficient measures that can feasibly 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 potential of 100% saving in CO2 emissions
- The development is to take a fabric first approach, which is to be designed to be highly insulated, with low u-values and good air tightness
- 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
- Short stay cycle storage for 2 cycles and long stay cycle storage for 16 cycles provided for each dwelling to promote healthier travel methods and reduce CO2 emissions from vehicles

Appendix A Site Plan



Appendix B SAP Worksheet Improvement over Part L1 2021

Full SAP Calculation Printout

Property Reference	13080 1	**Issued on Date**	20/05/2025
Assessment Reference	Be Green V1	**Prop Type Ref**	Flat 1
Property	Corner of, Maryland Road & High Road, London, N22		

SAP Rating	97 A	**DER**	-0.38	**TER**	12.72
Environmental	100 A	**% DER < TER**			102.99
CO_2 Emissions (t/year)	-0.06	**DFEE**	31.96	**TFEE**	34.30
Compliance Check	See BREL	**% DFEE < TFEE**			6.83
% DPER < TPER	84.79	**DPER**	10.25	**TPER**	67.39

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

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		78.6000	(1b)	x 2.3500	(2b) =	184.7100	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.6000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	184.7100	(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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.1750	(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) =	0.1487	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748	(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) =												80.1000	(23c)
Effective ac	0.2892	0.2854	0.2817	0.2631	0.2594	0.2408	0.2408	0.2371	0.2482	0.2594	0.2668	0.2743	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Door			1.8900	1.4000	2.6460			(26)
Window			11.2500	1.1450	12.8817			(27)
Heat Loss Floor 1			78.6000	0.1100	8.6460			(28a)
External Wall	69.4400	11.2500	58.1900	0.1700	9.8923			(29a)
Corridor Wall	16.8000	1.8900	14.9100	0.1700	2.5347			(29a)
Total net area of external elements Aum(A, m2)			164.8400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.6007			(33)
Main dwelling								
Party Ceiling 1			78.6000					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	100.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	8.2420	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.8427	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	17.6253	17.3986	17.1720	16.0386	15.8119	14.6786	14.6786	14.4519	15.1319	15.8119	16.2653	16.7186	(38)
Heat transfer coeff	62.4680	62.2413	62.0146	60.8813	60.6546	59.5212	59.5212	59.2946	59.9746	60.6546	61.1080	61.5613	(39)
Average = Sum(39)m / 12 =												60.8246	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7948	0.7919	0.7890	0.7746	0.7717	0.7573	0.7573	0.7544	0.7630	0.7717	0.7775	0.7832	(40)
HLP (average)												0.7739	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.4358 (42)

Hot water usage for mixer showers

73.1918	72.0919	70.4891	67.4224	65.1592	62.6354	61.2008	62.7915	64.5352	67.2450	70.3776	72.9114	(42a)

Hot water usage for baths

28.1009	27.6836	27.0959	26.0122	25.2008	24.3011	23.8152	24.3988	25.0342	25.9969	27.1028	28.0059	(42b)

Hot water usage for other uses

39.5746	38.1355	36.6965	35.2574	33.8183	32.3792	32.3792	33.8183	35.2574	36.6965	38.1355	39.5746	(42c)

Average daily hot water use (litres/day) 129.5113 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	140.8673	137.9110	134.2814	128.6920	124.1784	119.3158	117.3952	121.0086	124.8268	129.9384	135.6160	140.4919	(44)
Energy conte	223.0994	196.3834	206.3855	176.1729	167.1680	146.7127	141.9794	149.8339	153.9239	176.3252	193.2098	219.9764	(45)
Energy content (annual)										Total = Sum(45)m =		2151.1705	

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

33.4649	29.4575	30.9578	26.4259	25.0752	22.0069	21.2969	22.4751	23.0886	26.4488	28.9815	32.9965	(46)

Water storage loss:

Store volume 170.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.2300 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.6642 (55)

Total storage loss

20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902	(56)

If cylinder contains dedicated solar storage

20.5902	18.5976	20.5902	19.9260	20.5902	19.9260	20.5902	20.5902	19.9260	20.5902	19.9260	20.5902	(57)

Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

	266.9520	235.9922	250.2381	218.6109	211.0206	189.1507	185.8320	193.6865	196.3619	220.1778	235.6478	263.8290	(62)
WWHRS	-44.8026	-39.6238	-41.4917	-34.3568	-32.0193	-27.3991	-25.6823	-27.3106	-28.3482	-33.4194	-37.8601	-43.9729	(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

	222.1494	196.3684	208.7464	184.2541	179.0013	161.7515	160.1496	166.3759	168.0137	186.7584	197.7877	219.8561	(64)
										Total per year (kWh/year) = Sum(64)m =		2251.2126	(64)

12Total per year (kWh/year) 2251 (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

109.2626	96.9845	103.7053	92.5279	90.6654	82.7324	82.2902	84.9019	85.1301	93.7102	98.1927	108.2242	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.5857	129.0770	116.5857	120.4719	116.5857	120.4719	116.5857	116.5857	120.4719	116.5857	120.4719	116.5857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.4897	218.7362	213.0751	201.0233	185.8102	171.5119	161.9598	159.7134	165.3744	177.4262	192.6393	206.9376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	(71)
Water heating gains (Table 5)	146.8584	144.3222	139.3888	128.5110	121.8621	114.9061	110.6051	114.1154	118.2362	125.9546	136.3787	145.4627	(72)
Total internal gains	539.4702	551.6718	528.5860	509.5426	483.7944	466.4263	448.6871	449.9509	463.6190	479.5029	509.0263	528.5224	(73)

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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	
South	4.9500	46.7521	0.3500	0.0000	0.7700	62.3684	(78)
West	6.3000	19.6403	0.3500	0.0000	0.7700	33.3462	(80)

Solar gains	95.7146	167.3757	237.5409	303.7332	345.2553	344.0345	331.2246	300.6773	260.8615	187.5748	115.5067	81.3144	(83)
Total gains	635.1848	719.0475	766.1268	813.2758	829.0498	810.4608	779.9117	750.6282	724.4805	667.0777	624.5330	609.8367	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	34.9512	35.0785	35.2067	35.8621	35.9962	36.6816	36.6816	36.8218	36.4043	35.9962	35.7291	35.4660	
alpha	3.3301	3.3386	3.3471	3.3908	3.3997	3.4454	3.4454	3.4548	3.4270	3.3997	3.3819	3.3644	
util living area	0.9151	0.8778	0.8274	0.7327	0.6085	0.4509	0.3306	0.3563	0.5320	0.7507	0.8736	0.9229	(86)

Living	19.6333	19.9014	20.2132	20.5800	20.8219	20.9534	20.9877	20.9840	20.9149	20.6117	20.0949	19.5989	
Non living	18.6575	18.9907	19.3755	19.8247	20.1031	20.2521	20.2828	20.2825	20.2114	19.8717	19.2452	18.6218	
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	20.3009	19.9014	20.2132	20.5800	20.8219	20.9534	20.9877	20.9840	20.9149	20.6117	20.0949	19.7949	(87)
Th 2	20.2579	20.2604	20.2629	20.2754	20.2779	20.2905	20.2905	20.2930	20.2855	20.2779	20.2729	20.2679	(88)
util rest of house	0.9057	0.8650	0.8097	0.7067	0.5725	0.4056	0.2791	0.3039	0.4855	0.7210	0.8584	0.9143	(89)
MIT 2	19.6199	18.9907	19.3755	19.8247	20.1031	20.2521	20.2828	20.2825	20.2114	19.8717	19.2452	18.9185	(90)
Living area fraction									fLA = Living area / (4) =			0.3448	(91)
MIT	19.8547	19.3047	19.6643	20.0851	20.3509	20.4939	20.5258	20.5244	20.4540	20.1268	19.5382	19.2206	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8547	19.3047	19.6643	20.0851	20.3509	20.4939	20.5258	20.5244	20.4540	20.1268	19.5382	19.2206	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9001	0.8461	0.7938	0.6995	0.5763	0.4188	0.2963	0.3212	0.4967	0.7144	0.8410	0.8998	(94)
Useful gains	571.7096	608.4168	608.1422	568.8997	477.7702	339.4253	231.0849	241.1056	359.8611	476.5608	525.2155	548.7225	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	971.6683	896.5656	816.3821	680.9639	524.7194	350.8131	233.6702	244.5526	381.0767	577.8464	760.0721	924.6907	(97)
Space heating kWh	297.5693	193.6360	154.9305	80.6862	34.9302	0.0000	0.0000	0.0000	0.0000	75.3565	169.0968	279.7203	(98a)
Space heating requirement - total per year (kWh/year)												1285.9258	
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	297.5693	193.6360	154.9305	80.6862	34.9302	0.0000	0.0000	0.0000	0.0000	75.3565	169.0968	279.7203	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1285.9258	
Space heating per m2											(98c) / (4) =	16.3604	(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 %)	339.0635	(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	297.5693	193.6360	154.9305	80.6862	34.9302	0.0000	0.0000	0.0000	0.0000	75.3565	169.0968	279.7203	(98)
Space heating efficiency (main heating system 1)	339.0635	339.0635	339.0635	339.0635	339.0635	0.0000	0.0000	0.0000	0.0000	339.0635	339.0635	339.0635	(210)
Space heating fuel (main heating system)	87.7621	57.1091	45.6936	23.7968	10.3020	0.0000	0.0000	0.0000	0.0000	22.2249	49.8717	82.4979	(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	222.1494	196.3684	208.7464	184.2541	179.0013	161.7515	160.1496	166.3759	168.0137	186.7584	197.7877	219.8561	(64)
Efficiency of water heater												190.8211	(216)
(217)m	190.8211	190.8211	190.8211	190.8211	190.8211	190.8211	190.8211	190.8211	190.8211	190.8211	190.8211	190.8211	(217)
Fuel for water heating, kWh/month	116.4176	102.9071	109.3938	96.5586	93.8058	84.7661	83.9266	87.1895	88.0478	97.8709	103.6508	115.2158	(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	16.8806	15.2470	16.8806	16.3361	16.8806	16.3361	16.8806	16.8806	16.3361	16.8806	16.3361	16.8806	(231)
Lighting	25.4016	20.3781	18.3482	13.4427	10.3835	8.4834	9.4722	12.3123	15.9925	20.9830	23.7003	26.1076	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-48.2044	-69.0335	-100.7809	-113.6699	-122.7041	-113.5385	-112.2147	-105.7520	-93.3348	-78.5264	-53.0129	-41.4341	(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	-21.9167	-47.9785	-98.5039	-153.4109	-207.2518	-210.8607	-207.8974	-173.9316	-125.7135	-71.0579	-30.1608	-17.2452	(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												379.2581	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												190.8211	
Water heating fuel used												1179.7504	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8820)													
mechanical ventilation fans (SFP = 0.8820)												198.7553	(230a)
Total electricity for the above, kWh/year												198.7553	(231)
Electricity for lighting (calculated in Appendix L)												205.0054	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-2418.1352	(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	-455.3659	(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	379.2581	0.1561	59.1970	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1179.7504	0.1408	166.1054	(264)
Space and water heating			225.3024	(265)
Pumps, fans and electric keep-hot	198.7553	0.1387	27.5698	(267)
Energy for lighting	205.0054	0.1443	29.5886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1052.2062	0.1345	-141.5237	
PV Unit electricity exported	-1365.9289	0.1249	-170.6395	
Total			-312.1632	(269)
Total CO2, kg/year			-29.7024	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			-0.3800	(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	379.2581	1.5778	598.3985	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1179.7504	1.5206	1793.9417	(278)
Space and water heating			2392.3402	(279)
Pumps, fans and electric keep-hot	198.7553	1.5128	300.6771	(281)
Energy for lighting	205.0054	1.5338	314.4441	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1052.2062	1.4971	-1575.2537	
PV Unit electricity exported	-1365.9289	0.4585	-626.3077	
Total			-2201.5615	(283)
Total Primary energy kWh/year			805.9000	(286)
Dwelling Primary energy Rate (DPER)			10.2500	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	78.6000	(1b) x	2.3500	(2b) =	184.7100	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		184.7100	(5)

2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	3 * 10 =	30.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1624	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.4124	(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) =	0.3506	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate	0.4470	0.4382	0.4294	0.3856	0.3768	0.3330	0.3330	0.3243	0.3506	0.3768	0.3944	0.4119	(22b)
Effective ac	0.5999	0.5960	0.5922	0.5743	0.5710	0.5555	0.5555	0.5526	0.5614	0.5710	0.5778	0.5848	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K

Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type			11.2500	1.1450	12.8817			(27)
Heat Loss Floor 1			78.6000	0.1300	10.2180			(28a)
External Wall	69.4400	11.2500	58.1900	0.1800	10.4742			(29a)
Corridor Wall	16.8000	1.8900	14.9100	0.1800	2.6838			(29a)
Total net area of external elements Aum(A, m2)			164.8400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.1477			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000	(35)
List of Thermal Bridges								
K1 Element					Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)					14.3000	0.0500	0.7150	
E3 Sill					13.4000	0.0500	0.6700	
E4 Jamb					27.6000	0.0500	1.3800	
E5 Ground floor (normal)					34.2000	0.1600	5.4720	
E6 Intermediate floor within a dwelling					29.4000	0.0000	0.0000	
E16 Corner (normal)					10.0000	0.0900	0.9000	
E18 Party wall between dwellings					10.0000	0.0600	0.6000	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7370	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	47.8847	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.5656	36.3292	36.0974	35.0089	34.8053	33.8573	33.8573	33.6817	34.2224	34.8053	35.2173	35.6480	(38)
Heat transfer coeff	84.4503	84.2138	83.9821	82.8936	82.6900	81.7419	81.7419	81.5664	82.1071	82.6900	83.1020	83.5327	(39)
Average = Sum(39)m / 12 =												82.8926	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0744	1.0714	1.0685	1.0546	1.0520	1.0400	1.0400	1.0377	1.0446	1.0520	1.0573	1.0628	(40)
HLP (average)												1.0546	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.4358	(42)
Hot water usage for mixer showers	65.0594	64.0817	62.6570	59.9310	57.9193	55.6759	54.4007	55.8147	57.3646	59.7734	62.5579	64.8101	(42a)
Hot water usage for baths	28.1009	27.6836	27.0959	26.0122	25.2008	24.3011	23.8152	24.3988	25.0342	25.9969	27.1028	28.0059	(42b)
Hot water usage for other uses	39.5746	38.1355	36.6965	35.2574	33.8183	32.3792	32.3792	33.8183	35.2574	36.6965	38.1355	39.5746	(42c)
Average daily hot water use (litres/day)												122.0135	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	132.7349	129.9008	126.4493	121.2006	116.9385	112.3563	110.5951	114.0318	117.6562	122.4667	127.7962	132.3906	(44)
Energy conte	210.2197	184.9770	194.3478	165.9176	157.4217	138.1552	133.7552	141.1951	145.0819	166.1862	182.0692	207.2917	(45)
Energy content (annual)										Total = Sum(45)m =		2026.6183	
Distribution loss (46)m = 0.15 x (45)m	31.5329	27.7465	29.1522	24.8876	23.6133	20.7233	20.0633	21.1793	21.7623	24.9279	27.3104	31.0938	(46)
Water storage loss:													
Store volume												170.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8102	(55)
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153	(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	258.5974	228.6730	242.7255	212.7347	205.7994	184.9723	182.1329	189.5728	191.8990	214.5639	228.8863	255.6695	(62)
WWHRS	-29.7424	-26.3045	-27.5445	-22.8079	-21.2562	-18.1891	-17.0494	-18.1303	-18.8191	-22.1857	-25.1337	-29.1917	(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	228.8549	202.3685	215.1810	189.9268	184.5432	166.7832	165.0836	171.4426	173.0799	192.3782	203.7527	226.4778	(64)
										Total per year (kWh/year) = Sum(64)m =		2319.8724	(64)
12Total per year (kWh/year)												2320	(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	108.6002	96.4616	103.3228	92.6213	91.0449	83.3903	83.1758	85.6495	85.6934	93.9591	97.9917	107.6267	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	121.7880	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	116.5857	129.0770	116.5857	120.4719	116.5857	120.4719	116.5857	116.5857	120.4719	116.5857	120.4719	116.5857	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	216.4897	218.7362	213.0751	201.0233	185.8102	171.5119	161.9598	159.7134	165.3744	177.4262	192.6393	206.9376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	35.1788	(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)	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	-97.4304	(71)
Water heating gains (Table 5)	145.9680	143.5441	138.8748	128.6407	122.3721	115.8199	111.7954	115.1204	119.0186	126.2891	136.0996	144.6595	(72)
Total internal gains	541.5798	553.8937	531.0719	512.6723	487.3044	467.3401	449.8774	450.9558	464.4014	482.8374	511.7472	530.7192	(73)

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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	
South	4.9500	46.7521	0.6300	0.7000	0.7700	70.7258	(78)
West	6.3000	19.6403	0.6300	0.7000	0.7700	37.8146	(80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	108.5404	189.8040	269.3713	344.4335	391.5196	390.1351	375.6087	340.9681	295.8169	212.7099	130.9846	92.2105	(83)
Total gains	650.1202	743.6977	800.4433	857.1058	878.8240	857.4752	825.4861	791.9239	760.2183	695.5472	642.7318	622.9297	(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	25.8535	25.9261	25.9976	26.3390	26.4038	26.7101	26.7101	26.7676	26.5913	26.4038	26.2729	26.1375	
alpha	2.7236	2.7284	2.7332	2.7559	2.7603	2.7807	2.7807	2.7845	2.7728	2.7603	2.7515	2.7425	
util living area	0.9307	0.9018	0.8624	0.7885	0.6834	0.5389	0.4102	0.4407	0.6199	0.8064	0.9006	0.9370	(86)
MIT	18.8547	19.1727	19.5919	20.1221	20.5476	20.8353	20.9432	20.9292	20.7434	20.1967	19.4552	18.8072	(87)
Th 2	20.0218	20.0242	20.0267	20.0381	20.0402	20.0502	20.0502	20.0520	20.0463	20.0402	20.0359	20.0314	(88)
util rest of house	0.9215	0.8892	0.8445	0.7604	0.6401	0.4754	0.3301	0.3603	0.5593	0.7749	0.8858	0.9286	(89)
MIT 2	17.5309	17.9286	18.4505	19.1032	19.6021	19.9192	20.0172	20.0086	19.8285	19.2074	18.2965	17.4774	(90)
Living area fraction									fLA = Living area / (4) =			0.3448	(91)
MIT	17.9873	18.3575	18.8440	19.4545	19.9281	20.2351	20.3364	20.3260	20.1440	19.5485	18.6960	17.9359	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.9873	18.3575	18.8440	19.4545	19.9281	20.2351	20.3364	20.3260	20.1440	19.5485	18.6960	17.9359	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8966	0.8625	0.8185	0.7412	0.6346	0.4884	0.3550	0.3844	0.5659	0.7563	0.8601	0.9047	(94)
Useful gains	582.8933	641.4298	655.1524	635.3279	557.7250	418.7543	293.0141	304.3887	430.2384	526.0723	552.8224	563.5695	(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	1155.8979	1133.3096	1036.6787	874.9019	680.3799	460.6211	305.4243	320.2330	496.2534	739.9520	963.6493	1147.3954	(97)
Space heating kWh	426.3154	330.5432	283.8555	172.4933	91.2552	0.0000	0.0000	0.0000	0.0000	159.1265	295.7954	434.3665	(98a)
Space heating requirement - total per year (kWh/year)												2193.7510	
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	426.3154	330.5432	283.8555	172.4933	91.2552	0.0000	0.0000	0.0000	0.0000	159.1265	295.7954	434.3665	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2193.7510	
Space heating per m2											(98c) / (4) =	27.9103	(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	426.3154	330.5432	283.8555	172.4933	91.2552	0.0000	0.0000	0.0000	0.0000	159.1265	295.7954	434.3665	(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)	461.8802	358.1183	307.5358	186.8833	98.8681	0.0000	0.0000	0.0000	0.0000	172.4014	320.4717	470.6029	(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	228.8549	202.3685	215.1810	189.9268	184.5432	166.7832	165.0836	171.4426	173.0799	192.3782	203.7527	226.4778	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4343	85.1531	84.6819	83.8445	82.5689	79.8000	79.8000	79.8000	79.8000	83.6374	84.8948	85.4955	(217)
Fuel for water heating, kWh/month	267.8725	237.6526	254.1052	226.5227	223.5020	209.0015	206.8717	214.8403	216.8921	230.0145	240.0061	264.9003	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	24.2242	19.4336	17.4978	12.8196	9.9022	8.0902	9.0332	11.7416	15.2512	20.0104	22.6017	24.8975	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-20.9817	-31.0403	-46.7880	-55.2434	-61.8751	-58.5911	-57.8759	-53.4978	-46.1716	-36.6500	-23.5802	-17.9736	(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	-7.7898	-16.7298	-33.9025	-51.8890	-69.5705	-70.2605	-69.4342	-58.3457	-42.1863	-24.2390	-10.4999	-6.1346	(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	2376.7616 (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	2792.1815	(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)	195.5032	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-971.2505	(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	4479.1959	(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	2376.7616	0.2100	499.1199	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2792.1815	0.2100	586.3581	(264)
Space and water heating			1085.4781	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	195.5032	0.1443	28.2172	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2687	0.1336	-68.1669	
PV Unit electricity exported	-460.9817	0.1253	-57.7822	
Total			-125.9491	(269)
Total CO2, kg/year			999.6754	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.7200	(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	2376.7616	1.1300	2685.7407	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2792.1815	1.1300	3155.1651	(278)
Space and water heating			5840.9058	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	195.5032	1.5338	299.8694	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-510.2687	1.4937	-762.1732	
PV Unit electricity exported	-460.9817	0.4601	-212.0881	
Total			-974.2614	(283)
Total Primary energy kWh/year			5296.6146	(286)
Target Primary Energy Rate (TPER)			67.3900	(287)