Sustainability Statement for Planning

Corner of Maryland Road and High Road
London
N22 5AR

Job number: 11577

Date: December 2023

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Contents:

Report Details:

Revision	Issue Date	Author	Checked	Description
0	21/12/2023	ROB	CT	First Issue

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 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

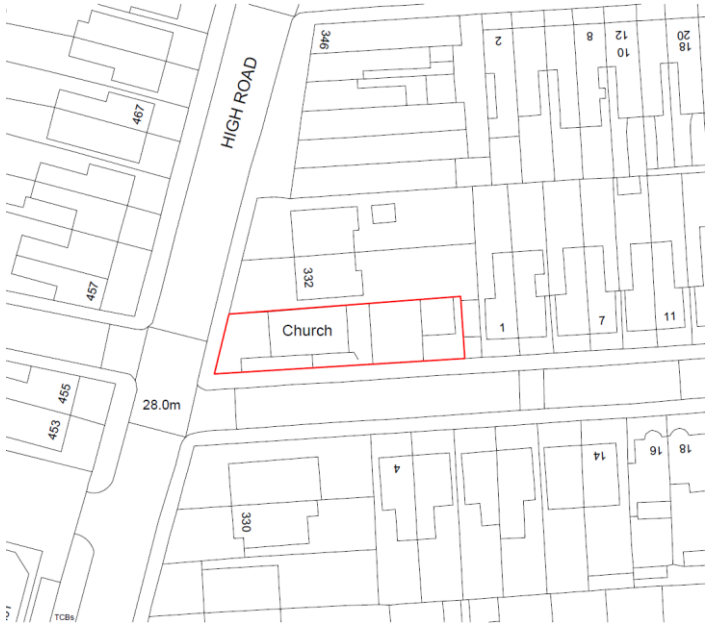
The Core strategy sets out to promote Sustainable Development. Furthermore, Sustainable Design and Construction Policy UD2, requires a sustainability statement to be provided for all planning applications in line with the key principals of the Sustainable Design and Construction.

3 - Existing and Proposed Development

The site is located on corner of Maryland Road and High Road, London (see Figure 1). The site is currently comprised of an existing building (the latest use being a Church)

Proposals are for the demolition of the existing building, and the construction of a new building (including lower ground floor) to comprise 6no. flats.

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 at corner of Maryland Road and High Road, London, 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 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 0.11W/m2k, Roof 0.10W/m2k • Air Source Heat Pump (winter efficiency 290% and Summer 175%) • Time and temperature zone control, • Solar PV panels 2.4kWp for all the dwellings, totalling 14.4kWp for the total development

	This has shown to be an improvement over building regulations Part L1 2021 baseline, by achieving a potential of 89% improvement in CO2 emissions.
Renewable Energy Sources	The feasibility of several renewable technologies has been reviewed and shown that an ASHP and Solar PV 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 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 cycle storage for 12 cycles provided for each dwelling to promote healthier travel methods and reduce CO2 emissions from vehicles.

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 should be carried out; given the nature of the development however it may be considered not feasible to install a rainwater harvesting system. Further assessment with a drainage engineer would be needed.
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 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 comprised of an existing building (the latest use being a Church) 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. Whilst measures to enhance the ecological potential of the site will be investigated where possible, opportunities to enhance the ecological value of the site are limited due to the small 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 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

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 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	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.
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/basement 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 sire 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.

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.

5 Conclusion

The proposed development is to be located on the corner of Maryland Road and High Road, London, where the site is currently comprised of an existing building (the latest use being a Church). Proposals are for the demolition of the existing building, and the construction of a new building (including lower ground floor) to comprise 6no. flats.

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).

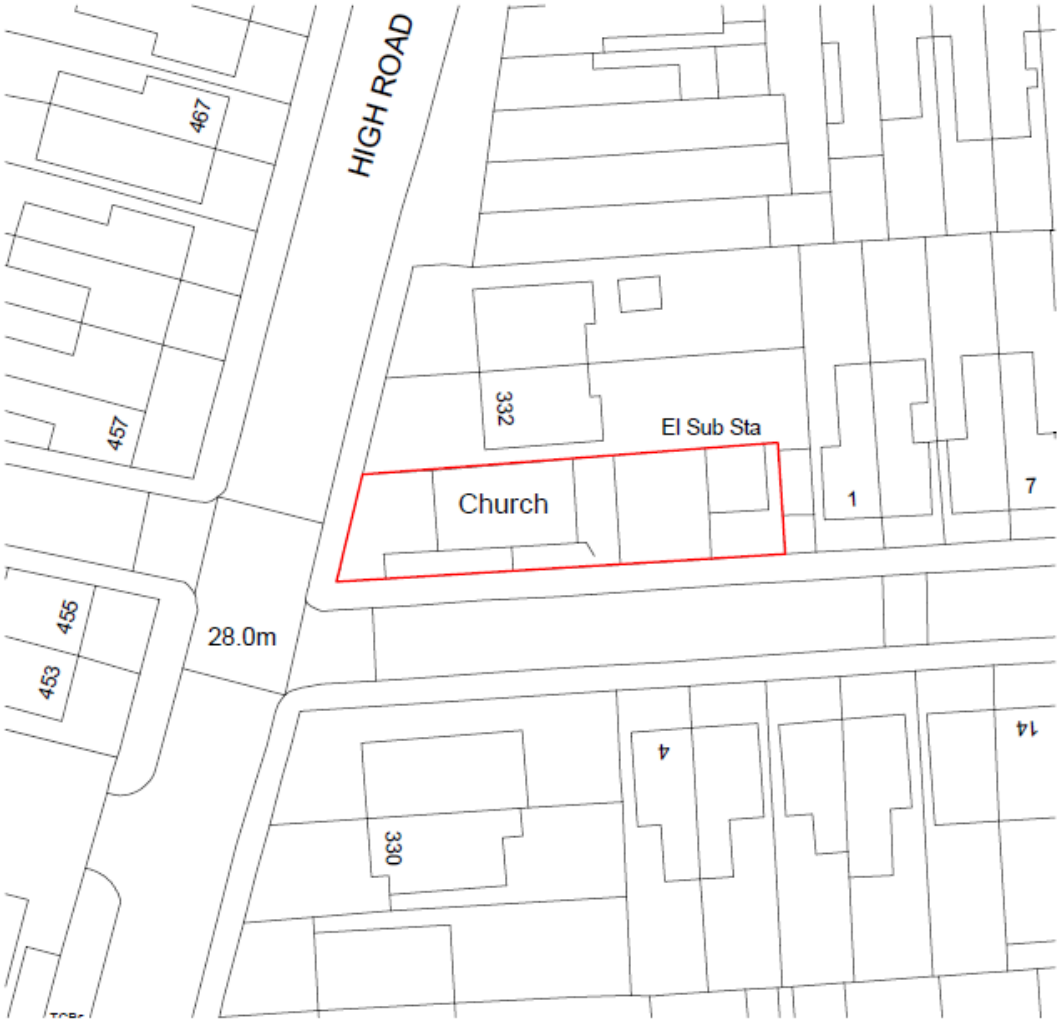
The above sustainability statement sets out what the requirements are of the planning policies and what can be achieved for the proposed development.

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 89% 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 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 12 cycles provided for each dwelling to promote healthier travel methods and reduce CO2 emissions from vehicles

Appendix A Site Plan

SITE LOCATION PLAN AS EXISTING, 1:1250



SITE LOCATION PLAN AS EXISTING, 1:1250

1:500@A3 5m 25m 50m

1:1250@A3 10m 50m 100m

Appendix B SAP Worksheet Improvement over Part L1 2023

Full SAP Calculation Printout

Property Reference	11577 1	**Issued on Date**	08/01/2024
Assessment Reference	Be Green - South PV	**Prop Type Ref**	Flat 1
Property	Corner of, Maryland Road & High Road, London, N22		

SAP Rating	90 B	**DER**	1.72	**TER**	11.12
Environmental	98 A	**% DER < TER**			84.53
CO_2 Emissions (t/year)	0.14	**DFEE**	33.11	**TFEE**	35.23
Compliance Check	See BREL	**% DFEE < TFEE**			6.00
% DPER < TPER	57.38	**DPER**	24.97	**TPER**	58.58

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 (m2)		Storey height (m)		Volume (m3)	
Ground floor	59.6600 (1b)	x	2.5000 (2b)	=	149.1500	(1b) - (3b)
First floor	53.9000 (1c)	x	2.5000 (2c)	=	134.7500	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	283.9000	(5)

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2. Ventilation rate

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		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	4 * 10 =	40.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1409	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.3409	(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) =	0.2898	(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	0.3694	0.3622	0.3550	0.3187	0.3115	0.2753	0.2753	0.2680	0.2898	0.3115	0.3260	0.3405	(22b)
Effective ac	0.5682	0.5656	0.5630	0.5508	0.5485	0.5379	0.5379	0.5359	0.5420	0.5485	0.5531	0.5580	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.4000	2.6460			(26)
Window (Uw = 1.20)			17.3400	1.1450	19.8550			(27)
Heat Loss Floor 1			59.6600	0.1100	6.5626			(28a)
External Wall	91.0000	19.2300	71.7700	0.1700	12.2009			(29a)
Basement Wall	48.7500		48.7500	0.1700	8.2875			(29a)
Corridor Wall	19.2500		19.2500	0.1700	3.2725			(29a)
Ceiling to corridor	5.7600		5.7600	0.0970	0.5587			(30)
Total net area of external elements Aum(A, m2)			224.4200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.3831			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	100.0000	(35)
Thermal bridges (User defined value 0.050 * total exposed area)	11.2210	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	64.6041	(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	53.2371	52.9889	52.7455	51.6025	51.3886	50.3931	50.3931	50.2087	50.7765	51.3886	51.8212	52.2735	(38)

Heat transfer coeff

	117.8413	117.5930	117.3497	116.2066	115.9928	114.9972	114.9972	114.8128	115.3807	115.9928	116.4254	116.8777 (39)
Average = Sum(39)m / 12 =												116.2056

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0377	1.0355	1.0334	1.0233	1.0214	1.0127	1.0127	1.0110	1.0160	1.0214	1.0252	1.0292	(40)
HLP (average)												1.0233	
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												2.8346 (42)
Hot water usage for mixer showers												
	98.6515	97.1690	95.0086	90.8752	87.8248	84.4231	82.4895	84.6335	86.9837	90.6362	94.8584	98.2735 (42a)
Hot water usage for baths												
	30.9766	30.5165	29.8687	28.6742	27.7798	26.7880	26.2523	26.8956	27.5960	28.6573	29.8764	30.8719 (42b)
Hot water usage for other uses												
	43.6590	42.0714	40.4838	38.8962	37.3086	35.7210	35.7210	37.3086	38.8962	40.4838	42.0714	43.6590 (42c)
Average daily hot water use (litres/day)												159.3636 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	173.2871	169.7570	165.3612	158.4456	152.9132	146.9321	144.4628	148.8377	153.4760	159.7773	166.8062	172.8044	(44)
Energy conte	274.4445	241.7316	254.1539	216.9041	205.8506	180.6701	174.7152	184.2922	189.2512	216.8163	237.6460	270.5700	(45)
Energy content (annual)										Total = Sum(45)m =		2647.0458	
Distribution loss (46)m = 0.15 x (45)m													
	41.1667	36.2597	38.1231	32.5356	30.8776	27.1005	26.2073	27.6438	28.3877	32.5224	35.6469	40.5855	(46)
Water storage loss:													
Store volume												200.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8640	(55)
Total storage loss													
	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	(56)
If cylinder contains dedicated solar storage													
	26.7840	24.1920	26.7840	25.9200	26.7840	25.9200	26.7840	26.7840	25.9200	26.7840	25.9200	26.7840	(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													
	324.4909	286.9348	304.2003	265.3361	255.8970	229.1021	224.7616	234.3386	237.6832	266.8627	286.0780	320.6164	(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													
	324.4909	286.9348	304.2003	265.3361	255.8970	229.1021	224.7616	234.3386	237.6832	266.8627	286.0780	320.6164	(64)
										Total per year (kWh/year) = Sum(64)m =		3236.3018	(64)
12Total per year (kWh/year)												3236	(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													
	131.2899	116.5383	124.5433	110.8662	108.4824	98.8184	98.1299	101.3143	101.6716	112.1285	117.7629	130.0016	(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	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	146.9197	162.6611	146.9197	151.8170	146.9197	151.8170	146.9197	146.9197	151.8170	146.9197	151.8170	146.9197	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	276.5748	279.4448	272.2125	256.8159	237.3804	219.1138	206.9106	204.0406	211.2729	226.6695	246.1050	264.3716	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	(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)													
	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	(71)
Water heating gains (Table 5)													
	176.4649	173.4201	167.3969	153.9809	145.8097	137.2478	131.8951	136.1751	141.2106	150.7104	163.5596	174.7334	(72)
Total internal gains													
	665.4782	681.0448	652.0480	628.1326	595.6287	573.6975	551.2442	552.6542	569.8193	589.8184	627.0004	651.5435	(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	
East	10.1400	19.6403	0.5000	0.0000	0.7700	76.6736	(76)
South	7.2000	46.7521	0.5000	0.0000	0.7700	129.5967	(78)

Solar gains	206.2703	362.2359	517.3758	665.8220	759.9252	758.3949	729.6900	660.3727	569.7120	406.9029	249.2193	175.0362	(83)
Total gains	871.7486	1043.2807	1169.4237	1293.9546	1355.5539	1332.0924	1280.9342	1213.0269	1139.5314	996.7213	876.2197	826.5797	(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	26.7686	26.8251	26.8807	27.1451	27.1952	27.4306	27.4306	27.4747	27.3395	27.1952	27.0941	26.9893	
alpha	2.7846	2.7883	2.7920	2.8097	2.8130	2.8287	2.8287	2.8316	2.8226	2.8130	2.8063	2.7993	
util living area													
	0.9395	0.9048	0.8554	0.7673	0.6488	0.5010	0.3772	0.4110	0.5961	0.8035	0.9092	0.9466	(86)
Living	19.2799	19.5588	19.9059	20.3088	20.6101	20.7946	20.8594	20.8499	20.7263	20.3195	19.7342	19.2303	
Non living	18.0330	18.3820	18.8129	19.3061	19.6554	19.8571	19.9150	19.9096	19.7910	19.3321	18.6137	17.9758	
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	20.1201	19.5588	19.9059	20.3088	20.6101	20.7946	20.8594	20.8499	20.7263	20.3195	19.7342	19.4779	(87)
Th 2	20.0520	20.0538	20.0556	20.0640	20.0655	20.0728	20.0728	20.0741	20.0700	20.0655	20.0624	20.0591	(88)
util rest of house													
	0.9314	0.8927	0.8371	0.7385	0.6056	0.4408	0.3037	0.3362	0.5369	0.7723	0.8956	0.9394	(89)
MIT 2	19.2471	18.3820	18.8129	19.3061	19.6554	19.8571	19.9150	19.9096	19.7910	19.3321	18.6137	18.3512	(90)
Living area fraction										fLA = Living area / (4) =		0.3104	(91)
MIT	19.5181	18.7473	19.1522	19.6174	19.9517	20.1481	20.2082	20.2015	20.0813	19.6386	18.9615	18.7009	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5181	18.7473	19.1522	19.6174	19.9517	20.1481	20.2082	20.2015	20.0813	19.6386	18.9615	18.7009	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9262	0.8726	0.8169	0.7233	0.6000	0.4459	0.3148	0.3468	0.5376	0.7561	0.8761	0.9266	(94)
Useful gains	807.4439	910.3353	955.2982	935.8641	813.2918	593.9537	403.2063	420.6875	612.6541	753.6153	767.6617	765.8758	(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													
	1793.3194	1628.3432	1484.7257	1245.4319	957.1408	638.0191	414.9283	436.4619	690.1274	1048.4110	1380.9829	1694.8367	(97)
Space heating kWh													
	733.4914	482.5013	393.8940	222.8888	107.0237	0.0000	0.0000	0.0000	0.0000	219.3280	441.5913	691.1469	(98a)
Space heating requirement - total per year (kWh/year)												3291.8655	
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													
	733.4914	482.5013	393.8940	222.8888	107.0237	0.0000	0.0000	0.0000	0.0000	219.3280	441.5913	691.1469	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3291.8655	
Space heating per m2											(98c) / (4) =	28.9879	(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 %)	284.6034	(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													
	733.4914	482.5013	393.8940	222.8888	107.0237	0.0000	0.0000	0.0000	0.0000	219.3280	441.5913	691.1469	(98)
Space heating efficiency (main heating system 1)													
	284.6034	284.6034	284.6034	284.6034	284.6034	0.0000	0.0000	0.0000	0.0000	284.6034	284.6034	284.6034	(210)
Space heating fuel (main heating system)													
	257.7241	169.5347	138.4010	78.3156	37.6045	0.0000	0.0000	0.0000	0.0000	77.0644	155.1603	242.8456	(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													
	324.4909	286.9348	304.2003	265.3361	255.8970	229.1021	224.7616	234.3386	237.6832	266.8627	286.0780	320.6164	(64)
Efficiency of water heater												186.6628	(216)
(217)m	186.6628	186.6628	186.6628	186.6628	186.6628	186.6628	186.6628	186.6628	186.6628	186.6628	186.6628	186.6628	(217)
Fuel for water heating, kWh/month													
	173.8380	153.7183	162.9679	142.1473	137.0905	122.7358	120.4105	125.5411	127.3330	142.9651	153.2593	171.7624	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	35.6422	28.5935	25.7453	18.8621	14.5696	11.9035	13.2909	17.2760	22.4398	29.4423	33.2550	36.6328	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-46.1469	-68.1952	-102.5073	-118.4787	-129.1483	-117.7211	-116.0412	-108.1501	-93.7266	-78.2958	-51.3178	-39.3628	(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	-14.7082	-33.3544	-70.4434	-113.3093	-157.2062	-163.8111	-161.7704	-134.5753	-96.3760	-51.5219	-20.8651	-11.5625	(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	1156.6502	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	186.6628	
Water heating fuel used	1733.7691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
Total electricity for the above, kWh/year	0.0000	(231)
Electricity for lighting (calculated in Appendix L)	287.6532	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-2098.5959	(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	1079.4767	(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	1156.6502	0.1556	179.9667	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1733.7691	0.1411	244.5594	(264)
Space and water heating			424.5260	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	287.6532	0.1443	41.5172	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1069.0919	0.1342	-143.4747	
PV Unit electricity exported	-1029.5040	0.1238	-127.4414	
Total			-270.9162	(269)
Total CO2, kg/year			195.1271	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.7200	(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	1156.6502	1.5760	1822.8653	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1733.7691	1.5216	2638.0748	(278)
Space and water heating			4460.9401	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	287.6532	1.5338	441.2120	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1069.0919	1.4960	-1599.3378	
PV Unit electricity exported	-1029.5040	0.4543	-467.6793	
Total			-2067.0171	(283)
Total Primary energy kWh/year			2835.1350	(286)
Dwelling Primary energy Rate (DPER)			24.9700	(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)	
Ground floor	59.6600 (1b)	x	2.5000 (2b)	=	149.1500	(1b) - (3b)
First floor	53.9000 (1c)	x	2.5000 (2c)	=	134.7500	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	113.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	283.9000	(5)

2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	4 * 10 =	40.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) =	0.1409 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3909 (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) =	0.3323 (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	0.4236	0.4153	0.4070	0.3655	0.3572	0.3156	0.3156	0.3073	0.3323	0.3572	0.3738	0.3904	(22b)
Effective ac	0.5897	0.5862	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5699	0.5762	(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			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.20)			17.3400	1.1450	19.8550			(27)
Heat Loss Floor 1			59.6600	0.1300	7.7558			(28a)
External Wall	91.0000	19.2300	71.7700	0.1800	12.9186			(29a)

Basement Wall	48.7500	48.7500	0.1800	8.7750		(29a)
Corridor Wall	19.2500	19.2500	0.1800	3.4650		(29a)
Ceiling to corridor	5.7600	5.7600	0.1100	0.6336		(30)
Total net area of external elements Aum(A, m2)		224.4200				(31)
Fabric heat loss, W/K = Sum (A x U)		(26)...(30) + (32) =		55.2930		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
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) = 65.0300 (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	55.2502	54.9238	54.6038	53.1009	52.8197	51.5107	51.5107	51.2683	52.0149	52.8197	53.3885	53.9832	(38)
Heat transfer coeff	120.2802	119.9537	119.6338	118.1308	117.8496	116.5406	116.5406	116.2982	117.0448	117.8496	118.4185	119.0132	(39)

Average = Sum(39)m / 12 = 118.1295

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0592	1.0563	1.0535	1.0403	1.0378	1.0262	1.0262	1.0241	1.0307	1.0378	1.0428	1.0480	(40)
HLP (average)												1.0402	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.8346 (42)

Hot water usage for mixer showers

71.7466	70.6684	69.0972	66.0910	63.8726	61.3986	59.9924	61.5516	63.2609	65.9172	68.9879	71.4717	(42a)

Hot water usage for baths

30.9766	30.5165	29.8687	28.6742	27.7798	26.7880	26.2523	26.8956	27.5960	28.6573	29.8764	30.8719	(42b)

Hot water usage for other uses

43.6590	42.0714	40.4838	38.8962	37.3086	35.7210	35.7210	37.3086	38.8962	40.4838	42.0714	43.6590	(42c)

Average daily hot water use (litres/day) 134.5581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	146.3822	143.2563	139.4497	133.6615	128.9610	123.9076	121.9657	125.7559	129.7532	135.0583	140.9357	146.0026	(44)
Energy conte	231.8336	203.9951	214.3290	182.9759	173.6063	152.3589	147.5069	155.7120	159.9986	183.2729	200.7888	228.6047	(45)
Energy content (annual)										Total = Sum(45)m =		2234.9826	
Distribution loss (46)m = 0.15 x (45)m	34.7750	30.5993	32.1494	27.4464	26.0409	22.8538	22.1260	23.3568	23.9998	27.4909	30.1183	34.2907	(46)

Water storage loss:

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

282.7597	249.9928	265.2551	232.2592	224.5323	201.6421	198.4330	206.6381	209.2819	234.1989	250.0721	279.5308	(62)
WWHRS -32.7995	-29.0082	-30.3757	-25.1523	-23.4410	-20.0586	-18.8018	-19.9938	-20.7534	-24.4660	-27.7170	-32.1921	(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

249.9601	220.9847	234.8794	207.1069	201.0913	181.5835	179.6312	186.6443	188.5285	209.7329	222.3551	247.3387	(64)
									Total per year (kWh/year) = Sum(64)m =		2529.8365	(64)

12Total per year (kWh/year) 2530 (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

117.8255	104.6266	112.0053	100.2661	98.4649	90.0860	89.7869	92.5151	92.6262	101.6791	106.1889	116.7519	(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	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	141.7295	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	146.9197	162.6611	146.9197	151.8170	146.9197	151.8170	146.9197	146.9197	151.8170	146.9197	151.8170	146.9197	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	276.5748	279.4448	272.2125	256.8159	237.3804	219.1138	206.9106	204.0406	211.2729	226.6695	246.1050	264.3716	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	37.1729	(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)	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	-113.3836	(71)
Water heating gains (Table 5)	158.3676	155.6943	150.5447	139.2585	132.3454	125.1194	120.6813	124.3483	128.6475	136.6654	147.4846	156.9246	(72)
Total internal gains	650.3810	666.3190	638.1957	616.4102	585.1643	561.5690	540.0304	540.8274	557.2562	578.7735	613.9254	636.7347	(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

East			10.1400		19.6403		0.6300		0.7000		0.7700	60.8635	(76)
South			7.2000		46.7521		0.6300		0.7000		0.7700	102.8739	(78)
Solar gains	163.7374	287.5429	410.6929	528.5295	603.2287	602.0139	579.2279	524.2038	452.2374	322.9995	197.8303	138.9437	(83)
Total gains	814.1184	953.8619	1048.8886	1144.9397	1188.3930	1163.5830	1119.2584	1065.0312	1009.4936	901.7730	811.7557	775.6784	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	26.2258	26.2972	26.3675	26.7030	26.7667	27.0673	27.0673	27.1238	26.9507	26.7667	26.6381	26.5050	
alpha	2.7484	2.7531	2.7578	2.7802	2.7844	2.8045	2.8045	2.8083	2.7967	2.7844	2.7759	2.7670	
util living area	0.9486	0.9219	0.8837	0.8109	0.7053	0.5600	0.4288	0.4633	0.6500	0.8363	0.9235	0.9541	(86)
MIT	18.7076	19.0477	19.4993	20.0648	20.5183	20.8231	20.9384	20.9220	20.7163	20.1191	19.3282	18.6558	(87)
Th 2	20.0343	20.0367	20.0390	20.0499	20.0520	20.0615	20.0615	20.0633	20.0578	20.0520	20.0478	20.0435	(88)
util rest of house	0.9414	0.9114	0.8679	0.7846	0.6632	0.4963	0.3470	0.3811	0.5902	0.8079	0.9114	0.9478	(89)
MIT 2	17.3552	17.7829	18.3477	19.0468	19.5816	19.9194	20.0253	20.0148	19.8137	19.1280	18.1491	17.2955	(90)
Living area fraction										fLA = Living area / (4) =		0.3104	(91)
MIT	17.7750	18.1755	18.7052	19.3628	19.8724	20.1999	20.3087	20.2964	20.0939	19.4357	18.5151	17.7178	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.7750	18.1755	18.7052	19.3628	19.8724	20.1999	20.3087	20.2964	20.0939	19.4357	18.5151	17.7178	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9188	0.8855	0.8410	0.7629	0.6545	0.5061	0.3693	0.4024	0.5926	0.7862	0.8865	0.9265	(94)
Useful gains	748.0526	844.6088	882.1447	873.5012	777.7610	588.9447	413.3090	428.5754	598.2697	708.9552	719.5890	718.6622	(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	1620.7758	1592.4493	1460.1527	1235.9769	963.1140	652.6144	432.2173	453.1473	701.5550	1041.2807	1351.7634	1608.7938	(97)
Space heating kWh	649.3060	502.5488	430.0379	260.9825	137.9026	0.0000	0.0000	0.0000	0.0000	247.2501	455.1656	662.2579	(98a)
Space heating requirement - total per year (kWh/year)												3345.4515	
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	649.3060	502.5488	430.0379	260.9825	137.9026	0.0000	0.0000	0.0000	0.0000	247.2501	455.1656	662.2579	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3345.4515	
Space heating per m2											(98c) / (4) =	29.4598	(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)
Space heating requirement	649.3060	502.5488	430.0379	260.9825	137.9026	0.0000	0.0000	0.0000	0.0000	247.2501	455.1656	662.2579	(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)	703.4735	544.4733	465.9133	282.7546	149.4069	0.0000	0.0000	0.0000	0.0000	267.8767	493.1371	717.5058	(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	249.9601	220.9847	234.8794	207.1069	201.0913	181.5835	179.6312	186.6443	188.5285	209.7329	222.3551	247.3387	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.1008	85.8430	85.3978	84.5794	83.2316	79.8000	79.8000	79.8000	79.8000	84.4298	85.6305	86.1577	(217)
Fuel for water heating, kWh/month	290.3109	257.4288	275.0416	244.8667	241.6045	227.5483	225.1018	233.8901	236.2512	248.4110	259.6681	287.0766	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	30.5270	24.4899	22.0504	16.1551	12.4787	10.1952	11.3835	14.7966	19.2194	25.2169	28.4824	31.3754	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-29.6106	-43.4327	-64.9074	-75.9429	-84.4306	-79.6887	-78.6785	-73.0085	-63.4610	-50.9440	-33.1360	-25.4044	(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	-11.9580	-25.5846	-51.6730	-78.8402	-105.4799	-106.4739	-105.2572	-88.5812	-64.1971	-37.0274	-16.1024	-9.4268	(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												3624.5411	(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												3027.1996	(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)	246.3704	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1403.2469	(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	5580.8643	(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	3624.5411	0.2100	761.1536	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3027.1996	0.2100	635.7119	(264)
Space and water heating			1396.8656	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	246.3704	0.1443	35.5589	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-702.6452	0.1338	-93.9992	
PV Unit electricity exported	-700.6017	0.1254	-87.8749	
Total			-181.8741	(269)
Total CO2, kg/year			1262.4796	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.1200	(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	3624.5411	1.1300	4095.7315	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	3027.1996	1.1300	3420.7355	(278)
Space and water heating			7516.4670	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	246.3704	1.5338	377.8912	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-702.6452	1.4944	-1050.0185	
PV Unit electricity exported	-700.6017	0.4604	-322.5449	
Total			-1372.5634	(283)
Total Primary energy kWh/year			6651.8956	(286)
Target Primary Energy Rate (TPER)			58.5800	(287)