ASSESSMENT HIVE



Energy Statement

PROJECT ADDRESS

107 Mayes Road, Wood Green, N22 6UP

DATE OF REPORT

24 September 2026

ACCEPTABLE

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Why have you received this report?

This report confirms whether your new build project meets energy and carbon targets set by Haringey Borough Council. They show how a property will reduce energy waste through smart design (like extra insulation) and generate clean power (like solar panels)

It includes:

✓ GLA Spreadsheet
✓ SAP Calculations – Notional
✓ SAP Calculations – Be Lean
✓ SAP Calculations – Be Clean
✓ SAP Calculations – Be Green
✓ Early-Stage Overheating Tool

What Happens Next?

✓ Check this report carefully
✓ Submit to Haringey Borough Council for approval
✓ Notify us if specifications change

Executive Summary

Address
107 Mayes Road, Wood Green, N22 6UP

Project
New Build Flats (4)

Documents Provided
Architects Plans including layout, elevations, section, and location

Software
SAP10

Accreditation
Elmhust Energy

Energy Assessor
Andrew Andreou
Accreditation No: AC35-0001

Energy Efficiency & Carbon Reduction Results
🟢 ACCEPTABLE 🟢

This report demonstrates that the proposed development can achieve a carbon emission reduction of **89%** over the notional development, see GLA Spreadsheet for full results.

Be 'Lean': It will achieve **25%** reduction in carbon emissions over Part L 2021 baseline.

Be 'Clean': district heating was deemed not viable for this project,

Be 'Green': Air Source Heat Pumps and Solar Panels with a peak power of 4.48 KWp split between the flats have been proposed for the specific scheme and will deliver a further **63%** reduction in regulated carbon emissions over Part L 2021 baseline,

Methodology

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

The Simplified Building Energy Model (SBEM) is the UK Government methodology for assessing and calculating the energy performance of non-domestic buildings.

SAP and SBEM calculations take into account a range of factors that contribute to energy efficiency, including:

- Materials used for the construction and the thermal insulation of the building fabric (u-values1 and thermal mass)
- Air permeability
- Efficiency, fuel source, and control of heating and cooling systems
- Ventilation system energy use and heat recovery
- Lighting energy
- Low carbon and energy saving or generating technologies

Approved Document Part L of current Building Regulations addresses the conservation of fuel and power. Part L is divided into two separate documents:

- Part L1 Newly constructed and extended or renovated existing dwellings
- Part L2 Newly constructed and extended or renovated existing non-domestic buildings

To comply with Part L, the calculations should demonstrate how the building will either meet or achieve a percentage reduction in the Building Emission Rate (BER) under the required Target Emission Rate (TER).

The calculation software has been used to calculate a baseline of energy demand and carbon dioxide emissions as appropriate from which any reductions or contributions have been measured.

Planning Policy Context

National Planning Policy Framework (NPPF) 2021

Emphasised the concept of sustainable development by encouraging local authorities to adopt proactive strategies to mitigate and adapt to climate change. It recommends the move to a low carbon future by:

Avoiding increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

Contributing to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for colocating potential heat customers and suppliers.

The London Plan 2021

Policy SI 2 Minimising Greenhouse Gas Emissions:

Major development should be net zero-carbon. Proposals should make the fullest contribution to reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy: i) Be lean: use less energy and manage demand during operation, ii) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly, iii) Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site, iiii) Be seen: monitor, verify and report on energy performance

Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non- residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either: i) through a cash in lieu contribution to the borough's carbon offset fund, or i) off-site provided that an alternative proposal is identified, and delivery is certain.

Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

Major development proposals should meet minimum standards outlines in the supplementary guidance Sustainable Design and Construction SPG (2014), to consider the following principles:

- Minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)
- Avoiding internal overheating and contributing to the urban heat island effect
- Efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
- Minimising pollution (including noise, air and urban runoff)
- Minimising the generation of waste and maximising reuse or recycling
- Avoiding impacts from natural hazards (including flooding)
- Ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions,
- Securing sustainable procurement of materials, using local supplies where feasible, and
- Promoting and protecting biodiversity and green infrastructure.

Haringey Local plan - Policy SP4: Working Towards a Low Carbon Haringey

The Haringey Local Planning Policy requirements are as follows.

A 20% CO2 reduction from on-site renewable technology sources.

Energy Strategy Guidance

The Energy strategy for the proposed development is based on the Building Regulations Part L; it adopts a set of principles to guide design and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. It seeks to incorporate energy efficiency through the approach detailed below.

Baseline Model

In accordance with London Plan Policy SI 2, a baseline model is run assuming the development complied with Part L 2021 of the Building Regulations. This baseline model is then used in the Energy Strategy process in comparison to the Be 'Lean', Be 'Clean' and Be 'Green' scenarios of the Energy Hierarchy, to establish the regulated CO^2 emissions from the development.

The baseline model used for this project assumed that any heating and hot water supply would be provided by gas boilers and any active cooling would be provided by electrically powered equipment. The comparative Be 'Lean' model assumes the same heating strategy.

Be 'Lean' – Demand Reduction

In accordance with London Plan Policy SI 2 the development must achieve at least a 10% improvement in energy efficiency on Building Regulations Part L 2021 baseline scenario.

The building fabric performance and engineering systems have been optimised in order to use less energy prior to the inclusion or consideration of Low and Zero Carbon (LZC) Technology.

Be 'Clean' – Supply Energy Efficiently

The Be Clean step of the energy hierarchy refers to the use of 'Clean energy supply'. This includes, but is not limited to, the use of Combined Heat and Power (CHP) and District Heat Networks. Policy SI 3 seeks new development to promote the use of CHP and district heating.

Be 'Green' – Renewable Energy

Once energy demand reduction measures have been applied, methods for generating low and zero carbon energy can be assessed. The following renewable technologies can be considered for the project: Biomass, Water source heat pump, air source heat pump, Wind energy and solar photovoltaic panels.

Be 'Seen' – Monitoring Performance

In accordance with London Plan Policy Guidance 'Be Seen' Energy Monitoring 1.2, the following is suggested:

To truly achieve net zero-carbon buildings we need to have a better understanding of their actual operational energy performance. Although Part L calculations and Energy Performance Certificates (EPCs) give an indication of the theoretical performance of buildings, it is well established that there is a 'performance gap' between design theory and measured reality.

To address this gap the London Plan Policy SI 2 'Minimising greenhouse gas emissions' introduces a fourth stage to the energy hierarchy; the 'be seen' stage, which requires monitoring and reporting of the actual operational energy performance of major developments for at least five years via the Mayor's 'be seen' monitoring portal.

The 'be seen' policy establishes post-construction monitoring as good practice, enabling developers and building owners to better understand their buildings and identify methods for improving energy performance from the project inception stage and throughout the building's lifetime.

Ensuring that the actual energy and carbon performance of buildings is aligned with the estimated energy and carbon performance will also be a key factor in achieving a zero-carbon London.

The energy performance data that will be collected will provide an evidence base which could help inform future industry-wide benchmarks or performance ratings for major building typologies based on in-use performance.

An effectively implemented post-construction monitoring regime can have a number of benefits including environmental (for example, carbon emissions reduction) and socio-economic (for example, reduced occupants' bills, raised awareness around energy usage).

Energy Strategy Renewables

Technology	Pros	Cons
Biomass Heating A biomass system designed for wood pellets, which have a high-energy content, would fuel this development.	Less volume of storage Less maintenance and produce considerably less ash residue	Nox Emissions which may impacts High Costs Not suitable for the project
Ground Source Heat Pump It circulates a mixture of water and antifreeze around a loop of pipe, called a ground loop, which is buried in the garden. Heat from the ground is absorbed into the fluid and passes through a heat exchanger into the heat pump	Use all through the year	High Costs Not suitable for this project
Air Source Heat Pump They are an efficient and environmentally- friendly way of heating using air drawn freely from the atmosphere. They operate rather like a refrigerator in reverse, absorbing heat from the air into a working fluid which is passed into a compressor where its temperature is increased before it is transferred into the heating and hot water circuits of the building	Can generate less CO_2 than conventional heating systems. Cheaper Provides heating and hot water Less maintenance	Needs electricity Can be noisy
Wind Turbines Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings.	Cheaper Less CO_2	Local wind speeds in the area are likely to be below the level generally required for investment in large wind turbines. Noise and signal interference. Detrimental aesthetic impact
Solar Photovoltaic Panels (PV) Photovoltaic panels extract the energy of the sun to generate electricity. They operate most efficiently when oriented to the south and are inclined to about 35 degrees.	Cheaper Less CO_2 No input power in order to generate electricity.	

On review of the available technologies, it has been concluded that the use of air source heat pumps and solar panels will be incorporated in the design.

Energy Strategy Modelling

The Specification			
	Baseline	**Be Lean**	**Be Green**
Thermal Elements			
Wall U Value	Part L notional building specifications	0.14	0.14
Roof U Value		0.10	0.10
Floor U Value		N/A – Dwellings below	N/A – Dwellings below
Door U Value		1.0	1.0
Window U value		1.0	1.0
Window G Value		0.63	0.40
Air Permeability rate		3.5	3.5
Thermal Bridging	Accredited Construction Details	Bespoke Psi Values	Bespoke Psi Values
Ventilation			
Ventilation Strategy	Natural with extractor fans	Natural with extractor fans	Mechanical with heat recovery
Can the windows be used for ventilation	Yes	Yes	Yes
Heating and Cooling Systems			
Heating System	Gas Boiler 89.5% efficiency	Gas Boiler 89.5% efficiency	Air Source Heat Pump
Heating Controls	TTZC	TTZC	TTZC
Waste Water Recovery	Yes	Yes	Yes
Lighting			
Low Energy Lighting	100%	100%	100%
Photovoltaic PV System			
PV	Yes - Part L 2021 notional building specifications	No PV	Yes, 4.48 kw split between the flats

🏠 This provides all the details of how the property/properties were modelled using the SAP10 software. The property/properties will be constructed as per the Be Green part of the specification.

The Energy Strategy Results

Overall Result

🟢 ACCEPTABLE 🟢

This report confirms that your new build project meets the energy and carbon targets set by Haringey Borough Council. It shows how a property will reduce energy waste through smart design and generate green power.

We reviewed: -

✓ External walls, roofs and floors
✓ Windows
✓ Doors
✓ Heating and Hot Water Systems
✓ Ventilation Strategy
✓ Renewables

Be Lean Results

Through passive design measures, efficient building fabric and engineering systems the building is estimated to achieve **25%** reduction in annual regulated CO_2 emissions over Part L benchmark, therefore demonstrating compliance with Building Regulations through passive measures alone without utilization of renewable technologies.

Be Clean Results

Not Applicable

Be Green Results

On review of the available technologies, it has been concluded that the use of air source heat pumps and solar panels will be incorporated in the design to achieve an additional CO_2 percentage reduction of **63%** to contribute to an overall reduction of **89%** in carbon emissions.

Be Seen Results

Smart metering equipment will be installed with display of energy usage and generation to raise awareness of occupants. This can help occupants to reduce demand and subsequent running costs.

GLA Spreadsheet Results

Carbon Dioxide Emissions for residential buildings		
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	3.3	
After energy demand reduction (be lean)	2.5	
After heat network connection (be clean)	2.5	
After renewable energy (be green)	0.3	

Regulated residential carbon dioxide savings		
	Tonnes per annum	**(%)**
Be lean: savings from energy demand reduction	0.8	25%
Be clean: savings from heat network	0	0%
Be green: savings from renewable energy	2.1	63%
Cumulative on site savings	3.0	89%
Annual savings from off-set payment	0.3	-
	Tonnes	
Cumulative savings for off-set payment	11	-
Cash in-lieu contribution (£)	1,078	-

Sustainability Strategy

Sustainable Design

London Plan Policy 5.3 Sustainable Design and Construction and Sustainable Design and Construction SPG (2014) to consider the following principles:

- Minimising carbon dioxide emissions across the site, including the building and services (such as heating and cooling systems)
- Avoiding internal overheating and contributing to the urban heat island effect
- Efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
- Minimising pollution (including noise, air and urban runoff)
- Minimising the generation of waste and maximising reuse or recycling
- Avoiding impacts from natural hazards (including flooding)
- Ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
- Securing sustainable procurement of materials, using local supplies where feasible, and
- Promoting and protecting biodiversity and green infrastructure.

The proposed project incorporates sustainable design and construction measures capable of mitigating and adapting to climate change to meet future needs. This section details site-specific initiatives which demonstrate how the conversion helps to meet the sustainability objectives set out in the National Planning Framework 2021.

Materials Efficiency

Materials can have a significant impact on environmental performance, both in construction but also ongoing use. Materials used for the building will have lower environmental impacts over their lifecycle. This applies to the materials used in the external walls, roof and glazing. This extends to elements of the materials category such as the basic building materials (internal walls) and the finishing elements (fascia, skirting, and furniture).

Overheating Strategy

Policy SI 4 Managing Heat Risk
Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

Minimise Heat Generation Through Energy Efficient Design
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.

Daylight
The design of the development has taken into consideration day lighting to habitable spaces to improve the wellbeing of occupants. Good levels of daylight will offer occupants a pleasant and highly valued connection to the outdoors and plenty of natural light. It will also reduce the use of artificial lighting and therefore energy use. All light fittings will be specified as low energy lighting.

Water: Water Efficiency

In domestic and non-domestic buildings, the demand for water can be reduced as much as 50% using a variety of simple and innovative strategies that are integrated into the plumbing and mechanical systems. In order to reduce water consumption, the proposed development will include efficient fixtures with low flow rates. Total internal water consumption will not exceed 105 litres/person/day.

Table 6. Water Fittings Standards

Schedule Appliance Water Consumption		
Appliance	**Flow rate or Capacity**	**Total Litres**
WC	Dual flush WC 4/2.6 litre	14.72
Basin	1.7 litres/min	5.98
Shower	8 litres/minute flow	24.00
Bath	160 litres	25.60
Sink	4 litres/min	14.13
W/machine	Default used	16.66
Dish Washer	Default used	3.90
		104.99

Pollution: Light, Air and Noise

Light
Light pollution can best be described as artificial light that is allowed to illuminate or intrude upon areas not intended to be lit. Light in the wrong place at the wrong time can be intrusive.

Intrusive light is over bright or poorly directed lights shining onto neighbouring property which affect the neighbours' right to enjoy their property. Therefore, the proposal will incorporate lighting measures in order to avoid causing a nuisance.

Air and Noise
The layout of the development can provide good internal air quality for habitable areas but not too much so as to waste heat.

The use of openable windows will create horizontal airflow. By achieving a good naturally ventilated building the energy demand for air conditioning and mechanical ventilation will thereby be eliminated within the development.

The development will not increase the air pollution of the area by reducing as a start, its energy use, which in turn will reduce emissions that lead to air pollution.

Other measures will include:

- Use of eco-friendly building materials
- Non-toxic paints
- Installation of energy efficient appliances and devices
- Use of renewable technologies
- Waste Management
- Considerate Construction
- All contractors would have been required to sign up to the nationally recognised Considerate Constructors Scheme which requires, amongst other things that dust emissions, potential noise pollution, impacts on water quality and the potential for ground contamination are minimised during demolition and construction. The Contractor would also be obliged to adhere to a site-specific Code of Construction Practice to reduce potential nuisance effects.

Diversion of waste from landfill

Where possible, segregation of recyclable and non-recyclable material would have been employed for all waste generated throughout the construction process. Furthermore, material will be re-used on-site where feasible;

Pre-fabrication of materials/elements such as bathroom pods, pipework and riser materials were considered;

Reusable packing solutions with key product manufacturers will be explored at the earliest opportunity. Solutions may include lets, bulk bags, steel stillages and returnable cable drums;

Operational Waste

A space for reuse and recycling has been included for the resident's exclusive use.

Flood Risk

The development site is located in a Low Flood Risk Area on the Environment Agency Flood Risk Map.

Sustainable Procurement

It is expected that all timber used in the development should come from a legal Source (FSC Scheme). At least 80% of the building materials will be responsibly sourced and will use suppliers who can provide an EMS certificate or equivalent. Materials rated with an A or B in the BRE Green

Other measures will be implemented:

- The reuse of existing materials from the demolition of existing buildings
- At least 20% of the total value of materials used should derive from recycled and reused content in the products and materials selected,
- Steel will have a high recycled content,
- Concrete will have a Ground Granulated Blast Furnace Slag (GGBS) value of 50%.
- Biodiversity and Green Infrastructure
- The proposed development will incorporate measures to support and enhance the environment through consideration of the existing site, including measures to mitigate the impact of the development and enhance site biodiversity.

Conclusion

The development has been designed to exceed Part L building regulations requirements. In line with the national and local policies, regulated CO_2 emissions from the development will be reduced by **89%** from the notional emissions once energy efficiency measures and lean measures are taken into account.

The use of air source heat pumps and solar panels will be incorporated in the design to achieve a CO_2 percentage reduction of **63%** to contribute to the overall reduction of **89%** in carbon emissions.

In order to achieve the required carbon emissions reduction, the report proposes the use of energy efficient measures outlined earlier in this report.

An appraisal of the proposed development has been undertaken against key sustainability objectives identified from relevant policy guidance. The framework for the appraisal was guided by the National Plan. This process has ensured that the development responds to the sustainable development objectives that are relevant to the area. Key sustainability initiatives in ecology, waste management, water, health and wellbeing, materials, pollution and Surface water management have been incorporated in the design of the proposed Development.

Our Details

This page sets out our company details, insurance schedules, code of conduct, accreditation details and complaints procedures. These measures ensure we provide a high-quality service to our clients, adding value and helping them achieve their goals. All our company policies and schedules can be found on our website using the link below.

https://assessmenthive.co.uk/about-assessment-hive/ethics-code-of-conduct/

Business Information

Assessment Hive Limited
Lucas End Farm
Crouch Lane
Goffs Oak
EN7 6TH
T: 020 3745 1093
E: info@assessmenthive.co.uk
W: www.assessmenthive.co.uk
Company Number: 11978321
VAT Registration Number: 351269894

Code of Business Conduct

We are dedicated to supplying energy assessment services that will meet and more importantly, exceed the expectations of our clients. In addition, we promote high quality work, take great pride in our work and develop lasting relationships.

To be successful in our mission, we embrace the following code of conduct, these define who we are, how we work, and what we stand for.

- Display our accreditation name and/or logos on relevant reports
- Act with integrity and carry out work with due skill, care and diligence.
- At all times maintain adequate and appropriate insurance to protect consumers.
- Conduct business in an honest, fair and professional manner.
- Handle complaints speedily and fairly.
- Ensure that products and services comply with industry registration rules and standards and relevant laws.
- Monitor our compliance with the code

Business Insurance

At all times we will maintain adequate and appropriate insurance to protect consumers. This also applies to our supply chain and any third-party suppliers we may use.

Accreditation

Elmhurst Energy
16 St Johns Business Park
Lutterworth
LE17 4HB
01455 883 236

Terms and Conditions

Terms and conditions provide clarity about what should happen in any given situation. They set out the key commercial terms we are offering to our clients and help the contractual parties understand their duties, rights, roles and responsibilities. Our terms are updated reviewed quarterly to ensure they aligned with our code.

GDPR Privacy Policy and Data Protection

Your data is extremely important to us, and we do everything in our power to protect it in line with GDPR. Our privacy policy sets out the information we hold, how we use it, how it can be accessed and how long it will be kept.

We will not provide your data to anyone (unless the law requires us to) without your specific consent to do so.

Complaints Policy and Procedure

We are committed to providing a quality service for our clients and working in an open and accountable way that builds the trust and respect. One of the ways in which we can continue to improve our service is by listening and responding to the views of our clients.

We see complaints as opportunities to highlight key areas where our services need improving such areas that we could not see. We also want you as our customers to be the vital components to our success. Please see out website for our current policy.

Appendix 1

SAP Calculations - Notional

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	91 B	**DER**	14.86	**TER**	16.20
Environmental	90 B	**% DER < TER**			8.27
CO_2 Emissions (t/year)	0.67	**DFEE**	45.54	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			-14.42
% DPER < TPER	9.87	**DPER**	78.19	**TPER**	86.75

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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		2 * 10 = 20.0000	(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) =		20.0000 / (5) = 0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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	
Main dwelling								
Windows			21.5600	1.1450	24.6870			(27)
Rooflights			1.0800	1.5918	1.7191			(27a)
External Wall	43.3900	21.5600	21.8300	0.1800	3.9294	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1100	5.8146	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1501			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200

P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900	
E3 Sill	9.8000	0.0500	0.4900	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.6064 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	72.1981	72.0349	71.8750	71.1238	70.9833	70.3290	70.3290	70.2079	70.5810	70.9833	71.2676	71.5648	(39)

Average = Sum(39)m / 12 = 71.1232

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3395	1.3365	1.3335	1.3196	1.3169	1.3048	1.3048	1.3026	1.3095	1.3169	1.3222	1.3277	(40)
HLP (average)												1.3195	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day) 92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)

Energy content (annual) Total = Sum(45)m = 1543.6206

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

23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)

Total heat required for water heating calculated for each month

210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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

210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)

Total per year (kWh/year) = Sum(64)m = 2100.4479 (64)

12Total per year (kWh/year) 2100 (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

65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	378.3502	386.3519	369.7144	355.2825	336.3071	320.0520	307.3081	308.6759	318.8835	334.0705	355.7908	370.4395	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains 85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains 463.8386	560.8275	683.5105	867.3425	1020.4886	1047.4505	988.5907	854.5143	700.4012	547.2968	463.4797	440.1538	(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	47.7809	47.8891	47.9957	48.5026	48.5986	49.0507	49.0507	49.1354	48.8756	48.5986	48.4047	48.2037	
alpha	4.1854	4.1926	4.1997	4.2335	4.2399	4.2700	4.2700	4.2757	4.2584	4.2399	4.2270	4.2136	
util living area	0.9886	0.9749	0.9341	0.8058	0.6068	0.4230	0.3115	0.3743	0.6424	0.9081	0.9781	0.9908	(86)
MIT	19.4721	19.7457	20.1735	20.6680	20.9159	20.9855	20.9969	20.9935	20.9238	20.5047	19.8977	19.4297	(87)
Th 2	19.8100	19.8124	19.8147	19.8255	19.8276	19.8371	19.8371	19.8388	19.8334	19.8276	19.8235	19.8192	(88)
util rest of house	0.9852	0.9676	0.9158	0.7620	0.5423	0.3490	0.2300	0.2816	0.5528	0.8741	0.9705	0.9880	(89)
MIT 2	18.0708	18.4167	18.9452	19.5197	19.7656	19.8298	19.8362	19.8368	19.7872	19.3622	18.6204	18.0232	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	18.6818	18.9961	19.4807	20.0204	20.2671	20.3337	20.3423	20.3411	20.2828	19.8603	19.1773	18.6364	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5318	18.8461	19.3307	19.8704	20.1171	20.1837	20.1923	20.1911	20.1328	19.7103	19.0273	18.4864	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9597	0.9068	0.7639	0.5588	0.3713	0.2550	0.3100	0.5771	0.8700	0.9634	0.9835	(94)
Useful gains	454.5707	538.2257	619.8028	662.5384	570.2328	388.9511	252.0850	264.9116	404.1675	476.1703	446.5352	432.8720	(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	1027.5056	1004.6089	922.2075	780.2551	597.4750	392.6930	252.6404	266.1649	425.7985	646.6799	850.0324	1022.4055	(97)
Space heating kWh	426.2635	313.4095	224.9891	84.7560	20.2682	0.0000	0.0000	0.0000	0.0000	126.8591	290.5180	438.6130	(98a)
Space heating requirement - total per year (kWh/year)												1925.6764	
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	426.2635	313.4095	224.9891	84.7560	20.2682	0.0000	0.0000	0.0000	0.0000	126.8591	290.5180	438.6130	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1925.6764	
Space heating per m2											(98c) / (4) =	35.7268	(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 %)	89.5000	(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	426.2635	313.4095	224.9891	84.7560	20.2682	0.0000	0.0000	0.0000	0.0000	126.8591	290.5180	438.6130	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	476.2721	350.1782	251.3845	94.6995	22.6460	0.0000	0.0000	0.0000	0.0000	141.7420	324.6011	490.0703	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.0129	-35.0509	-52.2500	-60.3832	-66.0439	-61.9777	-61.1649	-57.2404	-50.2184	-40.8253	-26.7451	-20.5617	(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	-12.3543	-27.2935	-57.6160	-91.0394	-123.7917	-125.5793	-123.5413	-102.4610	-72.0640	-39.9459	-16.7358	-9.6298	(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	2151.5938	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1358.5265	(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	3356.3009	(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	2151.5938	0.2100	451.8347	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			944.6772	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-556.4744	0.1340	-74.5756	
PV Unit electricity exported	-802.0521	0.1246	-99.9592	
Total			-174.5348	(269)
Total CO2, kg/year			800.8872	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.8600	(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	2151.5938	1.1300	2431.3010	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	1.1300	2651.9621	(278)
Space and water heating			5083.2631	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3644	1.5338	199.9573	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-556.4744	1.4953	-832.0769	
PV Unit electricity exported	-802.0521	0.4574	-366.8757	
Total			-1198.9526	(283)
Total Primary energy kWh/year			4214.3686	(286)
Dwelling Primary energy Rate (DPER)			78.1900	(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	53.9000 (1b)	x	2.6300 (2b)	=	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.9000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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 Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.8147 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
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 1.8051 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 88.3055 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.8637	43.1516	46.4924	43.2050	43.1079	40.1323	40.9169	42.1948	42.1276	45.2414	45.5941	48.7556	(61)
Total heat required for water heating calculated for each month	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(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	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(64)
										Total per year (kWh/year) = Sum(64)m =		1996.2229	(64)
12Total per year (kWh/year)												1996	(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	62.7107	55.1772	58.2478	50.6793	48.6418	43.3049	42.5178	44.6385	45.5568	51.3679	55.1950	61.9994	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	84.2886	82.1089	78.2901	70.3879	65.3787	60.1456	57.1475	59.9980	63.2733	69.0428	76.6597	83.3325	(72)
Total internal gains	374.0741	382.0304	365.5939	351.5778	332.8661	316.8864	304.3004	305.5181	315.5533	330.4367	351.7561	366.1755	(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	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	424.9536	485.8705	552.3527	656.3438	740.0854	749.8333	709.7970	630.3919	542.6195	457.3394	415.8481	407.6671	(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	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area													
	0.9912	0.9828	0.9596	0.8763	0.7104	0.5131	0.3790	0.4426	0.7137	0.9332	0.9831	0.9927	(86)
MIT	19.6549	19.8588	20.1877	20.6208	20.8886	20.9807	20.9963	20.9926	20.9171	20.5339	20.0273	19.6260	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house													
	0.9886	0.9778	0.9478	0.8437	0.6503	0.4353	0.2913	0.3462	0.6311	0.9075	0.9773	0.9905	(89)
MIT 2	18.3920	18.6517	19.0643	19.5873	19.8694	19.9565	19.9658	19.9661	19.9091	19.5034	18.8758	18.3620	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	18.9426	19.1780	19.5541	20.0379	20.3138	20.4030	20.4151	20.4137	20.3486	19.9527	19.3779	18.9131	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9426	19.1780	19.5541	20.0379	20.3138	20.4030	20.4151	20.4137	20.3486	19.9527	19.3779	18.9131	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9731	0.9425	0.8466	0.6718	0.4687	0.3296	0.3883	0.6635	0.9074	0.9731	0.9876	(94)
Useful gains	418.6806	472.7919	520.5748	555.6296	497.1834	351.4551	233.9352	244.7515	360.0515	414.9937	404.6643	402.5941	(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	928.4361	902.9864	823.4928	694.2474	535.7034	357.1036	234.7685	246.5038	386.0959	581.6610	767.0712	923.5850	(97)
Space heating kWh	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98a)
Space heating requirement - total per year (kWh/year)												1794.7342	
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	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1794.7342	
Space heating per m2											(98c) / (4) =	33.2975	(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 %)												92.4000	(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	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	410.4525	312.8687	243.9081	108.0139	31.0161	0.0000	0.0000	0.0000	0.0000	134.1997	282.3950	419.4992	(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	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.7226	85.4297	84.7857	83.3609	81.5174	80.3000	80.3000	80.3000	80.3000	83.7684	85.2078	85.7878	(217)
Fuel for water heating, kWh/month	234.1595	206.7820	220.2226	195.7021	192.5810	174.5926	171.8871	180.2249	183.6433	197.8253	208.0946	231.4567	(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	16.4901	13.2290	11.9112	8.7267	6.7407	5.5072	6.1491	7.9929	10.3819	13.6217	15.3856	16.9484	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-12.0404	-18.1098	-27.7558	-33.3520	-37.8870	-36.0888	-35.6638	-32.7112	-27.8473	-21.6382	-13.6382	-10.2824	(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	-3.7437	-8.0968	-16.5111	-25.4209	-34.2241	-34.5992	-34.1786	-28.6462	-20.6258	-11.7655	-5.0582	-2.9433	(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	1942.3531	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2397.1717	(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)	133.0846	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-532.8285	(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	4025.7808	(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	1942.3531	0.2100	407.8941	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2397.1717	0.2100	503.4061	(264)
Space and water heating			911.3002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.0846	0.1443	19.2082	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	0.1332	-40.9058	
PV Unit electricity exported	-225.8135	0.1252	-28.2691	
Total			-69.1749	(269)
Total CO2, kg/year			873.2628	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2000	(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	1942.3531	1.1300	2194.8590	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2397.1717	1.1300	2708.8040	(278)
Space and water heating			4903.6630	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.0846	1.5338	204.1296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	1.4923	-458.1722	
PV Unit electricity exported	-225.8135	0.4595	-103.7595	
Total			-561.9317	(283)
Total Primary energy kWh/year			4675.9617	(286)
Target Primary Energy Rate (TPER)			86.7500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	91 B	**DER**	14.86	**TER**	16.20
Environmental	90 B	**% DER < TER**			8.27
CO_2 Emissions (t/year)	0.67	**DFEE**	45.54	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			-14.42
% DPER < TPER	9.87	**DPER**	78.19	**TPER**	86.75

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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	
Main dwelling								
Windows			21.5600	1.1450	24.6870			(27)
Rooflights			1.0800	1.5918	1.7191			(27a)
External Wall	43.3900	21.5600	21.8300	0.1800	3.9294	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1100	5.8146	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1501			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367

E18 Party wall between dwellings	18.4100	0.0600	1.1046	
E14 Flat roof	16.5000	0.0800	1.3200	
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900	
E3 Sill	9.8000	0.0500	0.4900	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.6064 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	72.1981	72.0349	71.8750	71.1238	70.9833	70.3290	70.3290	70.2079	70.5810	70.9833	71.2676	71.5648	(39)
Average = Sum(39)m / 12 =												71.1232	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3395	1.3365	1.3335	1.3196	1.3169	1.3048	1.3048	1.3026	1.3095	1.3169	1.3222	1.3277	(40)
HLP (average)												1.3195	
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 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.5533	23.2035	22.7109	21.8027	21.1226	20.3685	19.9612	20.4503	20.9829	21.7898	22.7168	23.4737	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 51.9428 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.6690	55.1150	53.4182	51.3057	49.4214	47.4631	47.0558	48.7491	50.4859	52.4971	54.6282	56.5894	(44)
Energy conte	89.7498	78.4830	82.1018	70.2350	66.5307	58.3614	56.9099	60.3616	62.2542	71.2380	77.8279	88.6053	(45)
Energy content (annual)										Total = Sum(45)m =		862.6586	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(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	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(64)
										Total per year (kWh/year) = Sum(64)m =		733.2598	(64)
12Total per year (kWh/year)												733	(64)
Electric shower(s)	43.6330	38.8774	42.4526	40.5120	41.2722	39.3696	40.6820	41.2722	40.5120	42.4526	41.6543	43.6330	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		496.3227	(64a)
Heat gains from water heating, kWh/month	29.9801	26.3970	28.0598	25.0529	24.4558	22.2442	22.2638	23.1449	23.3570	25.7512	26.9520	29.7369	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	40.2958	39.2812	37.7147	34.7957	32.8707	30.8947	29.9245	31.1087	32.4403	34.6119	37.4333	39.9689	(72)
Total internal gains	327.0813	336.2027	322.0185	312.9856	297.3582	287.6355	277.0773	276.6288	284.7203	293.0057	309.5297	319.8119	(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	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains	412.5698	510.6782	635.8146	825.0457	981.5396	1015.0340	958.3599	822.4672	666.2381	506.2320	417.2186	389.5262	(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	47.7809	47.8891	47.9957	48.5026	48.5986	49.0507	49.0507	49.1354	48.8756	48.5986	48.4047	48.2037	
alpha	4.1854	4.1926	4.1997	4.2335	4.2399	4.2700	4.2700	4.2757	4.2584	4.2399	4.2270	4.2136	
util living area													
	0.9926	0.9818	0.9470	0.8256	0.6257	0.4357	0.3211	0.3883	0.6669	0.9263	0.9849	0.9941	(86)
MIT	19.3718	19.6529	20.0991	20.6317	20.9056	20.9838	20.9965	20.9925	20.9121	20.4470	19.8107	19.3296	(87)
Th 2	19.8100	19.8124	19.8147	19.8255	19.8276	19.8371	19.8371	19.8388	19.8334	19.8276	19.8235	19.8192	(88)
util rest of house													
	0.9903	0.9763	0.9316	0.7839	0.5606	0.3598	0.2372	0.2924	0.5766	0.8972	0.9794	0.9923	(89)
MIT 2	18.3556	18.6346	19.0681	19.5581	19.7729	19.8307	19.8363	19.8370	19.7913	19.4151	18.8014	18.3205	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	18.7987	19.0785	19.5176	20.0262	20.2667	20.3334	20.3422	20.3408	20.2800	19.8650	19.2415	18.7605	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7987	19.0785	19.5176	20.0262	20.2667	20.3334	20.3422	20.3408	20.2800	19.8650	19.2415	18.7605	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9876	0.9719	0.9269	0.7917	0.5858	0.3926	0.2738	0.3343	0.6130	0.8983	0.9757	0.9900	(94)
Useful gains	407.4533	496.3211	589.3599	653.1745	575.0195	398.4716	262.4153	274.9272	408.3867	454.7307	407.0994	385.6430	(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													
	1046.7758	1021.3496	935.6396	791.3369	608.0959	403.2254	263.1820	276.6739	436.1877	657.6613	865.2928	1042.0167	(97)
Space heating kWh													
	475.6559	352.8192	257.6321	99.4769	24.6088	0.0000	0.0000	0.0000	0.0000	150.9804	329.8992	488.3420	(98a)
Space heating requirement - total per year (kWh/year)												2179.4146	
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													
	475.6559	352.8192	257.6321	99.4769	24.6088	0.0000	0.0000	0.0000	0.0000	150.9804	329.8992	488.3420	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2179.4146	
Space heating per m2											(98c) / (4) =	40.4344	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	661.0929	520.4348	533.5798	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9569	0.9765	0.9573	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	632.6260	508.2161	510.8105	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1143.3615	1079.4829	924.4844	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	367.7296	425.0225	307.7733	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	91.9324	106.2556	76.9433	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												275.1314	(107)
Energy for space heating												40.4344	(99)
Energy for space cooling												5.1045	(108)
Total												45.5389	(109)
Fabric Energy Efficiency (DFEE)												45.5	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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								
TER Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.4563	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	35.8147	(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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8051	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.5533	23.2035	22.7109	21.8027	21.1226	20.3685	19.9612	20.4503	20.9829	21.7898	22.7168	23.4737	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day)	51.9428	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.6690	55.1150	53.4182	51.3057	49.4214	47.4631	47.0558	48.7491	50.4859	52.4971	54.6282	56.5894	(44)
Energy conte	89.7498	78.4830	82.1018	70.2350	66.5307	58.3614	56.9099	60.3616	62.2542	71.2380	77.8279	88.6053	(45)
Energy content (annual)										Total = Sum(45)m =		862.6586	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(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	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(64)
										Total per year (kWh/year) = Sum(64)m =		733.2598	(64)
12Total per year (kWh/year)												733	(64)
Electric shower(s)	43.6330	38.8774	42.4526	40.5120	41.2722	39.3696	40.6820	41.2722	40.5120	42.4526	41.6543	43.6330	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		496.3227	(64a)
Heat gains from water heating, kWh/month	29.9801	26.3970	28.0598	25.0529	24.4558	22.2442	22.2638	23.1449	23.3570	25.7512	26.9520	29.7369	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)													
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)													
	40.2958	39.2812	37.7147	34.7957	32.8707	30.8947	29.9245	31.1087	32.4403	34.6119	37.4333	39.9689	(72)
Total internal gains													
	327.0813	336.2027	322.0185	312.9856	297.3582	287.6355	277.0773	276.6288	284.7203	293.0057	309.5297	319.8119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	377.9608	440.0427	508.7773	617.7516	704.5774	720.5824	682.5739	601.5025	511.7865	419.9084	373.6217	361.3035	(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	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area													
	0.9945	0.9883	0.9698	0.8955	0.7347	0.5319	0.3937	0.4627	0.7425	0.9496	0.9889	0.9955	(86)
MIT	19.5593	19.7688	20.1103	20.5743	20.8714	20.9776	20.9956	20.9911	20.9017	20.4745	19.9440	19.5309	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house													
	0.9928	0.9847	0.9605	0.8661	0.6753	0.4521	0.3028	0.3625	0.6609	0.9288	0.9849	0.9942	(89)
MIT 2	18.6388	18.8482	19.1848	19.6288	19.8772	19.9574	19.9658	19.9663	19.9121	19.5505	19.0322	18.6178	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.0401	19.2496	19.5883	20.0410	20.3106	20.4022	20.4148	20.4131	20.3436	19.9534	19.4298	19.0159	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0401	19.2496	19.5883	20.0410	20.3106	20.4022	20.4148	20.4131	20.3436	19.9534	19.4298	19.0159	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9909	0.9817	0.9567	0.8688	0.6965	0.4864	0.3425	0.4062	0.6928	0.9287	0.9823	0.9925	(94)
Useful gains	374.5271	432.0019	486.7499	536.6887	490.7232	350.4639	233.7710	244.3447	354.5892	389.9739	367.0081	358.6038	(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													
	934.6190	907.5144	825.6551	694.4420	535.5095	357.0519	234.7542	246.4677	385.7865	581.6999	770.3121	930.0395	(97)
Space heating kWh													
	416.7084	319.5444	252.1455	113.5823	33.3210	0.0000	0.0000	0.0000	0.0000	142.6442	290.3789	425.1481	(98a)
Space heating requirement - total per year (kWh/year)												1993.4728	
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													
	416.7084	319.5444	252.1455	113.5823	33.3210	0.0000	0.0000	0.0000	0.0000	142.6442	290.3789	425.1481	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1993.4728	
Space heating per m2											(98c) / (4) =	36.9847	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	578.4508	455.3761	466.7628	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9308	0.9631	0.9378	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	538.4380	438.5622	437.7483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	805.0941	762.7081	670.8430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	191.9924	241.1646	173.4225	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	47.9981	60.2911	43.3556	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												151.6449	(107)
Energy for space heating												36.9847	(99)
Energy for space cooling												2.8134	(108)
Total												39.7981	(109)
Fabric Energy Efficiency (TFEE)												39.8	(109)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	91 B	**DER**	14.86	**TER**	16.20
Environmental	90 B	**% DER < TER**			8.27
CO_2 Emissions (t/year)	0.67	**DFEE**	45.54	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			-14.42
% DPER < TPER	9.87	**DPER**	78.19	**TPER**	86.75

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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		2 * 10 = 20.0000	(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) =		20.0000 / (5) = 0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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	
Main dwelling								
Windows			21.5600	1.1450	24.6870			(27)
Rooflights			1.0800	1.5918	1.7191			(27a)
External Wall	43.3900	21.5600	21.8300	0.1800	3.9294	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1100	5.8146	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1501			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200

P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900	
E3 Sill	9.8000	0.0500	0.4900	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.6064 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	72.1981	72.0349	71.8750	71.1238	70.9833	70.3290	70.3290	70.2079	70.5810	70.9833	71.2676	71.5648	(39)

Average = Sum(39)m / 12 = 71.1232

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3395	1.3365	1.3335	1.3196	1.3169	1.3048	1.3048	1.3026	1.3095	1.3169	1.3222	1.3277	(40)
HLP (average)												1.3195	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day) 92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)

Energy content (annual) Total = Sum(45)m = 1543.6206

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

23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)

Total heat required for water heating calculated for each month

210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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

210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)

Total per year (kWh/year) = Sum(64)m = 2100.4479 (64)

12Total per year (kWh/year) 2100 (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

65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	378.3502	386.3519	369.7144	355.2825	336.3071	320.0520	307.3081	308.6759	318.8835	334.0705	355.7908	370.4395	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains 85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains 463.8386	560.8275	683.5105	867.3425	1020.4886	1047.4505	988.5907	854.5143	700.4012	547.2968	463.4797	440.1538	(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	47.7809	47.8891	47.9957	48.5026	48.5986	49.0507	49.0507	49.1354	48.8756	48.5986	48.4047	48.2037	
alpha	4.1854	4.1926	4.1997	4.2335	4.2399	4.2700	4.2700	4.2757	4.2584	4.2399	4.2270	4.2136	
util living area	0.9886	0.9749	0.9341	0.8058	0.6068	0.4230	0.3115	0.3743	0.6424	0.9081	0.9781	0.9908	(86)
MIT	19.4721	19.7457	20.1735	20.6680	20.9159	20.9855	20.9969	20.9935	20.9238	20.5047	19.8977	19.4297	(87)
Th 2	19.8100	19.8124	19.8147	19.8255	19.8276	19.8371	19.8371	19.8388	19.8334	19.8276	19.8235	19.8192	(88)
util rest of house	0.9852	0.9676	0.9158	0.7620	0.5423	0.3490	0.2300	0.2816	0.5528	0.8741	0.9705	0.9880	(89)
MIT 2	18.0708	18.4167	18.9452	19.5197	19.7656	19.8298	19.8362	19.8368	19.7872	19.3622	18.6204	18.0232	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	18.6818	18.9961	19.4807	20.0204	20.2671	20.3337	20.3423	20.3411	20.2828	19.8603	19.1773	18.6364	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.5318	18.8461	19.3307	19.8704	20.1171	20.1837	20.1923	20.1911	20.1328	19.7103	19.0273	18.4864	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9800	0.9597	0.9068	0.7639	0.5588	0.3713	0.2550	0.3100	0.5771	0.8700	0.9634	0.9835	(94)
Useful gains	454.5707	538.2257	619.8028	662.5384	570.2328	388.9511	252.0850	264.9116	404.1675	476.1703	446.5352	432.8720	(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	1027.5056	1004.6089	922.2075	780.2551	597.4750	392.6930	252.6404	266.1649	425.7985	646.6799	850.0324	1022.4055	(97)
Space heating kWh	426.2635	313.4095	224.9891	84.7560	20.2682	0.0000	0.0000	0.0000	0.0000	126.8591	290.5180	438.6130	(98a)
Space heating requirement - total per year (kWh/year)												1925.6764	
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	426.2635	313.4095	224.9891	84.7560	20.2682	0.0000	0.0000	0.0000	0.0000	126.8591	290.5180	438.6130	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1925.6764	
Space heating per m2											(98c) / (4) =	35.7268	(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 %)	89.5000	(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	426.2635	313.4095	224.9891	84.7560	20.2682	0.0000	0.0000	0.0000	0.0000	126.8591	290.5180	438.6130	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	476.2721	350.1782	251.3845	94.6995	22.6460	0.0000	0.0000	0.0000	0.0000	141.7420	324.6011	490.0703	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.0129	-35.0509	-52.2500	-60.3832	-66.0439	-61.9777	-61.1649	-57.2404	-50.2184	-40.8253	-26.7451	-20.5617	(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	-12.3543	-27.2935	-57.6160	-91.0394	-123.7917	-125.5793	-123.5413	-102.4610	-72.0640	-39.9459	-16.7358	-9.6298	(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	2151.5938	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1358.5265	(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	3356.3009	(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	2151.5938	0.2100	451.8347	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			944.6772	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-556.4744	0.1340	-74.5756	
PV Unit electricity exported	-802.0521	0.1246	-99.9592	
Total			-174.5348	(269)
Total CO2, kg/year			800.8872	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.8600	(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	2151.5938	1.1300	2431.3010	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	1.1300	2651.9621	(278)
Space and water heating			5083.2631	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3644	1.5338	199.9573	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-556.4744	1.4953	-832.0769	
PV Unit electricity exported	-802.0521	0.4574	-366.8757	
Total			-1198.9526	(283)
Total Primary energy kWh/year			4214.3686	(286)
Dwelling Primary energy Rate (DPER)			78.1900	(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	53.9000 (1b)	x	2.6300 (2b)	=	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.9000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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 Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.8147 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
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 1.8051 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 88.3055 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.8637	43.1516	46.4924	43.2050	43.1079	40.1323	40.9169	42.1948	42.1276	45.2414	45.5941	48.7556	(61)
Total heat required for water heating calculated for each month	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(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	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(64)
										Total per year (kWh/year) = Sum(64)m =		1996.2229	(64)
12Total per year (kWh/year)												1996	(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	62.7107	55.1772	58.2478	50.6793	48.6418	43.3049	42.5178	44.6385	45.5568	51.3679	55.1950	61.9994	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	84.2886	82.1089	78.2901	70.3879	65.3787	60.1456	57.1475	59.9980	63.2733	69.0428	76.6597	83.3325	(72)
Total internal gains	374.0741	382.0304	365.5939	351.5778	332.8661	316.8864	304.3004	305.5181	315.5533	330.4367	351.7561	366.1755	(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	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	424.9536	485.8705	552.3527	656.3438	740.0854	749.8333	709.7970	630.3919	542.6195	457.3394	415.8481	407.6671	(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	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area													
	0.9912	0.9828	0.9596	0.8763	0.7104	0.5131	0.3790	0.4426	0.7137	0.9332	0.9831	0.9927	(86)
MIT	19.6549	19.8588	20.1877	20.6208	20.8886	20.9807	20.9963	20.9926	20.9171	20.5339	20.0273	19.6260	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house													
	0.9886	0.9778	0.9478	0.8437	0.6503	0.4353	0.2913	0.3462	0.6311	0.9075	0.9773	0.9905	(89)
MIT 2	18.3920	18.6517	19.0643	19.5873	19.8694	19.9565	19.9658	19.9661	19.9091	19.5034	18.8758	18.3620	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	18.9426	19.1780	19.5541	20.0379	20.3138	20.4030	20.4151	20.4137	20.3486	19.9527	19.3779	18.9131	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9426	19.1780	19.5541	20.0379	20.3138	20.4030	20.4151	20.4137	20.3486	19.9527	19.3779	18.9131	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9731	0.9425	0.8466	0.6718	0.4687	0.3296	0.3883	0.6635	0.9074	0.9731	0.9876	(94)
Useful gains	418.6806	472.7919	520.5748	555.6296	497.1834	351.4551	233.9352	244.7515	360.0515	414.9937	404.6643	402.5941	(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	928.4361	902.9864	823.4928	694.2474	535.7034	357.1036	234.7685	246.5038	386.0959	581.6610	767.0712	923.5850	(97)
Space heating kWh	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98a)
Space heating requirement - total per year (kWh/year)												1794.7342	
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	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1794.7342	
Space heating per m2											(98c) / (4) =	33.2975	(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 %)												92.4000	(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	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	410.4525	312.8687	243.9081	108.0139	31.0161	0.0000	0.0000	0.0000	0.0000	134.1997	282.3950	419.4992	(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	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.7226	85.4297	84.7857	83.3609	81.5174	80.3000	80.3000	80.3000	80.3000	83.7684	85.2078	85.7878	(217)
Fuel for water heating, kWh/month	234.1595	206.7820	220.2226	195.7021	192.5810	174.5926	171.8871	180.2249	183.6433	197.8253	208.0946	231.4567	(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	16.4901	13.2290	11.9112	8.7267	6.7407	5.5072	6.1491	7.9929	10.3819	13.6217	15.3856	16.9484	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-12.0404	-18.1098	-27.7558	-33.3520	-37.8870	-36.0888	-35.6638	-32.7112	-27.8473	-21.6382	-13.6382	-10.2824	(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	-3.7437	-8.0968	-16.5111	-25.4209	-34.2241	-34.5992	-34.1786	-28.6462	-20.6258	-11.7655	-5.0582	-2.9433	(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	1942.3531	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2397.1717	(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)	133.0846	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-532.8285	(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	4025.7808	(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	1942.3531	0.2100	407.8941	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2397.1717	0.2100	503.4061	(264)
Space and water heating			911.3002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.0846	0.1443	19.2082	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	0.1332	-40.9058	
PV Unit electricity exported	-225.8135	0.1252	-28.2691	
Total			-69.1749	(269)
Total CO2, kg/year			873.2628	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2000	(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	1942.3531	1.1300	2194.8590	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2397.1717	1.1300	2708.8040	(278)
Space and water heating			4903.6630	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.0846	1.5338	204.1296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	1.4923	-458.1722	
PV Unit electricity exported	-225.8135	0.4595	-103.7595	
Total			-561.9317	(283)
Total Primary energy kWh/year			4675.9617	(286)
Target Primary Energy Rate (TPER)			86.7500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	91 B	**DER**	14.86	**TER**	16.20
Environmental	90 B	**% DER < TER**			8.27
CO_2 Emissions (t/year)	0.67	**DFEE**	45.54	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			-14.42
% DPER < TPER	9.87	**DPER**	78.19	**TPER**	86.75

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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	
Main dwelling								
Windows			21.5600	1.1450	24.6870			(27)
Rooflights			1.0800	1.5918	1.7191			(27a)
External Wall	43.3900	21.5600	21.8300	0.1800	3.9294	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1100	5.8146	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1501			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12418.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							230.4059	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200

P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900	
E3 Sill	9.8000	0.0500	0.4900	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.6064 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)

Heat transfer coeff

	72.1981	72.0349	71.8750	71.1238	70.9833	70.3290	70.3290	70.2079	70.5810	70.9833	71.2676	71.5648	(39)

Average = Sum(39)m / 12 = 71.1232

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3395	1.3365	1.3335	1.3196	1.3169	1.3048	1.3048	1.3026	1.3095	1.3169	1.3222	1.3277	(40)
HLP (average)												1.3195	
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 1.8051 (42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

	34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day) 92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)

Energy content (annual) Total = Sum(45)m = 1543.6206

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

	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)

Water storage loss (or HIU loss):

Total storage loss

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)

Total heat required for water heating calculated for each month

	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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

	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)

Total per year (kWh/year) = Sum(64)m = 2100.4479 (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

	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4544	16.3911	13.3301	10.0917	7.5437	6.3687	6.8816	8.9450	12.0059	15.2443	17.7923	18.9673	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)

Water heating gains (Table 5)

	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)

Total internal gains

	428.6012	426.8405	413.6187	388.9887	364.6647	339.4707	326.4657	329.0926	341.7423	367.1274	394.1963	417.7839	(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	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains	514.0896	601.3161	727.4148	901.0487	1048.8462	1066.8691	1007.7482	874.9310	723.2600	580.3536	501.8852	487.4982	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	47.7809	47.8891	47.9957	48.5026	48.5986	49.0507	49.0507	49.1354	48.8756	48.5986	48.4047	48.2037	
alpha	4.1854	4.1926	4.1997	4.2335	4.2399	4.2700	4.2700	4.2757	4.2584	4.2399	4.2270	4.2136	
util living area	0.9836	0.9683	0.9211	0.7899	0.5935	0.4157	0.3057	0.3658	0.6267	0.8924	0.9713	0.9866	(86)
MIT	19.5685	19.8183	20.2381	20.6945	20.9226	20.9864	20.9971	20.9941	20.9306	20.5476	19.9678	19.5217	(87)
Th 2	19.8100	19.8124	19.8147	19.8255	19.8276	19.8371	19.8371	19.8388	19.8334	19.8276	19.8235	19.8192	(88)
util rest of house	0.9788	0.9593	0.9002	0.7448	0.5295	0.3428	0.2256	0.2751	0.5377	0.8547	0.9616	0.9827	(89)
MIT 2	18.1921	18.5066	19.0209	19.5464	19.7709	19.8303	19.8363	19.8370	19.7918	19.4086	18.7069	18.1394	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	18.7922	19.0785	19.5516	20.0470	20.2730	20.3343	20.3424	20.3414	20.2883	19.9052	19.2566	18.7421	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6422	18.9285	19.4016	19.8970	20.1230	20.1843	20.1924	20.1914	20.1383	19.7552	19.1066	18.5921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9724	0.9507	0.8916	0.7478	0.5462	0.3648	0.2502	0.3029	0.5621	0.8519	0.9538	0.9770	(94)
Useful gains	499.9012	571.6928	648.5296	673.7835	572.8549	389.2432	252.1346	265.0436	406.5629	494.4316	478.7015	476.2877	(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	1035.4773	1010.5432	927.3040	782.1465	597.8929	392.7407	252.6497	266.1888	426.1892	649.8663	855.6835	1029.9680	(97)
Space heating kWh	398.4686	294.9074	207.4082	78.0213	18.6282	0.0000	0.0000	0.0000	0.0000	115.6434	271.4271	411.9381	(98a)
Space heating requirement - total per year (kWh/year)												1796.4424	
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	398.4686	294.9074	207.4082	78.0213	18.6282	0.0000	0.0000	0.0000	0.0000	115.6434	271.4271	411.9381	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1796.4424	
Space heating per m2											(98c) / (4) =	33.3292	(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 %)	89.5000	(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	398.4686	294.9074	207.4082	78.0213	18.6282	0.0000	0.0000	0.0000	0.0000	115.6434	271.4271	411.9381	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	445.2164	329.5055	231.7410	87.1747	20.8136	0.0000	0.0000	0.0000	0.0000	129.2105	303.2705	460.2660	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.0129	-35.0509	-52.2500	-60.3832	-66.0439	-61.9777	-61.1649	-57.2404	-50.2184	-40.8253	-26.7451	-20.5617	(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	-12.3543	-27.2935	-57.6160	-91.0394	-123.7917	-125.5793	-123.5413	-102.4610	-72.0640	-39.9459	-16.7358	-9.6298	(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	2007.1982	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1358.5265	(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	3211.9053	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2007.1982	3.6400	73.0620	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	3.6400	85.4260	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	130.3644	16.4900	21.4971	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-556.4744	16.4900	-91.7626	
PV Unit electricity exported	-802.0521	5.5900	-44.8347	
Total			-136.5973	(252)
Total energy cost			149.5692	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5444	(257)
SAP value		91.1747	
SAP rating (Section 12)		91	(258)
SAP band		B	

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	2007.1982	0.2100	421.5116	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			914.3541	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-556.4744	0.1340	-74.5756	
PV Unit electricity exported	-802.0521	0.1246	-99.9592	
Total			-174.5348	(269)
Total CO2, kg/year			770.5642	(272)
CO2 emissions per m2			14.3000	(273)
EI value			89.5596	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b) x	2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)	
Pressure test		Yes		
Pressure Test Method		Blower Door		
Measured/design AP50		5.0000	(17)	
Infiltration rate		0.3911	(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) =	0.3324	(21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate													
	0.3657	0.3490	0.3490	0.3241	0.3241	0.2826	0.2909	0.3075	0.2992	0.3158	0.3158	0.3490	(22b)
Effective ac	0.5669	0.5609	0.5609	0.5525	0.5525	0.5399	0.5423	0.5473	0.5448	0.5499	0.5499	0.5609	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			21.5600	1.1450	24.6870			(27)
Rooflights			1.0800	1.5918	1.7191			(27a)
External Wall	43.3900	21.5600	21.8300	0.1800	3.9294	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1100	5.8146	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.1501			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.4563 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.6064 (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	26.5174	26.2395	26.2395	25.8470	25.8470	25.2574	25.3688	25.6014	25.4835	25.7226	25.7226	26.2395	(38)
Heat transfer coeff	71.1238	70.8460	70.8460	70.4534	70.4534	69.8638	69.9752	70.2079	70.0899	70.3290	70.3290	70.8460	(39)
Average = Sum(39)m / 12 =												70.4470	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3196	1.3144	1.3144	1.3071	1.3071	1.2962	1.2982	1.3026	1.3004	1.3048	1.3048	1.3144	(40)
HLP (average)												1.3070	
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		1.8051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day)	92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)										Total = Sum(45)m =		1543.6206	
Distribution loss (46)m = 0.15 x (45)m													
	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month													
	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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													
	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(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													
	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.4544	16.3911	13.3301	10.0917	7.5437	6.3687	6.8816	8.9450	12.0059	15.2443	17.7923	18.9673	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354 (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)												
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025 (71)
Water heating gains (Table 5)												
	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965 (72)
Total internal gains												
	428.6012	426.8405	413.6187	388.9887	364.6647	339.4707	326.4657	329.0926	341.7423	367.1274	394.1963	417.7839 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	12.4928	0.6300	0.7000	0.7700	32.7580	(75)
Northwest	12.9800	12.4928	0.6300	0.7000	0.7700	49.5570	(81)
Southeast	1.0800	29.0000	0.6300	0.7000	1.0000	12.4309	(82)

Solar gains	94.7460	174.3423	315.5033	533.7966	690.4518	785.1152	738.3094	606.9961	424.3747	233.0378	123.4245	79.0326	(83)
Total gains	523.3472	601.1828	729.1220	922.7853	1055.1165	1124.5859	1064.7751	936.0887	766.1169	600.1652	517.6208	496.8165	(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	48.5026	48.6928	48.6928	48.9641	48.9641	49.3774	49.2987	49.1354	49.2180	49.0507	49.0507	48.6928	
alpha	4.2335	4.2462	4.2462	4.2643	4.2643	4.2918	4.2866	4.2757	4.2812	4.2700	4.2700	4.2462	
util living area													
	0.9776	0.9602	0.8950	0.7161	0.4932	0.2848	0.1642	0.2023	0.4734	0.8269	0.9555	0.9813	(86)
MIT	19.7728	19.9880	20.4193	20.8231	20.9690	20.9978	20.9999	20.9997	20.9818	20.7331	20.1941	19.7309	(87)
Th 2	19.8255	19.8296	19.8296	19.8353	19.8353	19.8438	19.8422	19.8388	19.8405	19.8371	19.8371	19.8296	(88)
util rest of house													
	0.9708	0.9485	0.8668	0.6599	0.4229	0.2137	0.0882	0.1154	0.3751	0.7686	0.9398	0.9754	(89)
MIT 2	18.4614	18.7312	19.2488	19.6879	19.8164	19.8432	19.8422	19.8388	19.8330	19.6182	18.9975	18.4121	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.0331	19.2792	19.7591	20.1828	20.3190	20.3466	20.3469	20.3449	20.3339	20.1043	19.5192	18.9871	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8831	19.1292	19.6091	20.0328	20.1690	20.1966	20.1969	20.1949	20.1839	19.9543	19.3692	18.8371	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9397	0.8606	0.6700	0.4435	0.2355	0.1115	0.1421	0.4048	0.7752	0.9318	0.9687	(94)
Useful gains	504.2370	564.9416	627.4741	618.2489	467.9168	264.8317	118.7349	133.0119	310.1533	465.2532	482.3175	481.2901	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	958.9714	937.2333	836.6301	678.6636	476.8965	265.2434	118.7436	133.0391	314.2761	552.3847	771.4520	951.9616	(97)
Space heating kWh													
	338.3224	250.1800	155.6121	43.4985	6.6809	0.0000	0.0000	0.0000	0.0000	64.8258	208.1768	350.1797	(98a)
Space heating requirement - total per year (kWh/year)												1417.4762	
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													
	338.3224	250.1800	155.6121	43.4985	6.6809	0.0000	0.0000	0.0000	0.0000	64.8258	208.1768	350.1797	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1417.4762	
Space heating per m2											(98c) / (4) =	26.2983	(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 %)	89.5000	(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													
	338.3224	250.1800	155.6121	43.4985	6.6809	0.0000	0.0000	0.0000	0.0000	64.8258	208.1768	350.1797	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	378.0138	279.5307	173.8682	48.6017	7.4647	0.0000	0.0000	0.0000	0.0000	72.4311	232.5998	391.2622	(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													
	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													

(233a)m	-25.7036	-34.5470	-51.7016	-61.0288	-65.7607	-63.5758	-62.8288	-59.5674	-52.5283	-42.6491	-29.2257	-22.4628	(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	-13.9646	-26.5340	-56.3160	-93.4759	-122.3164	-135.5477	-133.8873	-114.4546	-80.4702	-43.7827	-19.7610	-11.2666	(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	1583.7723	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1423.3562	(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	2723.6496	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1583.7723	6.3400	100.4112	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	6.3400	148.7915	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	130.3644	26.0000	33.8947	(250)
Additional standing charges			113.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-571.5795	26.0000	-148.6107	
PV Unit electricity exported	-851.7767	5.8100	-49.4882	
Total			-198.0989	(252)
Total energy cost			220.3585	(255)

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	1583.7723	0.2100	332.5922	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			825.4347	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-571.5795	0.1340	-76.5930	
PV Unit electricity exported	-851.7767	0.1239	-105.4972	
Total			-182.0902	(269)
Total CO2, kg/year			674.0894	(272)

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	1583.7723	1.1300	1789.6627	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	1.1300	2651.9621	(278)
Space and water heating			4441.6248	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3644	1.5338	199.9573	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-571.5795	1.4952	-854.6305	
PV Unit electricity exported	-851.7767	0.4544	-387.0897	
Total			-1241.7202	(283)
Total Primary energy kWh/year			3529.9627	(286)

SAP 10 EPC IMPROVEMENTS

Flat 11

Current energy efficiency rating:	B 91
Current environmental impact rating:	B 90

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: B 91
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£56	£56	£0
Mains gas	£362	£362	£0
Space heating	£236	£236	£0
Water heating	£149	£149	£0
Lighting	£34	£34	£0
Generated (PV)	-£198	-£198	£0
Total cost of fuels	£220	£220	£0
Total cost of uses	£221	£221	£0
Delivered energy	51 kWh/m²	51 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	65 kWh/m²	65 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1411 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3911 (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) =	0.3324 (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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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								
Windows			21.5600	1.1450	24.6870			(27)
Rooflights			1.0800	1.5918	1.7191			(27a)
External Wall	43.3900	21.5600	21.8300	0.1800	3.9294	190.0000	4147.7000	(29a)

External Roof 1	53.9400	1.0800	52.8600	0.1100	5.8146	9.0000	475.7400 (30)
Total net area of external elements Aum(A, m2)			97.3300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1501		(33)
Main dwelling							
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000 (32)
Party Floor 1			53.9400			30.0000	1618.2000 (32d)
Internal Wall 1			49.9600			9.0000	449.6400 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 44.6064 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	72.1981	72.0349	71.8750	71.1238	70.9833	70.3290	70.3290	70.2079	70.5810	70.9833	71.2676	71.5648	(39)
Average = Sum(39)m / 12 =												71.1232	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3395	1.3365	1.3335	1.3196	1.3169	1.3048	1.3048	1.3026	1.3095	1.3169	1.3222	1.3277	(40)
HLP (average)												1.3195	
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 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day) 92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)										Total = Sum(45)m =		1543.6206	
Distribution loss (46)m = 0.15 x (45)m	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(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	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4544	16.3911	13.3301	10.0917	7.5437	6.3687	6.8816	8.9450	12.0059	15.2443	17.7923	18.9673	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	428.6012	426.8405	413.6187	388.9887	364.6647	339.4707	326.4657	329.0926	341.7423	367.1274	394.1963	417.7839	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

				W/m2	or Table 6b		or Table 6c		Table 6d				
Northeast				8.5800	11.2829		0.6300		0.7000		0.7700	29.5857	(75)
Northwest				12.9800	11.2829		0.6300		0.7000		0.7700	44.7578	(81)
Southeast				1.0800	26.0000		0.6300		0.7000		1.0000	11.1450	(82)
Solar gains	85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains	514.0896	601.3161	727.4148	901.0487	1048.8462	1066.8691	1007.7482	874.9310	723.2600	580.3536	501.8852	487.4982	(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	47.7809	47.8891	47.9957	48.5026	48.5986	49.0507	49.0507	49.1354	48.8756	48.5986	48.4047	48.2037	
alpha	4.1854	4.1926	4.1997	4.2335	4.2399	4.2700	4.2700	4.2757	4.2584	4.2399	4.2270	4.2136	
util living area	0.9836	0.9683	0.9211	0.7899	0.5935	0.4157	0.3057	0.3658	0.6267	0.8924	0.9713	0.9866	(86)
MIT	19.5685	19.8183	20.2381	20.6945	20.9226	20.9864	20.9971	20.9941	20.9306	20.5476	19.9678	19.5217	(87)
Th 2	19.8100	19.8124	19.8147	19.8255	19.8276	19.8371	19.8371	19.8388	19.8334	19.8276	19.8235	19.8192	(88)
util rest of house	0.9788	0.9593	0.9002	0.7448	0.5295	0.3428	0.2256	0.2751	0.5377	0.8547	0.9616	0.9827	(89)
MIT 2	18.1921	18.5066	19.0209	19.5464	19.7709	19.8303	19.8363	19.8370	19.7918	19.4086	18.7069	18.1394	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	18.7922	19.0785	19.5516	20.0470	20.2730	20.3343	20.3424	20.3414	20.2883	19.9052	19.2566	18.7421	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.6422	18.9285	19.4016	19.8970	20.1230	20.1843	20.1924	20.1914	20.1383	19.7552	19.1066	18.5921	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9724	0.9507	0.8916	0.7478	0.5462	0.3648	0.2502	0.3029	0.5621	0.8519	0.9538	0.9770	(94)
Useful gains	499.9012	571.6928	648.5296	673.7835	572.8549	389.2432	252.1346	265.0436	406.5629	494.4316	478.7015	476.2877	(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	1035.4773	1010.5432	927.3040	782.1465	597.8929	392.7407	252.6497	266.1888	426.1892	649.8663	855.6835	1029.9680	(97)
Space heating kWh	398.4686	294.9074	207.4082	78.0213	18.6282	0.0000	0.0000	0.0000	0.0000	115.6434	271.4271	411.9381	(98a)
Space heating requirement - total per year (kWh/year)												1796.4424	
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	398.4686	294.9074	207.4082	78.0213	18.6282	0.0000	0.0000	0.0000	0.0000	115.6434	271.4271	411.9381	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1796.4424	
Space heating per m2											(98c) / (4) =	33.3292	(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 %)	89.5000	(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	398.4686	294.9074	207.4082	78.0213	18.6282	0.0000	0.0000	0.0000	0.0000	115.6434	271.4271	411.9381	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	445.2164	329.5055	231.7410	87.1747	20.8136	0.0000	0.0000	0.0000	0.0000	129.2105	303.2705	460.2660	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-24.0129	-35.0509	-52.2500	-60.3832	-66.0439	-61.9777	-61.1649	-57.2404	-50.2184	-40.8253	-26.7451	-20.5617	(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	-12.3543	-27.2935	-57.6160	-91.0394	-123.7917	-125.5793	-123.5413	-102.4610	-72.0640	-39.9459	-16.7358	-9.6298	(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												2007.1982	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1358.5265	(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	3211.9053	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2007.1982	3.6400	73.0620	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	3.6400	85.4260	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	130.3644	16.4900	21.4971	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-556.4744	16.4900	-91.7626	
PV Unit electricity exported	-802.0521	5.5900	-44.8347	
Total			-136.5973	(252)
Total energy cost			149.5692	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5444	(257)
SAP value		91.1747	
SAP rating (Section 12)		91	(258)
SAP band		B	

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	2007.1982	0.2100	421.5116	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			914.3541	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-556.4744	0.1340	-74.5756	
PV Unit electricity exported	-802.0521	0.1246	-99.9592	
Total			-174.5348	(269)
Total CO2, kg/year			770.5642	(272)
CO2 emissions per m2			14.3000	(273)
EI value			89.5596	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.3657	0.3490	0.3490	0.3241	0.3241	0.2826	0.2909	0.3075	0.2992	0.3158	0.3158	0.3490	(22b)
Effective ac	0.5669	0.5609	0.5609	0.5525	0.5525	0.5399	0.5423	0.5473	0.5448	0.5499	0.5499	0.5609	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			21.5600	1.1450	24.6870			(27)
Rooflights			1.0800	1.5918	1.7191			(27a)
External Wall	43.3900	21.5600	21.8300	0.1800	3.9294	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1100	5.8146	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.1501			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.4563 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.6064 (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	26.5174	26.2395	26.2395	25.8470	25.8470	25.2574	25.3688	25.6014	25.4835	25.7226	25.7226	26.2395	(38)
Heat transfer coeff	71.1238	70.8460	70.8460	70.4534	70.4534	69.8638	69.9752	70.2079	70.0899	70.3290	70.3290	70.8460	(39)
Average = Sum(39)m / 12 =												70.4470	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3196	1.3144	1.3144	1.3071	1.3071	1.2962	1.2982	1.3026	1.3004	1.3048	1.3048	1.3144	(40)
HLP (average)												1.3070	
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	1.8051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day)	92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)										Total = Sum(45)m =		1543.6206	
Distribution loss (46)m = 0.15 x (45)m	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(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

	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718 (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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.4544	16.3911	13.3301	10.0917	7.5437	6.3687	6.8816	8.9450	12.0059	15.2443	17.7923	18.9673	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(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)

	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)

Water heating gains (Table 5)

	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)

Total internal gains

	428.6012	426.8405	413.6187	388.9887	364.6647	339.4707	326.4657	329.0926	341.7423	367.1274	394.1963	417.7839	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	12.4928	0.6300	0.7000	0.7700	32.7580	(75)
Northwest	12.9800	12.4928	0.6300	0.7000	0.7700	49.5570	(81)
Southeast	1.0800	29.0000	0.6300	0.7000	1.0000	12.4309	(82)

Solar gains	94.7460	174.3423	315.5033	533.7966	690.4518	785.1152	738.3094	606.9961	424.3747	233.0378	123.4245	79.0326	(83)
Total gains	523.3472	601.1828	729.1220	922.7853	1055.1165	1124.5859	1064.7751	936.0887	766.1169	600.1652	517.6208	496.8165	(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	48.5026	48.6928	48.6928	48.9641	48.9641	49.3774	49.2987	49.1354	49.2180	49.0507	49.0507	48.6928	
alpha	4.2335	4.2462	4.2462	4.2643	4.2643	4.2918	4.2866	4.2757	4.2812	4.2700	4.2700	4.2462	
util living area	0.9776	0.9602	0.8950	0.7161	0.4932	0.2848	0.1642	0.2023	0.4734	0.8269	0.9555	0.9813	(86)
MIT	19.7728	19.9880	20.4193	20.8231	20.9690	20.9978	20.9999	20.9997	20.9818	20.7331	20.1941	19.7309	(87)
Th 2	19.8255	19.8296	19.8296	19.8353	19.8353	19.8438	19.8422	19.8388	19.8405	19.8371	19.8371	19.8296	(88)
util rest of house	0.9708	0.9485	0.8668	0.6599	0.4229	0.2137	0.0882	0.1154	0.3751	0.7686	0.9398	0.9754	(89)
MIT 2	18.4614	18.7312	19.2488	19.6879	19.8164	19.8432	19.8422	19.8388	19.8330	19.6182	18.9975	18.4121	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.0331	19.2792	19.7591	20.1828	20.3190	20.3466	20.3469	20.3449	20.3339	20.1043	19.5192	18.9871	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8831	19.1292	19.6091	20.0328	20.1690	20.1966	20.1969	20.1949	20.1839	19.9543	19.3692	18.8371	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9635	0.9397	0.8606	0.6700	0.4435	0.2355	0.1115	0.1421	0.4048	0.7752	0.9318	0.9687	(94)
Useful gains	504.2370	564.9416	627.4741	618.2489	467.9168	264.8317	118.7349	133.0119	310.1533	465.2532	482.3175	481.2901	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	958.9714	937.2333	836.6301	678.6636	476.8965	265.2434	118.7436	133.0391	314.2761	552.3847	771.4520	951.9616	(97)
Space heating kWh	338.3224	250.1800	155.6121	43.4985	6.6809	0.0000	0.0000	0.0000	0.0000	64.8258	208.1768	350.1797	(98a)

Space heating requirement - total per year (kWh/year) 1417.4762

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

	338.3224	250.1800	155.6121	43.4985	6.6809	0.0000	0.0000	0.0000	0.0000	64.8258	208.1768	350.1797	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 1417.4762

Space heating per m2 (98c) / (4) = 26.2983 (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 %)	89.5000 (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	338.3224	250.1800	155.6121	43.4985	6.6809	0.0000	0.0000	0.0000	0.0000	64.8258	208.1768	350.1797	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	378.0138	279.5307	173.8682	48.6017	7.4647	0.0000	0.0000	0.0000	0.0000	72.4311	232.5998	391.2622	(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													
	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.7036	-34.5470	-51.7016	-61.0288	-65.7607	-63.5758	-62.8288	-59.5674	-52.5283	-42.6491	-29.2257	-22.4628	(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	-13.9646	-26.5340	-56.3160	-93.4759	-122.3164	-135.5477	-133.8873	-114.4546	-80.4702	-43.7827	-19.7610	-11.2666	(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	1583.7723	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1423.3562	(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	2723.6496	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1583.7723	6.3400	100.4112	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	6.3400	148.7915	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	130.3644	26.0000	33.8947	(250)
Additional standing charges			113.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-571.5795	26.0000	-148.6107	
PV Unit electricity exported	-851.7767	5.8100	-49.4882	
Total			-198.0989	(252)
Total energy cost			220.3585	(255)

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	1583.7723	0.2100	332.5922	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			825.4347	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-571.5795	0.1340	-76.5930	
PV Unit electricity exported	-851.7767	0.1239	-105.4972	
Total			-182.0902	(269)
Total CO2, kg/year			674.0894	(272)

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	1583.7723	1.1300	1789.6627	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	1.1300	2651.9621	(278)
Space and water heating			4441.6248	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3644	1.5338	199.9573	(282)

Energy saving/generation technologies			
PV Unit electricity used in dwelling	-571.5795	1.4952	-854.6305
PV Unit electricity exported	-851.7767	0.4544	-387.0897
Total			-1241.7202 (283)
Total Primary energy kWh/year			3529.9627 (286)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	92 A	**DER**	14.24	**TER**	16.46
Environmental	90 B	**% DER < TER**			13.49
CO_2 Emissions (t/year)	0.64	**DFEE**	42.69	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			-4.19
% DPER < TPER	15.09	**DPER**	74.86	**TPER**	88.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) =	0.3332	(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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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	
Main dwelling								
Windows			18.4800	1.1450	21.1603			(27)
Rooflights			1.7600	1.5918	2.8015			(27a)
External Wall	68.3800	18.4800	49.9000	0.1800	8.9820	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1100	5.6980	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6418			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800

P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200	
E3 Sill	8.4000	0.0500	0.4200	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.6338 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	76.0706	75.9077	75.7481	74.9982	74.8579	74.2048	74.2048	74.0838	74.4563	74.8579	75.1417	75.4384	(39)
Average = Sum(39)m / 12 =												74.9975	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4203	1.4172	1.4143	1.4003	1.3976	1.3855	1.3855	1.3832	1.3901	1.3976	1.4029	1.4085	(40)
HLP (average)												1.4003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day) 92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.2822	48.7879	45.3383	45.2363	42.1138	42.9371	44.2782	44.2076	47.4751	47.8453	50.9589	(61)
Total heat required for water heating calculated for each month	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
										Total per year (kWh/year) = Sum(64)m =		2094.2642	(64)
12Total per year (kWh/year)												2094	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7276	57.9016	61.1238	53.1816	51.0434	45.4430	44.6171	46.8425	47.8061	53.9041	57.9203	65.0096	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	88.3436	86.1630	82.1556	73.8633	68.6068	63.1153	59.9692	62.9604	66.3974	72.4518	80.4448	87.3785	(72)
Total internal gains	376.6565	384.5552	368.0006	353.6285	334.7461	318.5513	305.8708	307.2383	317.3975	332.5316	354.1505	368.7876	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	558.0244	706.8279	841.7982	991.5455	1092.6459	1089.2393	1041.3534	950.9527	847.9583	697.8173	573.8785	522.3551	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	65.4260	65.5664	65.7046	66.3615	66.4859	67.0711	67.0711	67.1806	66.8445	66.4859	66.2348	65.9743	
alpha	5.3617	5.3711	5.3803	5.4241	5.4324	5.4714	5.4714	5.4787	5.4563	5.4324	5.4157	5.3983	
util living area	0.9932	0.9770	0.9317	0.8046	0.6160	0.4334	0.3132	0.3575	0.5897	0.8868	0.9820	0.9951	(86)
MIT	19.9112	20.1916	20.5221	20.8329	20.9648	20.9956	20.9994	20.9988	20.9791	20.7565	20.2671	19.8616	(87)
Th 2	19.7478	19.7501	19.7524	19.7631	19.7651	19.7745	19.7745	19.7762	19.7709	19.7651	19.7611	19.7568	(88)
util rest of house	0.9902	0.9680	0.9072	0.7512	0.5425	0.3518	0.2262	0.2629	0.4923	0.8373	0.9733	0.9929	(89)
MIT 2	18.5334	18.8855	19.2836	19.6265	19.7436	19.7729	19.7744	19.7760	19.7615	19.5659	18.9929	18.4772	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.2665	19.5805	19.9426	20.2684	20.3934	20.4235	20.4262	20.4267	20.4094	20.1994	19.6709	19.2138	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1165	19.4305	19.7926	20.1184	20.2434	20.2735	20.2762	20.2767	20.2594	20.0494	19.5209	19.0638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9650	0.9081	0.7676	0.5717	0.3852	0.2618	0.3017	0.5320	0.8502	0.9711	0.9913	(94)
Useful gains	551.4500	682.1158	764.4676	761.1483	624.6119	419.5758	272.6624	286.9141	451.1051	593.2957	557.2764	517.8053	(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	1127.1028	1102.9754	1006.8893	841.3615	639.5410	421.0021	272.7945	287.1981	458.6080	707.3636	933.3307	1121.3051	(97)
Space heating kWh	428.2857	282.8177	180.3618	57.7535	11.1072	0.0000	0.0000	0.0000	0.0000	84.8665	270.7592	449.0039	(98a)
Space heating requirement - total per year (kWh/year)												1764.9554	
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	428.2857	282.8177	180.3618	57.7535	11.1072	0.0000	0.0000	0.0000	0.0000	84.8665	270.7592	449.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1764.9554	
Space heating per m2											(98c) / (4) =	32.9529	(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 %)	89.5000	(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	428.2857	282.8177	180.3618	57.7535	11.1072	0.0000	0.0000	0.0000	0.0000	84.8665	270.7592	449.0039	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	478.5315	315.9974	201.5215	64.5291	12.4103	0.0000	0.0000	0.0000	0.0000	94.8229	302.5242	501.6803	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	234.9956	207.1234	218.9232	191.2781	184.0649	164.3800	161.8327	169.6829	172.9012	194.2986	207.8968	232.5826	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.8723	-34.8484	-51.9530	-60.0462	-65.6815	-61.6409	-60.8335	-56.9277	-49.9394	-40.5930	-26.5897	-20.4411	(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	-12.2745	-27.1181	-57.2472	-90.4587	-123.0036	-124.7794	-122.7532	-101.8059	-71.6020	-39.6886	-16.6276	-9.5675	(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	1972.0172	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2339.9600	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1350.2930	(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	3177.3202	(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	1972.0172	0.2100	414.1236	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2339.9600	0.2100	491.3916	(264)
Space and water heating			905.5152	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-553.3668	0.1340	-74.1578	
PV Unit electricity exported	-796.9262	0.1246	-99.3201	
Total			-173.4779	(269)
Total CO2, kg/year			762.6770	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.2400	(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	1972.0172	1.1300	2228.3794	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.9600	1.1300	2644.1549	(278)
Space and water heating			4872.5343	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6360	1.5338	198.8400	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-553.3668	1.4953	-827.4254	
PV Unit electricity exported	-796.9262	0.4574	-364.5298	
Total			-1191.9552	(283)
Total Primary energy kWh/year			4009.5198	(286)
Dwelling Primary energy Rate (DPER)			74.8600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.5600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) =	0.3332	(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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.2108			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)

Average = Sum(39)m / 12 = 68.5665

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)
Total heat required for water heating calculated for each month	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
										Total per year (kWh/year) = Sum(64)m =		1990.0464	(64)
12Total per year (kWh/year)												1990	(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

62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)
Total internal gains	372.3406	380.2470	363.8928	349.9354	331.3157	315.3955	302.8723	304.0903	314.0776	328.9090	350.1283	364.4837	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)
Northwest	3.7800	11.2829	0.6300	0.7000	0.7700	13.0342	(81)
Southeast	1.1600	26.0000	0.6300	0.7000	1.0000	11.9705	(82)

Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	492.2504	593.2989	677.0812	771.5625	832.2109	824.7298	788.9450	729.5357	664.7708	570.3864	495.3965	466.0156	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area	0.9959	0.9878	0.9644	0.8829	0.7201	0.5202	0.3772	0.4250	0.6765	0.9303	0.9894	0.9970	(86)
MIT	19.9600	20.1764	20.4552	20.7698	20.9425	20.9927	20.9991	20.9982	20.9695	20.7192	20.2795	19.9242	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house	0.9942	0.9827	0.9499	0.8421	0.6480	0.4311	0.2806	0.3215	0.5787	0.8948	0.9840	0.9957	(89)
MIT 2	18.6646	18.9397	19.2857	19.6545	19.8206	19.8651	19.8679	19.8694	19.8496	19.6134	19.0810	18.6260	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.3539	19.5978	19.9080	20.2480	20.4176	20.4651	20.4698	20.4701	20.4455	20.2018	19.7187	19.3168	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3539	19.5978	19.9080	20.2480	20.4176	20.4651	20.4698	20.4701	20.4455	20.2018	19.7187	19.3168	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9813	0.9509	0.8574	0.6845	0.4786	0.3321	0.3767	0.6304	0.9070	0.9832	0.9948	(94)
Useful gains	488.8865	582.2180	643.8031	661.5051	569.6782	394.6975	262.0055	274.8063	419.0467	517.3632	487.0844	463.6138	(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	1048.3454	1021.1525	929.4023	778.0996	596.5158	397.5013	262.2707	275.3509	431.6551	657.0234	867.0405	1043.1710	(97)
Space heating kWh	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98a)
Space heating requirement - total per year (kWh/year)												1836.2687	
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	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.2687	
Space heating per m2										(98c) / (4) =		34.2843	(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 %)	92.4000 (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	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	450.4734	319.2251	229.9630	90.8528	21.6095	0.0000	0.0000	0.0000	0.0000	112.4537	296.0697	466.6564	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9127	85.4776	84.6659	83.0347	81.1887	80.3000	80.3000	80.3000	80.3000	83.4157	85.3136	86.0020	(217)
Fuel for water heating, kWh/month	232.9185	206.0266	219.8518	195.8630	192.7624	174.0524	171.3552	179.6673	183.0750	198.0470	207.1936	230.1657	(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	16.3980	13.1551	11.8447	8.6779	6.7031	5.4765	6.1148	7.9482	10.3239	13.5456	15.2997	16.8537	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.9664	-17.9997	-27.5889	-33.1538	-37.6644	-35.8780	-35.4558	-32.5194	-27.6824	-21.5080	-13.5549	-10.2192	(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	-3.7180	-8.0416	-16.3987	-25.2483	-33.9919	-34.3642	-33.9460	-28.4509	-20.4850	-11.6850	-5.0235	-2.9231	(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	1987.3037	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2390.9786	(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)	132.3410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-529.4674	(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	4067.1559	(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	1987.3037	0.2100	417.3338	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2390.9786	0.2100	502.1055	(264)
Space and water heating			919.4393	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.3410	0.1443	19.1009	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	0.1332	-40.6623	
PV Unit electricity exported	-224.2764	0.1252	-28.0767	
Total			-68.7389	(269)
Total CO2, kg/year			881.7305	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.4600	(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	1987.3037	1.1300	2245.6532	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2390.9786	1.1300	2701.8059	(278)
Space and water heating			4947.4591	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.3410	1.5338	202.9890	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	1.4923	-455.4483	
PV Unit electricity exported	-224.2764	0.4595	-103.0532	
Total			-558.5015	(283)
Total Primary energy kWh/year			4722.0474	(286)
Target Primary Energy Rate (TPER)			88.1600	(287)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	92 A	**DER**	14.24	**TER**	16.46
Environmental	90 B	**% DER < TER**			13.49
CO_2 Emissions (t/year)	0.64	**DFEE**	42.69	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			-4.19
% DPER < TPER	15.09	**DPER**	74.86	**TPER**	88.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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		2 * 10 =	20.0000	(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) =		20.0000 / (5) =	0.1420	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			5.0000	(17)
Infiltration rate			0.3920	(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) =	0.3332	(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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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	
Main dwelling								
Windows			18.4800	1.1450	21.1603			(27)
Rooflights			1.7600	1.5918	2.8015			(27a)
External Wall	68.3800	18.4800	49.9000	0.1800	8.9820	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1100	5.6980	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6418			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17917.1800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	334.5254	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020

E18 Party wall between dwellings	15.6000	0.0600	0.9360	
E14 Flat roof	26.0000	0.0800	2.0800	
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200	
E3 Sill	8.4000	0.0500	0.4200	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.9920 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	48.6338 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	76.0706	75.9077	75.7481	74.9982	74.8579	74.2048	74.2048	74.0838	74.4563	74.8579	75.1417	75.4384	(39)
Average = Sum(39)m / 12 =												74.9975	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4203	1.4172	1.4143	1.4003	1.3976	1.3855	1.3855	1.3832	1.3901	1.3976	1.4029	1.4085	(40)
HLP (average)												1.4003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7951	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	23.4812	23.1325	22.6414	21.7359	21.0579	20.3061	19.9000	20.3877	20.9186	21.7231	22.6472	23.4018	(42b)
Hot water usage for other uses													
	33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)
Average daily hot water use (litres/day)												51.7828	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	56.4944	54.9452	53.2536	51.1477	49.2692	47.3169	46.9108	48.5989	50.3304	52.3353	54.4599	56.4150	(44)
Energy conte	89.4733	78.2412	81.8488	70.0186	66.3258	58.1816	56.7346	60.1756	62.0624	71.0185	77.5881	88.3322	(45)
Energy content (annual)										Total = Sum(45)m =		860.0008	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(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													
	76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(64)
										Total per year (kWh/year) = Sum(64)m =		731.0006	(64)
12Total per year (kWh/year)												731	(64)
Electric shower(s)													
	43.4986	38.7576	42.3219	40.3872	41.1451	39.2484	40.5567	41.1451	40.3872	42.3219	41.5261	43.4986	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		494.7945	(64a)
Heat gains from water heating, kWh/month													
	29.8877	26.3157	27.9733	24.9758	24.3805	22.1757	22.1953	23.0736	23.2851	25.6719	26.8690	29.6453	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	40.1717	39.1602	37.5986	34.6886	32.7695	30.7996	29.8324	31.0129	32.3404	34.5052	37.3180	39.8458	(72)
Total internal gains													
	325.4845	334.5524	320.4435	311.4538	295.9088	286.2356	275.7339	275.2908	283.3405	291.5851	308.0238	318.2549	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	506.8525	656.8251	794.2411	949.3708	1053.8086	1056.9235	1011.2165	919.0052	813.9013	656.8708	527.7518	471.8225	(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	65.4260	65.5664	65.7046	66.3615	66.4859	67.0711	67.0711	67.1806	66.8445	66.4859	66.2348	65.9743	
alpha	5.3617	5.3711	5.3803	5.4241	5.4324	5.4714	5.4714	5.4787	5.4563	5.4324	5.4157	5.3983	
util living area	0.9956	0.9832	0.9446	0.8247	0.6353	0.4462	0.3224	0.3698	0.6113	0.9066	0.9876	0.9970	(86)
MIT	19.8359	20.1235	20.4703	20.8101	20.9593	20.9950	20.9993	20.9986	20.9752	20.7209	20.2026	19.7864	(87)
Th 2	19.7478	19.7501	19.7524	19.7631	19.7651	19.7745	19.7745	19.7762	19.7709	19.7651	19.7611	19.7568	(88)
util rest of house	0.9937	0.9763	0.9236	0.7733	0.5607	0.3624	0.2329	0.2720	0.5117	0.8623	0.9813	0.9956	(89)
MIT 2	18.7270	19.0110	19.3412	19.6403	19.7455	19.7730	19.7744	19.7760	19.7621	19.5827	19.1004	18.6851	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.3171	19.6030	19.9420	20.2628	20.3914	20.4232	20.4262	20.4266	20.4076	20.1883	19.6869	19.2711	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3171	19.6030	19.9420	20.2628	20.3914	20.4232	20.4262	20.4266	20.4076	20.1883	19.6869	19.2711	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9928	0.9753	0.9273	0.7954	0.5994	0.4070	0.2806	0.3241	0.5645	0.8794	0.9808	0.9949	(94)
Useful gains	503.2183	640.5982	736.5035	755.1228	631.6370	430.1919	283.7259	297.8787	459.4636	577.6563	517.6103	469.4204	(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	1142.3562	1116.0685	1018.2089	852.1878	650.6178	432.1119	283.9218	298.3026	469.6438	717.7630	945.8013	1136.9413	(97)
Space heating kWh	475.5186	319.5161	209.5888	69.8868	14.1218	0.0000	0.0000	0.0000	0.0000	104.2394	308.2976	496.6355	(98a)
Space heating requirement - total per year (kWh/year)												1997.8045	
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	475.5186	319.5161	209.5888	69.8868	14.1218	0.0000	0.0000	0.0000	0.0000	104.2394	308.2976	496.6355	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1997.8045	
Space heating per m2											(98c) / (4) =	37.3003	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	697.5249	549.1154	563.0371	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9765	0.9901	0.9831	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	681.1077	543.6835	553.5301	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1183.4027	1132.8357	1030.3424	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	361.6524	438.3292	354.7484	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	90.4131	109.5823	88.6871	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												288.6825	(107)
Energy for space heating												37.3003	(99)
Energy for space cooling												5.3899	(108)
Total												42.6902	(109)
Fabric Energy Efficiency (DFEE)												42.7	(109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 =	20.0000	(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) = 20.0000 / (5) = 0.1420 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3920 (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) = 0.3332 (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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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 Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.2108			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)

Average = Sum(39)m / 12 = 68.5665

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.4812	23.1325	22.6414	21.7359	21.0579	20.3061	19.9000	20.3877	20.9186	21.7231	22.6472	23.4018	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 51.7828 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.4944	54.9452	53.2536	51.1477	49.2692	47.3169	46.9108	48.5989	50.3304	52.3353	54.4599	56.4150	(44)
Energy conte	89.4733	78.2412	81.8488	70.0186	66.3258	58.1816	56.7346	60.1756	62.0624	71.0185	77.5881	88.3322	(45)

Energy content (annual) Total = Sum(45)m = 860.0008

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(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

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(64)

Total per year (kWh/year) = Sum(64)m = 731.0006 (64)
12Total per year (kWh/year) 731 (64)
Electric shower(s)

43.4986	38.7576	42.3219	40.3872	41.1451	39.2484	40.5567	41.1451	40.3872	42.3219	41.5261	43.4986	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 494.7945 (64a)

Heat gains from water heating, kWh/month

29.8877	26.3157	27.9733	24.9758	24.3805	22.1757	22.1953	23.0736	23.2851	25.6719	26.8690	29.6453	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	40.1717	39.1602	37.5986	34.6886	32.7695	30.7996	29.8324	31.0129	32.3404	34.5052	37.3180	39.8458	(72)
Total internal gains													
	325.4845	334.5524	320.4435	311.4538	295.9088	286.2356	275.7339	275.2908	283.3405	291.5851	308.0238	318.2549	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)
Northwest	3.7800	11.2829	0.6300	0.7000	0.7700	13.0342	(81)
Southeast	1.1600	26.0000	0.6300	0.7000	1.0000	11.9705	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	445.3943	547.6042	633.6319	733.0809	796.8040	795.5699	761.8066	700.7362	634.0337	533.0624	453.2919	419.7867	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area													
	0.9976	0.9917	0.9732	0.9010	0.7437	0.5382	0.3905	0.4421	0.7027	0.9463	0.9931	0.9983	(86)
MIT	19.8890	20.1099	20.3990	20.7378	20.9321	20.9913	20.9989	20.9978	20.9630	20.6786	20.2175	19.8537	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house													
	0.9965	0.9881	0.9618	0.8640	0.6719	0.4466	0.2906	0.3346	0.6039	0.9167	0.9895	0.9975	(89)
MIT 2	18.8537	19.0742	19.3570	19.6737	19.8230	19.8653	19.8679	19.8695	19.8500	19.6338	19.1913	18.8260	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.4046	19.6253	19.9115	20.2399	20.4132	20.4645	20.4697	20.4698	20.4423	20.1898	19.7374	19.3728	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4046	19.6253	19.9115	20.2399	20.4132	20.4645	20.4697	20.4698	20.4423	20.1898	19.7374	19.3728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9959	0.9872	0.9626	0.8777	0.7082	0.4954	0.3438	0.3920	0.6561	0.9267	0.9891	0.9970	(94)
Useful gains	443.5769	540.6174	609.9222	643.4155	564.3148	394.1044	261.9440	274.6626	415.9954	493.9855	448.3328	418.5396	(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													
	1051.8760	1023.0659	929.6433	777.5452	596.2139	397.4569	262.2642	275.3362	431.4343	656.1968	868.3227	1047.0379	(97)
Space heating kWh													
	452.5746	324.2054	237.8725	96.5734	23.7330	0.0000	0.0000	0.0000	0.0000	120.6852	302.3927	467.6027	(98a)
Space heating requirement - total per year (kWh/year)												2025.6395	
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													
	452.5746	324.2054	237.8725	96.5734	23.7330	0.0000	0.0000	0.0000	0.0000	120.6852	302.3927	467.6027	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2025.6395	
Space heating per m2											(98c) / (4) =	37.8200	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	637.0731	501.5256	514.1612	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9552	0.9811	0.9694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	608.5295	492.0559	498.4446	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	885.9655	848.9164	781.5350	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	199.7539	265.5042	210.6193	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	49.9385	66.3761	52.6548	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												168.9694	(107)
Energy for space heating												37.8200	(99)
Energy for space cooling												3.1548	(108)
Total												40.9748	(109)
Fabric Energy Efficiency (TFEE)												41.0	(109)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	92 A	**DER**	14.24	**TER**	16.46
Environmental	90 B	**% DER < TER**			13.49
CO_2 Emissions (t/year)	0.64	**DFEE**	42.69	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			-4.19
% DPER < TPER	15.09	**DPER**	74.86	**TPER**	88.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) =	0.3332	(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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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	
Main dwelling								
Windows			18.4800	1.1450	21.1603			(27)
Rooflights			1.7600	1.5918	2.8015			(27a)
External Wall	68.3800	18.4800	49.9000	0.1800	8.9820	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1100	5.6980	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6418			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800

P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200	
E3 Sill	8.4000	0.0500	0.4200	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.6338 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	76.0706	75.9077	75.7481	74.9982	74.8579	74.2048	74.2048	74.0838	74.4563	74.8579	75.1417	75.4384	(39)
Average = Sum(39)m / 12 =												74.9975	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4203	1.4172	1.4143	1.4003	1.3976	1.3855	1.3855	1.3832	1.3901	1.3976	1.4029	1.4085	(40)
HLP (average)												1.4003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day) 92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.2822	48.7879	45.3383	45.2363	42.1138	42.9371	44.2782	44.2076	47.4751	47.8453	50.9589	(61)
Total heat required for water heating calculated for each month	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
										Total per year (kWh/year) = Sum(64)m =		2094.2642	(64)
12Total per year (kWh/year)												2094	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		0.0000	(64a)
Heat gains from water heating, kWh/month	65.7276	57.9016	61.1238	53.1816	51.0434	45.4430	44.6171	46.8425	47.8061	53.9041	57.9203	65.0096	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	88.3436	86.1630	82.1556	73.8633	68.6068	63.1153	59.9692	62.9604	66.3974	72.4518	80.4448	87.3785	(72)
Total internal gains	376.6565	384.5552	368.0006	353.6285	334.7461	318.5513	305.8708	307.2383	317.3975	332.5316	354.1505	368.7876	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	558.0244	706.8279	841.7982	991.5455	1092.6459	1089.2393	1041.3534	950.9527	847.9583	697.8173	573.8785	522.3551	(84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	65.4260	65.5664	65.7046	66.3615	66.4859	67.0711	67.0711	67.1806	66.8445	66.4859	66.2348	65.9743	
alpha	5.3617	5.3711	5.3803	5.4241	5.4324	5.4714	5.4714	5.4787	5.4563	5.4324	5.4157	5.3983	
util living area	0.9932	0.9770	0.9317	0.8046	0.6160	0.4334	0.3132	0.3575	0.5897	0.8868	0.9820	0.9951	(86)
MIT	19.9112	20.1916	20.5221	20.8329	20.9648	20.9956	20.9994	20.9988	20.9791	20.7565	20.2671	19.8616	(87)
Th 2	19.7478	19.7501	19.7524	19.7631	19.7651	19.7745	19.7745	19.7762	19.7709	19.7651	19.7611	19.7568	(88)
util rest of house	0.9902	0.9680	0.9072	0.7512	0.5425	0.3518	0.2262	0.2629	0.4923	0.8373	0.9733	0.9929	(89)
MIT 2	18.5334	18.8855	19.2836	19.6265	19.7436	19.7729	19.7744	19.7760	19.7615	19.5659	18.9929	18.4772	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.2665	19.5805	19.9426	20.2684	20.3934	20.4235	20.4262	20.4267	20.4094	20.1994	19.6709	19.2138	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1165	19.4305	19.7926	20.1184	20.2434	20.2735	20.2762	20.2767	20.2594	20.0494	19.5209	19.0638	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9882	0.9650	0.9081	0.7676	0.5717	0.3852	0.2618	0.3017	0.5320	0.8502	0.9711	0.9913	(94)
Useful gains	551.4500	682.1158	764.4676	761.1483	624.6119	419.5758	272.6624	286.9141	451.1051	593.2957	557.2764	517.8053	(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	1127.1028	1102.9754	1006.8893	841.3615	639.5410	421.0021	272.7945	287.1981	458.6080	707.3636	933.3307	1121.3051	(97)
Space heating kWh	428.2857	282.8177	180.3618	57.7535	11.1072	0.0000	0.0000	0.0000	0.0000	84.8665	270.7592	449.0039	(98a)
Space heating requirement - total per year (kWh/year)												1764.9554	
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	428.2857	282.8177	180.3618	57.7535	11.1072	0.0000	0.0000	0.0000	0.0000	84.8665	270.7592	449.0039	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1764.9554	
Space heating per m2											(98c) / (4) =	32.9529	(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 %)	89.5000	(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	428.2857	282.8177	180.3618	57.7535	11.1072	0.0000	0.0000	0.0000	0.0000	84.8665	270.7592	449.0039	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	478.5315	315.9974	201.5215	64.5291	12.4103	0.0000	0.0000	0.0000	0.0000	94.8229	302.5242	501.6803	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	234.9956	207.1234	218.9232	191.2781	184.0649	164.3800	161.8327	169.6829	172.9012	194.2986	207.8968	232.5826	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.8723	-34.8484	-51.9530	-60.0462	-65.6815	-61.6409	-60.8335	-56.9277	-49.9394	-40.5930	-26.5897	-20.4411	(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	-12.2745	-27.1181	-57.2472	-90.4587	-123.0036	-124.7794	-122.7532	-101.8059	-71.6020	-39.6886	-16.6276	-9.5675	(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	1972.0172	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2339.9600	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1350.2930	(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	3177.3202	(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	1972.0172	0.2100	414.1236	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2339.9600	0.2100	491.3916	(264)
Space and water heating			905.5152	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-553.3668	0.1340	-74.1578	
PV Unit electricity exported	-796.9262	0.1246	-99.3201	
Total			-173.4779	(269)
Total CO2, kg/year			762.6770	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.2400	(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	1972.0172	1.1300	2228.3794	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.9600	1.1300	2644.1549	(278)
Space and water heating			4872.5343	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6360	1.5338	198.8400	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-553.3668	1.4953	-827.4254	
PV Unit electricity exported	-796.9262	0.4574	-364.5298	
Total			-1191.9552	(283)
Total Primary energy kWh/year			4009.5198	(286)
Dwelling Primary energy Rate (DPER)			74.8600	(287)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.5600						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) =	0.3332	(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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.2108			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)

Average = Sum(39)m / 12 = 68.5665

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)
Total heat required for water heating calculated for each month	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
										Total per year (kWh/year) = Sum(64)m =		1990.0464	(64)
12Total per year (kWh/year)												1990	(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

62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)
Total internal gains	372.3406	380.2470	363.8928	349.9354	331.3157	315.3955	302.8723	304.0903	314.0776	328.9090	350.1283	364.4837	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)
Northwest	3.7800	11.2829	0.6300	0.7000	0.7700	13.0342	(81)
Southeast	1.1600	26.0000	0.6300	0.7000	1.0000	11.9705	(82)

Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	492.2504	593.2989	677.0812	771.5625	832.2109	824.7298	788.9450	729.5357	664.7708	570.3864	495.3965	466.0156	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area	0.9959	0.9878	0.9644	0.8829	0.7201	0.5202	0.3772	0.4250	0.6765	0.9303	0.9894	0.9970	(86)
MIT	19.9600	20.1764	20.4552	20.7698	20.9425	20.9927	20.9991	20.9982	20.9695	20.7192	20.2795	19.9242	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house	0.9942	0.9827	0.9499	0.8421	0.6480	0.4311	0.2806	0.3215	0.5787	0.8948	0.9840	0.9957	(89)
MIT 2	18.6646	18.9397	19.2857	19.6545	19.8206	19.8651	19.8679	19.8694	19.8496	19.6134	19.0810	18.6260	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.3539	19.5978	19.9080	20.2480	20.4176	20.4651	20.4698	20.4701	20.4455	20.2018	19.7187	19.3168	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3539	19.5978	19.9080	20.2480	20.4176	20.4651	20.4698	20.4701	20.4455	20.2018	19.7187	19.3168	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9813	0.9509	0.8574	0.6845	0.4786	0.3321	0.3767	0.6304	0.9070	0.9832	0.9948	(94)
Useful gains	488.8865	582.2180	643.8031	661.5051	569.6782	394.6975	262.0055	274.8063	419.0467	517.3632	487.0844	463.6138	(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	1048.3454	1021.1525	929.4023	778.0996	596.5158	397.5013	262.2707	275.3509	431.6551	657.0234	867.0405	1043.1710	(97)
Space heating kWh	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98a)
Space heating requirement - total per year (kWh/year)												1836.2687	
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	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.2687	
Space heating per m2										(98c) / (4) =		34.2843	(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 %)	92.4000 (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	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	450.4734	319.2251	229.9630	90.8528	21.6095	0.0000	0.0000	0.0000	0.0000	112.4537	296.0697	466.6564	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9127	85.4776	84.6659	83.0347	81.1887	80.3000	80.3000	80.3000	80.3000	83.4157	85.3136	86.0020	(217)
Fuel for water heating, kWh/month	232.9185	206.0266	219.8518	195.8630	192.7624	174.0524	171.3552	179.6673	183.0750	198.0470	207.1936	230.1657	(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	16.3980	13.1551	11.8447	8.6779	6.7031	5.4765	6.1148	7.9482	10.3239	13.5456	15.2997	16.8537	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.9664	-17.9997	-27.5889	-33.1538	-37.6644	-35.8780	-35.4558	-32.5194	-27.6824	-21.5080	-13.5549	-10.2192	(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	-3.7180	-8.0416	-16.3987	-25.2483	-33.9919	-34.3642	-33.9460	-28.4509	-20.4850	-11.6850	-5.0235	-2.9231	(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	1987.3037	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2390.9786	(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)	132.3410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-529.4674	(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	4067.1559	(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	1987.3037	0.2100	417.3338	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2390.9786	0.2100	502.1055	(264)
Space and water heating			919.4393	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.3410	0.1443	19.1009	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	0.1332	-40.6623	
PV Unit electricity exported	-224.2764	0.1252	-28.0767	
Total			-68.7389	(269)
Total CO2, kg/year			881.7305	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.4600	(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	1987.3037	1.1300	2245.6532	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2390.9786	1.1300	2701.8059	(278)
Space and water heating			4947.4591	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.3410	1.5338	202.9890	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	1.4923	-455.4483	
PV Unit electricity exported	-224.2764	0.4595	-103.0532	
Total			-558.5015	(283)
Total Primary energy kWh/year			4722.0474	(286)
Target Primary Energy Rate (TPER)			88.1600	(287)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	92 A	**DER**	14.24	**TER**	16.46
Environmental	90 B	**% DER < TER**			13.49
CO_2 Emissions (t/year)	0.64	**DFEE**	42.69	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			-4.19
% DPER < TPER	15.09	**DPER**	74.86	**TPER**	88.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) =	0.3332	(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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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	
Main dwelling								
Windows			18.4800	1.1450	21.1603			(27)
Rooflights			1.7600	1.5918	2.8015			(27a)
External Wall	68.3800	18.4800	49.9000	0.1800	8.9820	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1100	5.6980	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6418			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800

P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200	
E3 Sill	8.4000	0.0500	0.4200	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				9.9920 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =		48.6338 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	76.0706	75.9077	75.7481	74.9982	74.8579	74.2048	74.2048	74.0838	74.4563	74.8579	75.1417	75.4384	(39)
Average = Sum(39)m / 12 =												74.9975	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4203	1.4172	1.4143	1.4003	1.3976	1.3855	1.3855	1.3832	1.3901	1.3976	1.4029	1.4085	(40)
HLP (average)												1.4003	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7951	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)
Hot water usage for other uses	34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)
Average daily hot water use (litres/day)												92.6655	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.2822	48.7879	45.3383	45.2363	42.1138	42.9371	44.2782	44.2076	47.4751	47.8453	50.9589	(61)
Total heat required for water heating calculated for each month	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
									Total per year (kWh/year) = Sum(64)m =			2094.2642	(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	65.7276	57.9016	61.1238	53.1816	51.0434	45.4430	44.6171	46.8425	47.8061	53.9041	57.9203	65.0096	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3513	16.2995	13.2556	10.0354	7.5015	6.3331	6.8432	8.8950	11.9389	15.1591	17.6929	18.8614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	88.3436	86.1630	82.1556	73.8633	68.6068	63.1153	59.9692	62.9604	66.3974	72.4518	80.4448	87.3785	(72)
Total internal gains	426.6947	424.8856	411.7276	387.2144	363.0132	337.9295	324.9893	327.6090	340.1966	365.4718	392.4095	415.9354	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	608.0626	747.1583	885.5252	1025.1314	1120.9130	1108.6175	1060.4719	971.3234	870.7574	730.7575	612.1374	569.5030	(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	65.4260	65.5664	65.7046	66.3615	66.4859	67.0711	67.0711	67.1806	66.8445	66.4859	66.2348	65.9743	
alpha	5.3617	5.3711	5.3803	5.4241	5.4324	5.4714	5.4714	5.4787	5.4563	5.4324	5.4157	5.3983	
util living area													
	0.9899	0.9711	0.9186	0.7887	0.6025	0.4260	0.3075	0.3501	0.5759	0.8700	0.9763	0.9926	(86)
MIT	19.9837	20.2448	20.5665	20.8491	20.9683	20.9960	20.9995	20.9989	20.9813	20.7823	20.3191	19.9309	(87)
Th 2	19.7478	19.7501	19.7524	19.7631	19.7651	19.7745	19.7745	19.7762	19.7709	19.7651	19.7611	19.7568	(88)
util rest of house													
	0.9857	0.9601	0.8910	0.7339	0.5298	0.3457	0.2221	0.2574	0.4800	0.8167	0.9652	0.9895	(89)
MIT 2	18.6246	18.9501	19.3330	19.6412	19.7459	19.7730	19.7744	19.7760	19.7626	19.5905	19.0561	18.5648	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.3478	19.6390	19.9893	20.2839	20.3963	20.4238	20.4263	20.4267	20.4111	20.2246	19.7281	19.2917	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1978	19.4890	19.8393	20.1339	20.2463	20.2738	20.2763	20.2767	20.2611	20.0746	19.5781	19.1417	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9572	0.8932	0.7514	0.5588	0.3786	0.2571	0.2954	0.5191	0.8316	0.9631	0.9874	(94)
Useful gains	597.8641	715.1898	790.9527	770.2397	626.3447	419.7112	272.6765	286.9485	452.0511	607.7342	589.5639	562.3441	(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	1133.2864	1107.4203	1010.4292	842.5225	639.7594	421.0206	272.7969	287.2037	458.7327	709.2507	937.6275	1127.1817	(97)
Space heating kWh	398.3542	263.5789	163.2905	52.0436	9.9806	0.0000	0.0000	0.0000	0.0000	75.5283	250.6057	420.2392	(98a)
Space heating requirement - total per year (kWh/year)												1633.6211	
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	398.3542	263.5789	163.2905	52.0436	9.9806	0.0000	0.0000	0.0000	0.0000	75.5283	250.6057	420.2392	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1633.6211	
Space heating per m2											(98c) / (4) =	30.5008	(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 %)												89.5000	(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	398.3542	263.5789	163.2905	52.0436	9.9806	0.0000	0.0000	0.0000	0.0000	75.5283	250.6057	420.2392	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	445.0885	294.5016	182.4475	58.1493	11.1515	0.0000	0.0000	0.0000	0.0000	84.3892	280.0064	469.5410	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	234.9956	207.1234	218.9232	191.2781	184.0649	164.3800	161.8327	169.6829	172.9012	194.2986	207.8968	232.5826	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.8723	-34.8484	-51.9530	-60.0462	-65.6815	-61.6409	-60.8335	-56.9277	-49.9394	-40.5930	-26.5897	-20.4411	(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	-12.2745	-27.1181	-57.2472	-90.4587	-123.0036	-124.7794	-122.7532	-101.8059	-71.6020	-39.6886	-16.6276	-9.5675	(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												1825.2750	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2339.9600	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1350.2930	(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	3030.5780	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1825.2750	3.6400	66.4400	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.9600	3.6400	85.1745	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	129.6360	16.4900	21.3770	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-553.3668	16.4900	-91.2502	
PV Unit electricity exported	-796.9262	5.5900	-44.5482	
Total			-135.7984	(252)
Total energy cost			143.3746	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5237	(257)
SAP value		91.5110	
SAP rating (Section 12)		92	(258)
SAP band		A	

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	1825.2750	0.2100	383.3077	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2339.9600	0.2100	491.3916	(264)
Space and water heating			874.6994	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-553.3668	0.1340	-74.1578	
PV Unit electricity exported	-796.9262	0.1246	-99.3201	
Total			-173.4779	(269)
Total CO2, kg/year			731.8612	(272)
CO2 emissions per m2			13.6600	(273)
EI value			90.0498	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) = 0.3332 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.3665	0.3498	0.3498	0.3249	0.3249	0.2832	0.2915	0.3082	0.2999	0.3165	0.3165	0.3498	(22b)
Effective ac	0.5672	0.5612	0.5612	0.5528	0.5528	0.5401	0.5425	0.5475	0.5450	0.5501	0.5501	0.5612	(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	
Windows			18.4800	1.1450	21.1603			(27)
Rooflights			1.7600	1.5918	2.8015			(27a)
External Wall	68.3800	18.4800	49.9000	0.1800	8.9820	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1100	5.6980	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6418			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 48.6338 (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	26.3644	26.0870	26.0870	25.6951	25.6951	25.1065	25.2178	25.4500	25.3323	25.5710	25.5710	26.0870	(38)
Heat transfer coeff	74.9982	74.7208	74.7208	74.3290	74.3290	73.7403	73.8516	74.0838	73.9661	74.2048	74.2048	74.7208	(39)
Average = Sum(39)m / 12 =												74.3225	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4003	1.3951	1.3951	1.3878	1.3878	1.3768	1.3789	1.3832	1.3810	1.3855	1.3855	1.3951	(40)
HLP (average)												1.3876	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day) 92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.2822	48.7879	45.3383	45.2363	42.1138	42.9371	44.2782	44.2076	47.4751	47.8453	50.9589	(61)
Total heat required for water heating calculated for each month	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
									Total per year (kWh/year) = Sum(64)m =			2094.2642	(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	65.7276	57.9016	61.1238	53.1816	51.0434	45.4430	44.6171	46.8425	47.8061	53.9041	57.9203	65.0096	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
18.3513 16.2995 13.2556 10.0354 7.5015 6.3331 6.8432 8.8950 11.9389 15.1591 17.6929 18.8614 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
233.5332 235.9565 229.8498 216.8492 200.4384 185.0145 174.7104 172.2871 178.3938 191.3943 207.8052 223.2291 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
47.5654 47.5654 47.5654 47.5654 47.5654 47.5654 47.5654 47.5654 47.5654 47.5654 47.5654 47.5654 (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)
-71.8023 -71.8023 -71.8023 -71.8023 -71.8023 -71.8023 -71.8023 -71.8023 -71.8023 -71.8023 -71.8023 -71.8023 (71)
Water heating gains (Table 5)
88.3436 86.1630 82.1556 73.8633 68.6068 63.1153 59.9692 62.9604 66.3974 72.4518 80.4448 87.3785 (72)
Total internal gains
426.6947 424.8856 411.7276 387.2144 363.0132 337.9295 324.9893 327.6090 340.1966 365.4718 392.4095 415.9354 (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	
Southeast	3.5200	39.1209	0.6300	0.7000	0.7700	42.0846	(77)
Southwest	9.2400	39.1209	0.6300	0.7000	0.7700	110.4722	(79)
Northwest	5.7200	12.4928	0.6300	0.7000	0.7700	21.8387	(81)
Southeast	1.7600	29.0000	0.6300	0.7000	1.0000	20.2578	(82)

Solar gains 194.6533 311.0266 460.5420 646.9968 749.2493 817.5814 782.2483 698.4730 571.7118 385.4704 243.6259 168.7893 (83)
Total gains 621.3479 735.9122 872.2696 1034.2113 1112.2626 1155.5109 1107.2376 1026.0820 911.9084 750.9422 636.0354 584.7247 (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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.3615	66.6079	66.6079	66.9590	66.9590	67.4935	67.3918	67.1806	67.2875	67.0711	67.0711	66.6079	
alpha	5.4241	5.4405	5.4405	5.4639	5.4639	5.4996	5.4928	5.4787	5.4858	5.4714	5.4714	5.4405	
util living area	0.9846	0.9637	0.8916	0.7122	0.5016	0.2933	0.1667	0.1949	0.4275	0.7865	0.9577	0.9882	(86)
MIT	20.1490	20.3606	20.6818	20.9217	20.9894	20.9996	21.0000	21.0000	20.9967	20.8933	20.5022	20.1032	(87)
Th 2	19.7631	19.7671	19.7671	19.7727	19.7727	19.7812	19.7796	19.7762	19.7779	19.7745	19.7745	19.7671	(88)
util rest of house	0.9780	0.9494	0.8550	0.6461	0.4236	0.2157	0.0853	0.1066	0.3303	0.7099	0.9376	0.9830	(89)
MIT 2	18.8446	19.1064	19.4766	19.7169	19.7677	19.7811	19.7796	19.7762	19.7770	19.7032	19.2890	18.7907	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.5387	19.7738	20.1179	20.3580	20.4178	20.4295	20.4290	20.4274	20.4260	20.3365	19.9345	19.4891	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3887	19.6238	19.9679	20.2080	20.2678	20.2795	20.2790	20.2774	20.2760	20.1865	19.7845	19.3391	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9473	0.8617	0.6705	0.4554	0.2475	0.1187	0.1428	0.3701	0.7376	0.9378	0.9806	(94)
Useful gains	606.0352	697.1649	751.6309	693.4771	506.5298	285.9731	131.3792	146.4907	337.5414	553.9108	596.4714	573.3586	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	1049.1273	1025.4529	909.1969	729.0183	510.4740	286.0728	131.3802	146.4936	338.4693	600.0557	844.7869	1041.5425	(97)
Space heating kWh	329.6606	220.6096	117.2291	25.5897	2.9345	0.0000	0.0000	0.0000	0.0000	34.3318	178.7872	348.3288	(98a)
Space heating requirement - total per year (kWh/year)												1257.4712	
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	329.6606	220.6096	117.2291	25.5897	2.9345	0.0000	0.0000	0.0000	0.0000	34.3318	178.7872	348.3288	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1257.4712	
Space heating per m2											(98c) / (4) =	23.4778	(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 %) 89.5000 (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	329.6606	220.6096	117.2291	25.5897	2.9345	0.0000	0.0000	0.0000	0.0000	34.3318	178.7872	348.3288	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	368.3358	246.4911	130.9822	28.5918	3.2788	0.0000	0.0000	0.0000	0.0000	38.3596	199.7622	389.1942	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	234.9956	207.1234	218.9232	191.2781	184.0649	164.3800	161.8327	169.6829	172.9012	194.2986	207.8968	232.5826	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-25.5533	-34.3474	-51.4075	-60.6885	-65.3997	-63.2316	-62.4897	-59.2435	-52.2376	-42.4070	-29.0565	-22.3313	(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	-13.8744	-26.3634	-55.9554	-92.8798	-121.5375	-134.6851	-133.0341	-113.7238	-79.9548	-43.5009	-19.6333	-11.1937	(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	1404.9958	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2339.9600	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1414.7298	(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	2545.8620	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1404.9958	6.3400	89.0767	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.9600	6.3400	148.3535	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	129.6360	26.0000	33.7054	(250)
Additional standing charges			113.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.3935	26.0000	-147.7823	
PV Unit electricity exported	-846.3363	5.8100	-49.1721	
Total			-196.9544	(252)
Total energy cost			209.5411	(255)

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	1404.9958	0.2100	295.0491	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2339.9600	0.2100	491.3916	(264)
Space and water heating			786.4407	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.3935	0.1340	-76.1646	
PV Unit electricity exported	-846.3363	0.1239	-104.8230	
Total			-180.9876	(269)
Total CO2, kg/year			636.0929	(272)

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	1404.9958	1.1300	1587.6452	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.9600	1.1300	2644.1549	(278)
Space and water heating			4231.8001	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6360	1.5338	198.8400	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.3935	1.4952	-849.8615	
PV Unit electricity exported	-846.3363	0.4544	-384.6158	
Total			-1234.4773	(283)
Total Primary energy kWh/year			3326.2636	(286)

SAP 10 EPC IMPROVEMENTS

Flat 10

Current energy efficiency rating: A 92
Current environmental impact rating: B 90

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Typical annual savings — Energy efficiency — Environmental impact

Recommended measures
(none)

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: A 92
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£56	£56	£0
Mains gas	£350	£350	£0
Space heating	£224	£224	£0
Water heating	£148	£148	£0
Lighting	£34	£34	£0
Generated (PV)	-£197	-£197	£0
Total cost of fuels	£209	£209	£0
Total cost of uses	£209	£209	£0
Delivered energy	48 kWh/m²	48 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	62 kWh/m²	62 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(5)

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2. Ventilation rate

	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1420 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3920 (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) =	0.3332 (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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(25)

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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	
Windows			18.4800	1.1450	21.1603			(27)
Rooflights			1.7600	1.5918	2.8015			(27a)
External Wall	68.3800	18.4800	49.9000	0.1800	8.9820	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1100	5.6980	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6418			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.9920 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.6338 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	76.0706	75.9077	75.7481	74.9982	74.8579	74.2048	74.2048	74.0838	74.4563	74.8579	75.1417	75.4384	(39)
Average = Sum(39)m / 12 =												74.9975	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4203	1.4172	1.4143	1.4003	1.3976	1.3855	1.3855	1.3832	1.3901	1.3976	1.4029	1.4085	(40)
HLP (average)												1.4003	
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		1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day)		92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.2822	48.7879	45.3383	45.2363	42.1138	42.9371	44.2782	44.2076	47.4751	47.8453	50.9589	(61)
Total heat required for water heating calculated for each month	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
										Total per year (kWh/year) = Sum(64)m =		2094.2642	(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	65.7276	57.9016	61.1238	53.1816	51.0434	45.4430	44.6171	46.8425	47.8061	53.9041	57.9203	65.0096	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3513	16.2995	13.2556	10.0354	7.5015	6.3331	6.8432	8.8950	11.9389	15.1591	17.6929	18.8614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	88.3436	86.1630	82.1556	73.8633	68.6068	63.1153	59.9692	62.9604	66.3974	72.4518	80.4448	87.3785	(72)
Total internal gains	426.6947	424.8856	411.7276	387.2144	363.0132	337.9295	324.9893	327.6090	340.1966	365.4718	392.4095	415.9354	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	608.0626	747.1583	885.5252	1025.1314	1120.9130	1108.6175	1060.4719	971.3234	870.7574	730.7575	612.1374	569.5030	(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	65.4260	65.5664	65.7046	66.3615	66.4859	67.0711	67.0711	67.1806	66.8445	66.4859	66.2348	65.9743	
alpha	5.3617	5.3711	5.3803	5.4241	5.4324	5.4714	5.4714	5.4787	5.4563	5.4324	5.4157	5.3983	
util living area	0.9899	0.9711	0.9186	0.7887	0.6025	0.4260	0.3075	0.3501	0.5759	0.8700	0.9763	0.9926	(86)
MIT	19.9837	20.2448	20.5665	20.8491	20.9683	20.9960	20.9995	20.9989	20.9813	20.7823	20.3191	19.9309	(87)
Th 2	19.7478	19.7501	19.7524	19.7631	19.7651	19.7745	19.7745	19.7762	19.7709	19.7651	19.7611	19.7568	(88)
util rest of house	0.9857	0.9601	0.8910	0.7339	0.5298	0.3457	0.2221	0.2574	0.4800	0.8167	0.9652	0.9895	(89)
MIT 2	18.6246	18.9501	19.3330	19.6412	19.7459	19.7730	19.7744	19.7760	19.7626	19.5905	19.0561	18.5648	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.3478	19.6390	19.9893	20.2839	20.3963	20.4238	20.4263	20.4267	20.4111	20.2246	19.7281	19.2917	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1978	19.4890	19.8393	20.1339	20.2463	20.2738	20.2763	20.2767	20.2611	20.0746	19.5781	19.1417	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9832	0.9572	0.8932	0.7514	0.5588	0.3786	0.2571	0.2954	0.5191	0.8316	0.9631	0.9874	(94)
Useful gains	597.8641	715.1898	790.9527	770.2397	626.3447	419.7112	272.6765	286.9485	452.0511	607.7342	589.5639	562.3441	(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	1133.2864	1107.4203	1010.4292	842.5225	639.7594	421.0206	272.7969	287.2037	458.7327	709.2507	937.6275	1127.1817	(97)
Space heating kWh	398.3542	263.5789	163.2905	52.0436	9.9806	0.0000	0.0000	0.0000	0.0000	75.5283	250.6057	420.2392	(98a)
Space heating requirement - total per year (kWh/year)												1633.6211	
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	398.3542	263.5789	163.2905	52.0436	9.9806	0.0000	0.0000	0.0000	0.0000	75.5283	250.6057	420.2392	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1633.6211	
Space heating per m2										(98c) / (4) =		30.5008	(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 %)	89.5000	(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	398.3542	263.5789	163.2905	52.0436	9.9806	0.0000	0.0000	0.0000	0.0000	75.5283	250.6057	420.2392	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	445.0885	294.5016	182.4475	58.1493	11.1515	0.0000	0.0000	0.0000	0.0000	84.3892	280.0064	469.5410	(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	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	234.9956	207.1234	218.9232	191.2781	184.0649	164.3800	161.8327	169.6829	172.9012	194.2986	207.8968	232.5826	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-23.8723	-34.8484	-51.9530	-60.0462	-65.6815	-61.6409	-60.8335	-56.9277	-49.9394	-40.5930	-26.5897	-20.4411	(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	-12.2745	-27.1181	-57.2472	-90.4587	-123.0036	-124.7794	-122.7532	-101.8059	-71.6020	-39.6886	-16.6276	-9.5675	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1825.2750	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2339.9600	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1350.2930	(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	3030.5780	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1825.2750	3.6400	66.4400	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.9600	3.6400	85.1745	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	129.6360	16.4900	21.3770	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-553.3668	16.4900	-91.2502	
PV Unit electricity exported	-796.9262	5.5900	-44.5482	
Total			-135.7984	(252)
Total energy cost			143.3746	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5237	(257)
SAP value		91.5110	
SAP rating (Section 12)		92	(258)
SAP band		A	

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	1825.2750	0.2100	383.3077	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2339.9600	0.2100	491.3916	(264)
Space and water heating			874.6994	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-553.3668	0.1340	-74.1578	
PV Unit electricity exported	-796.9262	0.1246	-99.3201	
Total			-173.4779	(269)
Total CO2, kg/year			731.8612	(272)
CO2 emissions per m2			13.6600	(273)
EI value			90.0498	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) =	0.3332	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.3665	0.3498	0.3498	0.3249	0.3249	0.2832	0.2915	0.3082	0.2999	0.3165	0.3165	0.3498	(22b)
Effective ac	0.5672	0.5612	0.5612	0.5528	0.5528	0.5401	0.5425	0.5475	0.5450	0.5501	0.5501	0.5612	(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	
Main dwelling								
Windows			18.4800	1.1450	21.1603			(27)
Rooflights			1.7600	1.5918	2.8015			(27a)
External Wall	68.3800	18.4800	49.9000	0.1800	8.9820	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1100	5.6980	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.6418			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		9.9920 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	48.6338 (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	26.3644	26.0870	26.0870	25.6951	25.6951	25.1065	25.2178	25.4500	25.3323	25.5710	25.5710	26.0870	(38)
Heat transfer coeff	74.9982	74.7208	74.7208	74.3290	74.3290	73.7403	73.8516	74.0838	73.9661	74.2048	74.2048	74.7208	(39)
Average = Sum(39)m / 12 =												74.3225	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.4003	1.3951	1.3951	1.3878	1.3878	1.3768	1.3789	1.3832	1.3810	1.3855	1.3855	1.3951	(40)
HLP (average)												1.3876	
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		1.7951 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day)		92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.2822	48.7879	45.3383	45.2363	42.1138	42.9371	44.2782	44.2076	47.4751	47.8453	50.9589	(61)
Total heat required for water heating calculated for each month	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(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													
	210.3211	185.3755	195.9363	171.1939	164.7381	147.1201	144.8403	151.8662	154.7466	173.8972	186.0676	208.1615	(64)
									Total per year (kWh/year) = Sum(64)m =			2094.2642	(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													
	65.7276	57.9016	61.1238	53.1816	51.0434	45.4430	44.6171	46.8425	47.8061	53.9041	57.9203	65.0096	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.3513	16.2995	13.2556	10.0354	7.5015	6.3331	6.8432	8.8950	11.9389	15.1591	17.6929	18.8614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	88.3436	86.1630	82.1556	73.8633	68.6068	63.1153	59.9692	62.9604	66.3974	72.4518	80.4448	87.3785	(72)
Total internal gains													
	426.6947	424.8856	411.7276	387.2144	363.0132	337.9295	324.9893	327.6090	340.1966	365.4718	392.4095	415.9354	(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	
Southeast	3.5200	39.1209	0.6300	0.7000	0.7700	42.0846	(77)
Southwest	9.2400	39.1209	0.6300	0.7000	0.7700	110.4722	(79)
Northwest	5.7200	12.4928	0.6300	0.7000	0.7700	21.8387	(81)
Southeast	1.7600	29.0000	0.6300	0.7000	1.0000	20.2578	(82)

Solar gains	194.6533	311.0266	460.5420	646.9968	749.2493	817.5814	782.2483	698.4730	571.7118	385.4704	243.6259	168.7893	(83)
Total gains	621.3479	735.9122	872.2696	1034.2113	1112.2626	1155.5109	1107.2376	1026.0820	911.9084	750.9422	636.0354	584.7247	(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	66.3615	66.6079	66.6079	66.9590	66.9590	67.4935	67.3918	67.1806	67.2875	67.0711	67.0711	66.6079	
alpha	5.4241	5.4405	5.4405	5.4639	5.4639	5.4996	5.4928	5.4787	5.4858	5.4714	5.4714	5.4405	
util living area													
	0.9846	0.9637	0.8916	0.7122	0.5016	0.2933	0.1667	0.1949	0.4275	0.7865	0.9577	0.9882	(86)
MIT	20.1490	20.3606	20.6818	20.9217	20.9894	20.9996	21.0000	21.0000	20.9967	20.8933	20.5022	20.1032	(87)
Th 2	19.7631	19.7671	19.7671	19.7727	19.7727	19.7812	19.7796	19.7762	19.7779	19.7745	19.7745	19.7671	(88)
util rest of house													
	0.9780	0.9494	0.8550	0.6461	0.4236	0.2157	0.0853	0.1066	0.3303	0.7099	0.9376	0.9830	(89)
MIT 2	18.8446	19.1064	19.4766	19.7169	19.7677	19.7811	19.7796	19.7762	19.7770	19.7032	19.2890	18.7907	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.5387	19.7738	20.1179	20.3580	20.4178	20.4295	20.4290	20.4274	20.4260	20.3365	19.9345	19.4891	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3887	19.6238	19.9679	20.2080	20.2678	20.2795	20.2790	20.2774	20.2760	20.1865	19.7845	19.3391	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9473	0.8617	0.6705	0.4554	0.2475	0.1187	0.1428	0.3701	0.7376	0.9378	0.9806	(94)
Useful gains	606.0352	697.1649	751.6309	693.4771	506.5298	285.9731	131.3792	146.4907	337.5414	553.9108	596.4714	573.3586	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	1049.1273	1025.4529	909.1969	729.0183	510.4740	286.0728	131.3802	146.4936	338.4693	600.0557	844.7869	1041.5425	(97)
Space heating kWh													
	329.6606	220.6096	117.2291	25.5897	2.9345	0.0000	0.0000	0.0000	0.0000	34.3318	178.7872	348.3288	(98a)
Space heating requirement - total per year (kWh/year)												1257.4712	
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													
	329.6606	220.6096	117.2291	25.5897	2.9345	0.0000	0.0000	0.0000	0.0000	34.3318	178.7872	348.3288	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1257.4712	
Space heating per m2											(98c) / (4) =	23.4778	(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 %)												89.5000	(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
329.6606 220.6096 117.2291 25.5897 2.9345 0.0000 0.0000 0.0000 0.0000 34.3318 178.7872 348.3288 (98)
Space heating efficiency (main heating system 1)
89.5000 89.5000 89.5000 89.5000 0.0000 0.0000 0.0000 0.0000 89.5000 89.5000 89.5000 (210)
Space heating fuel (main heating system)
368.3358 246.4911 130.9822 28.5918 3.2788 0.0000 0.0000 0.0000 0.0000 38.3596 199.7622 389.1942 (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
210.3211 185.3755 195.9363 171.1939 164.7381 147.1201 144.8403 151.8662 154.7466 173.8972 186.0676 208.1615 (64)
Efficiency of water heater
89.5000 (216)
(217)m 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 89.5000 (217)
Fuel for water heating, kWh/month
234.9956 207.1234 218.9232 191.2781 184.0649 164.3800 161.8327 169.6829 172.9012 194.2986 207.8968 232.5826 (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 16.0628 12.8862 11.6026 8.5005 6.5661 5.3645 5.9898 7.7857 10.1129 13.2687 14.9870 16.5092 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m -25.5533 -34.3474 -51.4075 -60.6885 -65.3997 -63.2316 -62.4897 -59.2435 -52.2376 -42.4070 -29.0565 -22.3313 (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 -13.8744 -26.3634 -55.9554 -92.8798 -121.5375 -134.6851 -133.0341 -113.7238 -79.9548 -43.5009 -19.6333 -11.1937 (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 1404.9958 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 89.5000
Water heating fuel used 2339.9600 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 129.6360 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -1414.7298 (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 2545.8620 (238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1404.9958	6.3400	89.0767	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.9600	6.3400	148.3535	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	129.6360	26.0000	33.7054	(250)
Additional standing charges			113.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.3935	26.0000	-147.7823	
PV Unit electricity exported	-846.3363	5.8100	-49.1721	
Total			-196.9544	(252)
Total energy cost			209.5411	(255)

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	1404.9958	0.2100	295.0491	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2339.9600	0.2100	491.3916	(264)
Space and water heating			786.4407	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.3935	0.1340	-76.1646	
PV Unit electricity exported	-846.3363	0.1239	-104.8230	
Total			-180.9876	(269)
Total CO2, kg/year			636.0929	(272)

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

	Energy	Primary energy factor	Primary energy	

	kWh/year	kg CO2/kWh	kWh/year	
Space heating - main system 1	1404.9958	1.1300	1587.6452	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2339.9600	1.1300	2644.1549	(278)
Space and water heating			4231.8001	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6360	1.5338	198.8400	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-568.3935	1.4952	-849.8615	
PV Unit electricity exported	-846.3363	0.4544	-384.6158	
Total			-1234.4773	(283)
Total Primary energy kWh/year			3326.2636	(286)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	93 A	**DER**	12.60	**TER**	14.07
Environmental	91 B	**% DER < TER**			10.45
CO_2 Emissions (t/year)	0.63	**DFEE**	37.20	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			-15.85
% DPER < TPER	12.17	**DPER**	66.01	**TPER**	75.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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	
Main dwelling								
Windows			23.1000	1.1450	26.4504			(27)
External Wall	44.4600	23.1000	21.3600	0.1800	3.8448	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1100	0.9724	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2676			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250

E3 Sill	10.5000	0.0500	0.5250		
E4 Jamb	30.8000	0.0500	1.5400		
E14 Flat roof	8.2000	0.0800	0.6560		
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560		

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.6106 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	68.4443	68.2769	68.1127	67.3418	67.1975	66.5260	66.5260	66.4016	66.7847	67.1975	67.4893	67.7944	(39)

Average = Sum(39)m / 12 = 67.3411

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1505	1.1477	1.1449	1.1320	1.1296	1.1183	1.1183	1.1162	1.1226	1.1296	1.1345	1.1396	(40)
HLP (average)												1.1320	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)

Energy content (annual) Total = Sum(45)m = 1621.0090

Distribution loss (46)m = 0.15 x (45)m												
25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)
Water storage loss (or HIU loss):												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month												
218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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													
218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)

Total per year (kWh/year) = Sum(64)m = 2197.4514 (64)
12Total per year (kWh/year) 2197 (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												
68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)													
-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains													
405.8951	414.9480	397.4377	382.1784	361.6923	344.4564	330.6821	332.0518	343.0471	359.0948	382.0868	397.3043	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	495.8401	593.1036	707.4587	877.3725	1017.7242	1040.3349	983.0267	857.5870	716.1173	573.8603	494.3631	471.3390	(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	48.9956	49.1158	49.2341	49.7978	49.9047	50.4084	50.4084	50.5028	50.2132	49.9047	49.6889	49.4653	
alpha	4.2664	4.2744	4.2823	4.3199	4.3270	4.3606	4.3606	4.3669	4.3475	4.3270	4.3126	4.2977	
util living area	0.9837	0.9657	0.9179	0.7808	0.5830	0.4043	0.2967	0.3536	0.6062	0.8827	0.9691	0.9867	(86)
MIT	19.6130	19.8849	20.2832	20.7243	20.9328	20.9890	20.9978	20.9954	20.9432	20.5911	20.0250	19.5702	(87)
Th 2	19.9598	19.9621	19.9643	19.9748	19.9768	19.9859	19.9859	19.9876	19.9824	19.9768	19.9728	19.9686	(88)
util rest of house	0.9796	0.9574	0.8992	0.7408	0.5276	0.3422	0.2289	0.2770	0.5296	0.8482	0.9601	0.9832	(89)
MIT 2	18.3678	18.7103	19.2002	19.7136	19.9243	19.9798	19.9852	19.9859	19.9453	19.5856	18.8986	18.3199	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	18.9644	19.2730	19.7190	20.1978	20.4075	20.4633	20.4703	20.4695	20.4233	20.0673	19.4382	18.9188	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8144	19.1230	19.5690	20.0478	20.2575	20.3133	20.3203	20.3195	20.2733	19.9173	19.2882	18.7688	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9735	0.9489	0.8908	0.7439	0.5432	0.3625	0.2513	0.3023	0.5524	0.8459	0.9524	0.9778	(94)
Useful gains	482.6929	562.7957	630.2114	652.6746	552.8255	377.0779	247.0424	259.2666	395.5483	485.4075	470.8429	460.8778	(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	993.4255	971.1046	890.1684	750.7093	575.0395	380.0807	247.4952	260.2611	412.2841	626.0995	822.5747	987.6858	(97)
Space heating kWh	379.9850	274.3836	193.4080	70.5850	16.5272	0.0000	0.0000	0.0000	0.0000	104.6748	253.2469	391.9452	(98a)
Space heating requirement - total per year (kWh/year)												1684.7558	
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	379.9850	274.3836	193.4080	70.5850	16.5272	0.0000	0.0000	0.0000	0.0000	104.6748	253.2469	391.9452	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1684.7558	
Space heating per m2											(98c) / (4) =	28.3200	(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 %)	89.5000	(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	379.9850	274.3836	193.4080	70.5850	16.5272	0.0000	0.0000	0.0000	0.0000	104.6748	253.2469	391.9452	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	424.5643	306.5739	216.0983	78.8659	18.4662	0.0000	0.0000	0.0000	0.0000	116.9551	282.9575	437.9276	(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	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4968	-38.6001	-57.4167	-66.1931	-72.2467	-67.7270	-66.8241	-62.6040	-55.0369	-44.8777	-29.4802	-22.6961	(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	-13.8377	-30.5455	-64.4348	-101.7484	-138.2983	-140.2908	-138.0318	-114.5195	-80.5855	-44.7048	-18.7440	-10.7891	(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	1882.4087	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2455.2529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1506.7294	(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	3059.1548	(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	1882.4087	0.2100	395.3058	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			910.9089	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-610.1992	0.1341	-81.8071	
PV Unit electricity exported	-896.5302	0.1246	-111.7468	
Total			-193.5539	(269)
Total CO2, kg/year			749.8114	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.6000	(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	1882.4087	1.1300	2127.1218	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	1.1300	2774.4358	(278)
Space and water heating			4901.5576	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-610.1992	1.4955	-912.5284	
PV Unit electricity exported	-896.5302	0.4575	-410.1395	
Total			-1322.6679	(283)
Total Primary energy kWh/year			3927.1362	(286)
Dwelling Primary energy Rate (DPER)			66.0100	(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	59.4900	(1b) x	2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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 Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.6683 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3150	48.8232	45.3711	45.2691	42.1443	42.9682	44.3102	44.2396	47.5095	47.8800	50.9589	(61)
Total heat required for water heating calculated for each month	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(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	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(64)
										Total per year (kWh/year) = Sum(64)m =		2095.7066	(64)
12Total per year (kWh/year)												2096	(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	65.7660	57.9435	61.1681	53.2201	51.0804	45.4759	44.6494	46.8765	47.8407	53.9432	57.9622	65.0474	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	88.3952	86.2254	82.2151	73.9168	68.6564	63.1610	60.0126	63.0060	66.4454	72.5042	80.5030	87.4293	(72)
Total internal gains	402.1439	411.0321	393.2564	378.2880	358.0788	341.1321	327.5236	328.7357	339.5500	355.2788	378.2265	393.6040	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northeast					7.2200	11.2829		0.6300	0.7000	0.7700		24.8961	(75)
Southwest					0.8500	36.7938		0.6300	0.7000	0.7700		9.5580	(79)
Northwest					6.8000	11.2829		0.6300	0.7000	0.7700		23.4479	(81)
Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	460.0459	525.7184	592.8279	697.0592	780.3840	789.0869	747.4547	667.0375	579.7075	493.5318	450.5039	441.2638	(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	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area	0.9863	0.9737	0.9418	0.8389	0.6606	0.4681	0.3435	0.4001	0.6569	0.9045	0.9739	0.9885	(86)
MIT	19.7871	19.9981	20.3146	20.7069	20.9222	20.9878	20.9978	20.9956	20.9447	20.6282	20.1495	19.7565	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house	0.9829	0.9673	0.9280	0.8061	0.6078	0.4048	0.2736	0.3231	0.5850	0.8759	0.9665	0.9857	(89)
MIT 2	18.6658	18.9332	19.3274	19.7969	20.0231	20.0888	20.0952	20.0960	20.0545	19.7218	19.1350	18.6336	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.2030	19.4434	19.8003	20.2328	20.4538	20.5195	20.5276	20.5270	20.4810	20.1560	19.6210	19.1716	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2030	19.4434	19.8003	20.2328	20.4538	20.5195	20.5276	20.5270	20.4810	20.1560	19.6210	19.1716	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9620	0.9232	0.8118	0.6296	0.4347	0.3071	0.3600	0.6168	0.8783	0.9618	0.9820	(94)
Useful gains	450.2692	505.7239	547.3013	565.8583	491.3636	343.0503	229.5475	240.1168	357.5812	433.4859	433.3061	433.3037	(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	901.6609	877.4700	800.2875	673.1648	518.7107	346.7884	230.0948	241.2596	375.4734	566.2453	745.5903	896.0798	(97)
Space heating kWh	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98a)
Space heating requirement - total per year (kWh/year)												1539.4004	
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	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.4004	
Space heating per m2											(98c) / (4) =	25.8766	(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 %)												92.4000	(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	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	363.4582	270.3608	203.7031	83.6154	22.0197	0.0000	0.0000	0.0000	0.0000	106.8971	243.3383	372.6250	(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	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3776	85.0198	84.2939	82.7892	81.1626	80.3000	80.3000	80.3000	80.3000	83.2147	84.7866	85.4506	(217)
Fuel for water heating, kWh/month	246.4774	218.1959	232.6126	206.9325	203.1200	183.3457	180.5045	189.2604	192.8501	209.1254	219.6130	243.7376	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	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	17.9901	14.4323	12.9947	9.5205	7.3539	6.0082	6.7085	8.7199	11.3263	14.8607	16.7851	18.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.2539	-19.9158	-30.4928	-36.5992	-41.5339	-39.5415	-39.0700	-35.8526	-30.5508	-23.7735	-15.0044	-11.3205	(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	-4.1671	-9.0087	-18.3650	-28.2691	-38.0559	-38.4777	-38.0158	-31.8682	-22.9496	-13.0946	-5.6310	-3.2769	(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												1666.0177	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	80.3000	
Water heating fuel used	2525.7750	(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)	145.1902	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-588.0885	(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	3834.8944	(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	1666.0177	0.2100	349.8637	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2525.7750	0.2100	530.4127	(264)
Space and water heating			880.2765	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	145.1902	0.1443	20.9554	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	0.1333	-44.8970	
PV Unit electricity exported	-251.1796	0.1252	-31.4452	
Total			-76.3422	(269)
Total CO2, kg/year			836.8190	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0700	(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	1666.0177	1.1300	1882.6001	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2525.7750	1.1300	2854.1257	(278)
Space and water heating			4736.7258	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	145.1902	1.5338	222.6975	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	1.4924	-502.8150	
PV Unit electricity exported	-251.1796	0.4595	-115.4171	
Total			-618.2321	(283)
Total Primary energy kWh/year			4471.2920	(286)
Target Primary Energy Rate (TPER)			75.1600	(287)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	93 A	**DER**	12.60	**TER**	14.07
Environmental	91 B	**% DER < TER**			10.45
CO_2 Emissions (t/year)	0.63	**DFEE**	37.20	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			-15.85
% DPER < TPER	12.17	**DPER**	66.01	**TPER**	75.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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)	
Main dwelling								
Windows			23.1000	1.1450	26.4504			(27)
External Wall	44.4600	23.1000	21.3600	0.1800	3.8448	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1100	0.9724	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2676			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340

E18 Party wall between dwellings	23.4000	0.0600	1.4040		
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250		
E3 Sill	10.5000	0.0500	0.5250		
E4 Jamb	30.8000	0.0500	1.5400		
E14 Flat roof	8.2000	0.0800	0.6560		
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.3430	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	38.6106	(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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	68.4443	68.2769	68.1127	67.3418	67.1975	66.5260	66.5260	66.4016	66.7847	67.1975	67.4893	67.7944	(39)
Average = Sum(39)m / 12 =												67.3411	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1505	1.1477	1.1449	1.1320	1.1296	1.1183	1.1183	1.1162	1.1226	1.1296	1.1345	1.1396	(40)
HLP (average)												1.1320	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

24.7223	24.3551	23.8381	22.8847	22.1709	21.3794	20.9518	21.4652	22.0242	22.8712	23.8442	24.6387	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 54.5359 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.4981	57.8664	56.0848	53.8669	51.8885	49.8323	49.4048	51.1828	53.0064	55.1179	57.3555	59.4145	(44)
Energy conte	94.2305	82.4010	86.2002	73.7410	69.8518	61.2747	59.7508	63.3750	65.3622	74.7945	81.7134	93.0288	(45)
Energy content (annual)										Total = Sum(45)m =		905.7239	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(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	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(64)
									Total per year (kWh/year) = Sum(64)m =			769.8653	(64)
12Total per year (kWh/year)												770	(64)
Electric shower(s)	45.8098	40.8169	44.5705	42.5331	43.3312	41.3338	42.7116	43.3312	42.5331	44.5705	43.7324	45.8098	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							521.0839	(64a)
Heat gains from water heating, kWh/month	31.4764	27.7144	29.4602	26.3032	25.6763	23.3543	23.3749	24.3000	24.5227	27.0365	28.2972	31.2211	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	42.3070	41.2417	39.5970	36.5323	34.5112	32.4365	31.4179	32.6613	34.0594	36.3393	39.3017	41.9638	(72)
Total internal gains	353.0558	363.0484	347.6383	337.9036	320.9336	310.4076	298.9289	298.3910	307.1639	316.1139	334.0251	345.1385	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	443.0008	541.2040	657.6592	833.0977	976.9655	1006.2862	951.2735	823.9262	680.2341	530.8793	446.3014	419.1732	(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	48.9956	49.1158	49.2341	49.7978	49.9047	50.4084	50.4084	50.5028	50.2132	49.9047	49.6889	49.4653	
alpha	4.2664	4.2744	4.2823	4.3199	4.3270	4.3606	4.3606	4.3669	4.3475	4.3270	4.3126	4.2977	
util living area	0.9892	0.9748	0.9337	0.8029	0.6029	0.4173	0.3065	0.3676	0.6315	0.9048	0.9783	0.9913	(86)
MIT	19.5081	19.7892	20.2083	20.6899	20.9237	20.9876	20.9975	20.9946	20.9335	20.5354	19.9348	19.4651	(87)
Th 2	19.9598	19.9621	19.9643	19.9748	19.9768	19.9859	19.9859	19.9876	19.9824	19.9768	19.9728	19.9686	(88)
util rest of house	0.9863	0.9685	0.9177	0.7645	0.5467	0.3535	0.2365	0.2882	0.5538	0.8747	0.9717	0.9890	(89)
MIT 2	18.6159	18.8940	19.2997	19.7435	19.9299	19.9805	19.9853	19.9860	19.9481	19.6243	19.0486	18.5801	(90)
Living area fraction									fLA = Living area / (4) =			0.4791	(91)
MIT	19.0433	19.3229	19.7350	20.1969	20.4060	20.4629	20.4702	20.4692	20.4202	20.0608	19.4731	19.0041	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0433	19.3229	19.7350	20.1969	20.4060	20.4629	20.4702	20.4692	20.4202	20.0608	19.4731	19.0041	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9830	0.9636	0.9136	0.7734	0.5709	0.3838	0.2700	0.3262	0.5884	0.8775	0.9676	0.9862	(94)
Useful gains	435.4892	521.4949	600.8197	644.3227	557.7254	386.1836	256.8377	268.8033	400.2729	465.8402	431.8455	413.3889	(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	1009.0967	984.7484	901.4715	760.7504	585.0218	390.0382	257.4673	270.2022	422.0902	635.7420	835.0545	1003.6338	(97)
Space heating kWh	426.7640	311.3064	223.6849	83.8280	20.3086	0.0000	0.0000	0.0000	0.0000	126.4070	290.3105	439.1422	(98a)
Space heating requirement - total per year (kWh/year)												1921.7514	
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	426.7640	311.3064	223.6849	83.8280	20.3086	0.0000	0.0000	0.0000	0.0000	126.4070	290.3105	439.1422	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1921.7514	
Space heating per m2											(98c) / (4) =	32.3038	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	625.3444	492.2924	504.6525	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9662	0.9821	0.9676	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	604.1823	483.5040	488.3175	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1144.4683	1081.8714	934.6918	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	389.0060	445.1854	332.1025	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	97.2515	111.2963	83.0256	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												291.5735	(107)
Energy for space heating												32.3038	(99)
Energy for space cooling												4.9012	(108)
Total												37.2050	(109)
Fabric Energy Efficiency (DFEE)												37.2	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.3430	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	30.6683	(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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9672	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.7223	24.3551	23.8381	22.8847	22.1709	21.3794	20.9518	21.4652	22.0242	22.8712	23.8442	24.6387	(42b)
Hot water usage for other uses	34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)
Average daily hot water use (litres/day)												54.5359	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.4981	57.8664	56.0848	53.8669	51.8885	49.8323	49.4048	51.1828	53.0064	55.1179	57.3555	59.4145	(44)
Energy conte	94.2305	82.4010	86.2002	73.7410	69.8518	61.2747	59.7508	63.3750	65.3622	74.7945	81.7134	93.0288	(45)
Energy content (annual)										Total = Sum(45)m =		905.7239	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(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	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(64)
									Total per year (kWh/year) = Sum(64)m =			769.8653	(64)
12Total per year (kWh/year)												770	(64)
Electric shower(s)	45.8098	40.8169	44.5705	42.5331	43.3312	41.3338	42.7116	43.3312	42.5331	44.5705	43.7324	45.8098	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							521.0839	(64a)
Heat gains from water heating, kWh/month	31.4764	27.7144	29.4602	26.3032	25.6763	23.3543	23.3749	24.3000	24.5227	27.0365	28.2972	31.2211	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	42.3070	41.2417	39.5970	36.5323	34.5112	32.4365	31.4179	32.6613	34.0594	36.3393	39.3017	41.9638	(72)
Total internal gains													
	353.0558	363.0484	347.6383	337.9036	320.9336	310.4076	298.9289	298.3910	307.1639	316.1139	334.0251	345.1385	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.2200	11.2829	0.6300	0.7000	0.7700	24.8961	(75)
Southwest	0.8500	36.7938	0.6300	0.7000	0.7700	9.5580	(79)
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	410.9577	477.7347	547.2098	656.6747	743.2388	758.3624	718.8601	636.6928	547.3214	454.3669	406.3025	392.7983	(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	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area													
	0.9913	0.9817	0.9556	0.8616	0.6855	0.4859	0.3569	0.4185	0.6863	0.9259	0.9824	0.9929	(86)
MIT	19.6860	19.9045	20.2374	20.6654	20.9090	20.9858	20.9974	20.9946	20.9334	20.5719	20.0629	19.6555	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house													
	0.9890	0.9770	0.9444	0.8313	0.6327	0.4206	0.2844	0.3383	0.6141	0.9019	0.9772	0.9910	(89)
MIT 2	18.8759	19.0934	19.4194	19.8254	20.0281	20.0894	20.0953	20.0961	20.0563	19.7531	19.2602	18.8527	(90)
Living area fraction									fLA = Living area / (4) =			0.4791	(91)
MIT	19.2640	19.4820	19.8113	20.2278	20.4501	20.5188	20.5275	20.5266	20.4765	20.1454	19.6447	19.2373	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2640	19.4820	19.8113	20.2278	20.4501	20.5188	20.5275	20.5266	20.4765	20.1454	19.6447	19.2373	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9734	0.9407	0.8364	0.6544	0.4514	0.3192	0.3767	0.6459	0.9036	0.9740	0.9888	(94)
Useful gains	405.3938	465.0063	514.7763	549.2498	486.3603	342.3588	229.4366	239.8433	353.5072	410.5796	395.7406	388.3949	(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													
	905.3524	879.7984	800.9463	672.8648	518.4908	346.7482	230.0854	241.2357	375.2067	565.6127	747.0026	900.0151	(97)
Space heating kWh													
	371.9692	278.7403	212.9105	89.0028	23.9051	0.0000	0.0000	0.0000	0.0000	115.3447	252.9086	380.6454	(98a)
Space heating requirement - total per year (kWh/year)												1725.4267	
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													
	371.9692	278.7403	212.9105	89.0028	23.9051	0.0000	0.0000	0.0000	0.0000	115.3447	252.9086	380.6454	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1725.4267	
Space heating per m2										(98c) / (4) =		29.0036	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	550.6871	433.5196	444.2913	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9536	0.9765	0.9595	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	525.1236	423.3349	426.2937	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	854.6873	810.2194	715.8476	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	237.2859	287.8420	215.4281	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	59.3215	71.9605	53.8570	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.1390	(107)
Energy for space heating												29.0036	(99)
Energy for space cooling												3.1121	(108)
Total												32.1157	(109)
Fabric Energy Efficiency (TFEE)												32.1	(109)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	93 A	**DER**	12.60	**TER**	14.07
Environmental	91 B	**% DER < TER**			10.45
CO_2 Emissions (t/year)	0.63	**DFEE**	37.20	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			-15.85
% DPER < TPER	12.17	**DPER**	66.01	**TPER**	75.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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	
Main dwelling								
Windows			23.1000	1.1450	26.4504			(27)
External Wall	44.4600	23.1000	21.3600	0.1800	3.8448	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1100	0.9724	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2676			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250

E3 Sill	10.5000	0.0500	0.5250		
E4 Jamb	30.8000	0.0500	1.5400		
E14 Flat roof	8.2000	0.0800	0.6560		
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560		

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.6106 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	68.4443	68.2769	68.1127	67.3418	67.1975	66.5260	66.5260	66.4016	66.7847	67.1975	67.4893	67.7944	(39)

Average = Sum(39)m / 12 = 67.3411

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1505	1.1477	1.1449	1.1320	1.1296	1.1183	1.1183	1.1162	1.1226	1.1296	1.1345	1.1396	(40)
HLP (average)												1.1320	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)

Energy content (annual) Total = Sum(45)m = 1621.0090

Distribution loss (46)m = 0.15 x (45)m												
25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)
Water storage loss (or HIU loss):												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month												
218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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													
218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)

Total per year (kWh/year) = Sum(64)m = 2197.4514 (64)
12Total per year (kWh/year) 2197 (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												
68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)													
-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains													
405.8951	414.9480	397.4377	382.1784	361.6923	344.4564	330.6821	332.0518	343.0471	359.0948	382.0868	397.3043	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	495.8401	593.1036	707.4587	877.3725	1017.7242	1040.3349	983.0267	857.5870	716.1173	573.8603	494.3631	471.3390	(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	48.9956	49.1158	49.2341	49.7978	49.9047	50.4084	50.4084	50.5028	50.2132	49.9047	49.6889	49.4653	
alpha	4.2664	4.2744	4.2823	4.3199	4.3270	4.3606	4.3606	4.3669	4.3475	4.3270	4.3126	4.2977	
util living area	0.9837	0.9657	0.9179	0.7808	0.5830	0.4043	0.2967	0.3536	0.6062	0.8827	0.9691	0.9867	(86)
MIT	19.6130	19.8849	20.2832	20.7243	20.9328	20.9890	20.9978	20.9954	20.9432	20.5911	20.0250	19.5702	(87)
Th 2	19.9598	19.9621	19.9643	19.9748	19.9768	19.9859	19.9859	19.9876	19.9824	19.9768	19.9728	19.9686	(88)
util rest of house	0.9796	0.9574	0.8992	0.7408	0.5276	0.3422	0.2289	0.2770	0.5296	0.8482	0.9601	0.9832	(89)
MIT 2	18.3678	18.7103	19.2002	19.7136	19.9243	19.9798	19.9852	19.9859	19.9453	19.5856	18.8986	18.3199	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	18.9644	19.2730	19.7190	20.1978	20.4075	20.4633	20.4703	20.4695	20.4233	20.0673	19.4382	18.9188	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8144	19.1230	19.5690	20.0478	20.2575	20.3133	20.3203	20.3195	20.2733	19.9173	19.2882	18.7688	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9735	0.9489	0.8908	0.7439	0.5432	0.3625	0.2513	0.3023	0.5524	0.8459	0.9524	0.9778	(94)
Useful gains	482.6929	562.7957	630.2114	652.6746	552.8255	377.0779	247.0424	259.2666	395.5483	485.4075	470.8429	460.8778	(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	993.4255	971.1046	890.1684	750.7093	575.0395	380.0807	247.4952	260.2611	412.2841	626.0995	822.5747	987.6858	(97)
Space heating kWh	379.9850	274.3836	193.4080	70.5850	16.5272	0.0000	0.0000	0.0000	0.0000	104.6748	253.2469	391.9452	(98a)
Space heating requirement - total per year (kWh/year)												1684.7558	
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	379.9850	274.3836	193.4080	70.5850	16.5272	0.0000	0.0000	0.0000	0.0000	104.6748	253.2469	391.9452	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1684.7558	
Space heating per m2											(98c) / (4) =	28.3200	(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 %)	89.5000	(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	379.9850	274.3836	193.4080	70.5850	16.5272	0.0000	0.0000	0.0000	0.0000	104.6748	253.2469	391.9452	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	424.5643	306.5739	216.0983	78.8659	18.4662	0.0000	0.0000	0.0000	0.0000	116.9551	282.9575	437.9276	(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	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4968	-38.6001	-57.4167	-66.1931	-72.2467	-67.7270	-66.8241	-62.6040	-55.0369	-44.8777	-29.4802	-22.6961	(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	-13.8377	-30.5455	-64.4348	-101.7484	-138.2983	-140.2908	-138.0318	-114.5195	-80.5855	-44.7048	-18.7440	-10.7891	(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	1882.4087	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2455.2529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1506.7294	(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	3059.1548	(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	1882.4087	0.2100	395.3058	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			910.9089	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-610.1992	0.1341	-81.8071	
PV Unit electricity exported	-896.5302	0.1246	-111.7468	
Total			-193.5539	(269)
Total CO2, kg/year			749.8114	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.6000	(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	1882.4087	1.1300	2127.1218	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	1.1300	2774.4358	(278)
Space and water heating			4901.5576	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-610.1992	1.4955	-912.5284	
PV Unit electricity exported	-896.5302	0.4575	-410.1395	
Total			-1322.6679	(283)
Total Primary energy kWh/year			3927.1362	(286)
Dwelling Primary energy Rate (DPER)			66.0100	(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	59.4900	(1b) x	2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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 Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.6683 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3150	48.8232	45.3711	45.2691	42.1443	42.9682	44.3102	44.2396	47.5095	47.8800	50.9589	(61)
Total heat required for water heating calculated for each month	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(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	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(64)
										Total per year (kWh/year) = Sum(64)m =		2095.7066	(64)
12Total per year (kWh/year)												2096	(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	65.7660	57.9435	61.1681	53.2201	51.0804	45.4759	44.6494	46.8765	47.8407	53.9432	57.9622	65.0474	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	88.3952	86.2254	82.2151	73.9168	68.6564	63.1610	60.0126	63.0060	66.4454	72.5042	80.5030	87.4293	(72)
Total internal gains	402.1439	411.0321	393.2564	378.2880	358.0788	341.1321	327.5236	328.7357	339.5500	355.2788	378.2265	393.6040	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

					W/m2	or Table 6b		or Table 6c		Table 6d			
Northeast					7.2200	11.2829		0.6300	0.7000	0.7700		24.8961	(75)
Southwest					0.8500	36.7938		0.6300	0.7000	0.7700		9.5580	(79)
Northwest					6.8000	11.2829		0.6300	0.7000	0.7700		23.4479	(81)
Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	460.0459	525.7184	592.8279	697.0592	780.3840	789.0869	747.4547	667.0375	579.7075	493.5318	450.5039	441.2638	(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	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area	0.9863	0.9737	0.9418	0.8389	0.6606	0.4681	0.3435	0.4001	0.6569	0.9045	0.9739	0.9885	(86)
MIT	19.7871	19.9981	20.3146	20.7069	20.9222	20.9878	20.9978	20.9956	20.9447	20.6282	20.1495	19.7565	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house	0.9829	0.9673	0.9280	0.8061	0.6078	0.4048	0.2736	0.3231	0.5850	0.8759	0.9665	0.9857	(89)
MIT 2	18.6658	18.9332	19.3274	19.7969	20.0231	20.0888	20.0952	20.0960	20.0545	19.7218	19.1350	18.6336	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.2030	19.4434	19.8003	20.2328	20.4538	20.5195	20.5276	20.5270	20.4810	20.1560	19.6210	19.1716	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2030	19.4434	19.8003	20.2328	20.4538	20.5195	20.5276	20.5270	20.4810	20.1560	19.6210	19.1716	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9620	0.9232	0.8118	0.6296	0.4347	0.3071	0.3600	0.6168	0.8783	0.9618	0.9820	(94)
Useful gains	450.2692	505.7239	547.3013	565.8583	491.3636	343.0503	229.5475	240.1168	357.5812	433.4859	433.3061	433.3037	(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	901.6609	877.4700	800.2875	673.1648	518.7107	346.7884	230.0948	241.2596	375.4734	566.2453	745.5903	896.0798	(97)
Space heating kWh	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98a)
Space heating requirement - total per year (kWh/year)												1539.4004	
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	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.4004	
Space heating per m2											(98c) / (4) =	25.8766	(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 %)												92.4000	(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	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	363.4582	270.3608	203.7031	83.6154	22.0197	0.0000	0.0000	0.0000	0.0000	106.8971	243.3383	372.6250	(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	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3776	85.0198	84.2939	82.7892	81.1626	80.3000	80.3000	80.3000	80.3000	83.2147	84.7866	85.4506	(217)
Fuel for water heating, kWh/month	246.4774	218.1959	232.6126	206.9325	203.1200	183.3457	180.5045	189.2604	192.8501	209.1254	219.6130	243.7376	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	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	17.9901	14.4323	12.9947	9.5205	7.3539	6.0082	6.7085	8.7199	11.3263	14.8607	16.7851	18.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.2539	-19.9158	-30.4928	-36.5992	-41.5339	-39.5415	-39.0700	-35.8526	-30.5508	-23.7735	-15.0044	-11.3205	(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	-4.1671	-9.0087	-18.3650	-28.2691	-38.0559	-38.4777	-38.0158	-31.8682	-22.9496	-13.0946	-5.6310	-3.2769	(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												1666.0177	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	80.3000	
Water heating fuel used	2525.7750	(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)	145.1902	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-588.0885	(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	3834.8944	(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	1666.0177	0.2100	349.8637	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2525.7750	0.2100	530.4127	(264)
Space and water heating			880.2765	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	145.1902	0.1443	20.9554	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	0.1333	-44.8970	
PV Unit electricity exported	-251.1796	0.1252	-31.4452	
Total			-76.3422	(269)
Total CO2, kg/year			836.8190	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0700	(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	1666.0177	1.1300	1882.6001	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2525.7750	1.1300	2854.1257	(278)
Space and water heating			4736.7258	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	145.1902	1.5338	222.6975	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	1.4924	-502.8150	
PV Unit electricity exported	-251.1796	0.4595	-115.4171	
Total			-618.2321	(283)
Total Primary energy kWh/year			4471.2920	(286)
Target Primary Energy Rate (TPER)			75.1600	(287)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	93 A	**DER**	12.60	**TER**	14.07
Environmental	91 B	**% DER < TER**			10.45
CO_2 Emissions (t/year)	0.63	**DFEE**	37.20	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			-15.85
% DPER < TPER	12.17	**DPER**	66.01	**TPER**	75.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1293 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3793 (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) =	0.3224 (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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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	
Main dwelling								
Windows			23.1000	1.1450	26.4504			(27)
External Wall	44.4600	23.1000	21.3600	0.1800	3.8448	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1100	0.9724	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2676			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250

E3 Sill	10.5000	0.0500	0.5250		
E4 Jamb	30.8000	0.0500	1.5400		
E14 Flat roof	8.2000	0.0800	0.6560		
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560		

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.6106 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	68.4443	68.2769	68.1127	67.3418	67.1975	66.5260	66.5260	66.4016	66.7847	67.1975	67.4893	67.7944	(39)

Average = Sum(39)m / 12 = 67.3411

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1505	1.1477	1.1449	1.1320	1.1296	1.1183	1.1183	1.1162	1.1226	1.1296	1.1345	1.1396	(40)
HLP (average)												1.1320	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)
Energy content (annual)										Total = Sum(45)m =		1621.0090	
Distribution loss (46)m = 0.15 x (45)m	25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
										Total per year (kWh/year) = Sum(64)m =		2197.4514	(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	68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains	459.6005	458.0031	444.2191	417.8341	391.5129	364.5250	350.4659	353.2092	366.8687	394.0421	422.8692	447.8388	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	549.5456	636.1586	754.2401	913.0282	1047.5448	1060.4035	1002.8104	878.7444	739.9389	608.8076	535.1456	521.8735	(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	48.9956	49.1158	49.2341	49.7978	49.9047	50.4084	50.4084	50.5028	50.2132	49.9047	49.6889	49.4653	
alpha	4.2664	4.2744	4.2823	4.3199	4.3270	4.3606	4.3606	4.3669	4.3475	4.3270	4.3126	4.2977	
util living area													
	0.9767	0.9569	0.9019	0.7632	0.5691	0.3970	0.2909	0.3453	0.5902	0.8637	0.9598	0.9808	(86)
MIT	19.7166	19.9611	20.3485	20.7491	20.9387	20.9898	20.9979	20.9958	20.9487	20.6321	20.0984	19.6694	(87)
Th 2	19.9598	19.9621	19.9643	19.9748	19.9768	19.9859	19.9859	19.9876	19.9824	19.9768	19.9728	19.9686	(88)
util rest of house													
	0.9710	0.9468	0.8806	0.7221	0.5143	0.3359	0.2244	0.2704	0.5145	0.8260	0.9486	0.9760	(89)
MIT 2	18.4978	18.8041	19.2766	19.7390	19.9291	19.9802	19.9852	19.9860	19.9492	19.6296	18.9884	18.4448	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.0817	19.3584	19.7901	20.2229	20.4128	20.4639	20.4704	20.4698	20.4280	20.1099	19.5202	19.0315	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9317	19.2084	19.6401	20.0729	20.2628	20.3139	20.3204	20.3198	20.2780	19.9599	19.3702	18.8815	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9636	0.9378	0.8730	0.7263	0.5300	0.3558	0.2464	0.2952	0.5372	0.8253	0.9403	0.9693	(94)
Useful gains	529.5330	596.5685	658.4309	663.1311	555.1599	377.3270	247.0848	259.3763	397.5292	502.4233	503.1996	505.8689	(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													
	1001.4576	976.9315	895.0093	752.4028	575.3998	380.1199	247.5027	260.2799	412.5964	628.9588	828.1060	995.3237	(97)
Space heating kWh													
	351.1119	255.6040	176.0144	64.2756	15.0585	0.0000	0.0000	0.0000	0.0000	94.1424	233.9326	364.1544	(98a)
Space heating requirement - total per year (kWh/year)												1554.2938	
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													
	351.1119	255.6040	176.0144	64.2756	15.0585	0.0000	0.0000	0.0000	0.0000	94.1424	233.9326	364.1544	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1554.2938	
Space heating per m2											(98c) / (4) =	26.1270	(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 %)												89.5000	(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													
	351.1119	255.6040	176.0144	64.2756	15.0585	0.0000	0.0000	0.0000	0.0000	94.1424	233.9326	364.1544	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	392.3038	285.5910	196.6641	71.8163	16.8251	0.0000	0.0000	0.0000	0.0000	105.1870	261.3772	406.8765	(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													
	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4968	-38.6001	-57.4167	-66.1931	-72.2467	-67.7270	-66.8241	-62.6040	-55.0369	-44.8777	-29.4802	-22.6961	(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	-13.8377	-30.5455	-64.4348	-101.7484	-138.2983	-140.2908	-138.0318	-114.5195	-80.5855	-44.7048	-18.7440	-10.7891	(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												1736.6411	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2455.2529	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1506.7294	(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 2913.3872 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1736.6411	3.6400	63.2137	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	3.6400	89.3712	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	142.2226	16.4900	23.4525	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-610.1992	16.4900	-100.6218	
PV Unit electricity exported	-896.5302	5.5900	-50.1160	
Total			-150.7379	(252)
Total energy cost			131.4810	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4530 (257)
SAP value		92.6570
SAP rating (Section 12)		93 (258)
SAP band		A

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	1736.6411	0.2100	364.6946	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			880.2977	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-610.1992	0.1341	-81.8071	
PV Unit electricity exported	-896.5302	0.1246	-111.7468	
Total			-193.5539	(269)
Total CO2, kg/year			719.2002	(272)
CO2 emissions per m2			12.0900	(273)
EI value			90.7768	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.3546	0.3385	0.3385	0.3143	0.3143	0.2740	0.2821	0.2982	0.2902	0.3063	0.3063	0.3385	(22b)
Effective ac	0.5629	0.5573	0.5573	0.5494	0.5494	0.5376	0.5398	0.5445	0.5421	0.5469	0.5469	0.5573	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			23.1000	1.1450	26.4504			(27)
External Wall	44.4600	23.1000	21.3600	0.1800	3.8448	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1100	0.9724	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2676			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.3430 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	38.6106 (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	28.7312	28.4460	28.4460	28.0431	28.0431	27.4379	27.5523	27.7911	27.6700	27.9154	27.9154	28.4460	(38)
Heat transfer coeff	67.3418	67.0566	67.0566	66.6537	66.6537	66.0485	66.1629	66.4016	66.2806	66.5260	66.5260	67.0566	(39)
Average = Sum(39)m / 12 =												66.6470	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1320	1.1272	1.1272	1.1204	1.1204	1.1102	1.1122	1.1162	1.1141	1.1183	1.1183	1.1272	(40)
HLP (average)												1.1203	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9672 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day)	97.6133 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte 167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)

Energy content (annual)	Total = Sum(45)m = 1621.0090

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

25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)

	Total per year (kWh/year) = Sum(64)m = 2197.4514 (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

68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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 118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains													
	459.6005	458.0031	444.2191	417.8341	391.5129	364.5250	350.4659	353.2092	366.8687	394.0421	422.8692	447.8388	(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	
Northeast	11.2200	12.4928	0.6300	0.7000	0.7700	42.8374	(75)
Southwest	1.3200	39.1209	0.6300	0.7000	0.7700	15.7817	(79)
Northwest	10.5600	12.4928	0.6300	0.7000	0.7700	40.3176	(81)

Solar gains	98.9368	176.8612	310.3275	515.0276	661.2993	750.5418	706.3167	583.4067	413.5229	233.3624	127.7452	83.2863	(83)
Total gains	558.5373	634.8643	754.5466	932.8618	1052.8122	1115.0668	1056.7826	936.6159	780.3916	627.4045	550.6145	531.1252	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	49.7978	50.0096	50.0096	50.3119	50.3119	50.7729	50.6851	50.5028	50.5951	50.4084	50.4084	50.0096	
alpha	4.3199	4.3340	4.3340	4.3541	4.3541	4.3849	4.3790	4.3669	4.3730	4.3606	4.3606	4.3340	
util living area													
	0.9683	0.9462	0.8711	0.6866	0.4706	0.2718	0.1565	0.1913	0.4425	0.7891	0.9387	0.9732	(86)
MIT	19.9168	20.1239	20.5153	20.8593	20.9764	20.9984	20.9999	20.9998	20.9873	20.7933	20.3150	19.8742	(87)
Th 2	19.9748	19.9787	19.9787	19.9842	19.9842	19.9925	19.9909	19.9876	19.9893	19.9859	19.9859	19.9787	(88)
util rest of house													
	0.9603	0.9333	0.8432	0.6370	0.4114	0.2126	0.0933	0.1196	0.3615	0.7344	0.9211	0.9662	(89)
MIT 2	18.7609	19.0190	19.4861	19.8623	19.9686	19.9919	19.9909	19.9876	19.9833	19.8113	19.2650	18.7109	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.3147	19.5483	19.9792	20.3399	20.4514	20.4741	20.4743	20.4725	20.4643	20.2817	19.7680	19.2682	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1647	19.3983	19.8292	20.1899	20.3014	20.3241	20.3243	20.3225	20.3143	20.1317	19.6180	19.1182	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9522	0.9244	0.8386	0.6475	0.4302	0.2321	0.1142	0.1434	0.3879	0.7430	0.9134	0.9587	(94)
Useful gains	531.8479	586.8732	632.7596	604.0095	452.8762	258.8492	120.6923	134.2743	302.7227	466.1388	502.9357	509.1893	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	926.9364	905.1506	806.6349	652.5347	460.0015	259.1805	120.7003	134.2981	305.8363	534.3192	746.2887	919.8969	(97)
Space heating kWh													
	293.9458	213.8824	129.3633	34.9381	5.3013	0.0000	0.0000	0.0000	0.0000	50.7262	175.2141	305.5665	(98a)
Space heating requirement - total per year (kWh/year)												1208.9377	
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													
	293.9458	213.8824	129.3633	34.9381	5.3013	0.0000	0.0000	0.0000	0.0000	50.7262	175.2141	305.5665	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1208.9377	
Space heating per m2											(98c) / (4) =	20.3217	(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 %)												89.5000	(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													
	293.9458	213.8824	129.3633	34.9381	5.3013	0.0000	0.0000	0.0000	0.0000	50.7262	175.2141	305.5665	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	328.4311	238.9748	144.5399	39.0370	5.9232	0.0000	0.0000	0.0000	0.0000	56.6773	195.7700	341.4150	(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													
	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.3558	-38.0480	-56.8185	-66.8927	-71.9416	-69.4414	-68.6081	-65.1081	-57.5383	-46.8678	-32.2021	-24.7876	(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	-15.6398	-29.6963	-62.9828	-104.4671	-136.6530	-151.4046	-149.5678	-127.8981	-89.9691	-48.9929	-22.1287	-12.6213	(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	1350.7684	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2455.2529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1578.6315	(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	2455.6124	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1350.7684	6.3400	85.6387	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	6.3400	155.6630	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	142.2226	26.0000	36.9779	(250)
Additional standing charges			113.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-626.6100	26.0000	-162.9186	
PV Unit electricity exported	-952.0215	5.8100	-55.3124	
Total			-218.2310	(252)
Total energy cost			195.4086	(255)

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	1350.7684	0.2100	283.6614	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			799.2645	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-626.6100	0.1341	-84.0020	
PV Unit electricity exported	-952.0215	0.1239	-117.9288	
Total			-201.9308	(269)
Total CO2, kg/year			629.7900	(272)

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	1350.7684	1.1300	1526.3683	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	1.1300	2774.4358	(278)
Space and water heating			4300.8041	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-626.6100	1.4954	-937.0433	
PV Unit electricity exported	-952.0215	0.4545	-432.7043	
Total			-1369.7477	(283)
Total Primary energy kWh/year			3279.3029	(286)

SAP 10 EPC IMPROVEMENTS

Flat 9

Current energy efficiency rating:	A 93
Current environmental impact rating:	B 91

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 93
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£59	£59	£0
Mains gas	£354	£354	£0
Space heating	£221	£221	£0
Water heating	£156	£156	£0
Lighting	£37	£37	£0
Generated (PV)	-£218	-£218	£0
Total cost of fuels	£195	£195	£0
Total cost of uses	£196	£196	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	55 kWh/m²	55 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1293 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3793 (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) =	0.3224 (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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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								
Windows			23.1000	1.1450	26.4504			(27)
External Wall	44.4600	23.1000	21.3600	0.1800	3.8448	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1100	0.9724	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2676			(33)

Main dwelling

Party Wall 1	24.7000	0.0000	0.0000	180.0000	4446.0000 (32)
Party Floor 1	59.4900			30.0000	1784.7000 (32d)
Party Ceiling 1	50.5600			20.0000	1011.2000 (32b)
Internal Wall 1	76.9600			9.0000	692.6400 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 202.9333 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 38.6106 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	68.4443	68.2769	68.1127	67.3418	67.1975	66.5260	66.5260	66.4016	66.7847	67.1975	67.4893	67.7944	(39)

Average = Sum(39)m / 12 = 67.3411

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1505	1.1477	1.1449	1.1320	1.1296	1.1183	1.1183	1.1162	1.1226	1.1296	1.1345	1.1396	(40)
HLP (average)												1.1320	
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 1.9672 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)

Energy content (annual) Total = Sum(45)m = 1621.0090

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

25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(62)
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)
-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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)

Total per year (kWh/year) = Sum(64)m = 2197.4514 (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

68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains	459.6005	458.0031	444.2191	417.8341	391.5129	364.5250	350.4659	353.2092	366.8687	394.0421	422.8692	447.8388	(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	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)

Southwest			1.3200		36.7938		0.6300		0.7000		0.7700		14.8430 (79)
Northwest			10.5600		11.2829		0.6300		0.7000		0.7700		36.4131 (81)
Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	549.5456	636.1586	754.2401	913.0282	1047.5448	1060.4035	1002.8104	878.7444	739.9389	608.8076	535.1456	521.8735	(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	48.9956	49.1158	49.2341	49.7978	49.9047	50.4084	50.4084	50.5028	50.2132	49.9047	49.6889	49.4653	
alpha	4.2664	4.2744	4.2823	4.3199	4.3270	4.3606	4.3606	4.3669	4.3475	4.3270	4.3126	4.2977	
util living area	0.9767	0.9569	0.9019	0.7632	0.5691	0.3970	0.2909	0.3453	0.5902	0.8637	0.9598	0.9808	(86)
MIT	19.7166	19.9611	20.3485	20.7491	20.9387	20.9898	20.9979	20.9958	20.9487	20.6321	20.0984	19.6694	(87)
Th 2	19.9598	19.9621	19.9643	19.9748	19.9768	19.9859	19.9859	19.9876	19.9824	19.9768	19.9728	19.9686	(88)
util rest of house	0.9710	0.9468	0.8806	0.7221	0.5143	0.3359	0.2244	0.2704	0.5145	0.8260	0.9486	0.9760	(89)
MIT 2	18.4978	18.8041	19.2766	19.7390	19.9291	19.9802	19.9852	19.9860	19.9492	19.6296	18.9884	18.4448	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.0817	19.3584	19.7901	20.2229	20.4128	20.4639	20.4704	20.4698	20.4280	20.1099	19.5202	19.0315	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.9317	19.2084	19.6401	20.0729	20.2628	20.3139	20.3204	20.3198	20.2780	19.9599	19.3702	18.8815	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9636	0.9378	0.8730	0.7263	0.5300	0.3558	0.2464	0.2952	0.5372	0.8253	0.9403	0.9693	(94)
Useful gains	529.5330	596.5685	658.4309	663.1311	555.1599	377.3270	247.0848	259.3763	397.5292	502.4233	503.1996	505.8689	(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	1001.4576	976.9315	895.0093	752.4028	575.3998	380.1199	247.5027	260.2799	412.5964	628.9588	828.1060	995.3237	(97)
Space heating kWh	351.1119	255.6040	176.0144	64.2756	15.0585	0.0000	0.0000	0.0000	0.0000	94.1424	233.9326	364.1544	(98a)
Space heating requirement - total per year (kWh/year)												1554.2938	
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	351.1119	255.6040	176.0144	64.2756	15.0585	0.0000	0.0000	0.0000	0.0000	94.1424	233.9326	364.1544	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1554.2938	
Space heating per m2										(98c) / (4) =		26.1270	(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 %)	89.5000 (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	351.1119	255.6040	176.0144	64.2756	15.0585	0.0000	0.0000	0.0000	0.0000	94.1424	233.9326	364.1544	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	392.3038	285.5910	196.6641	71.8163	16.8251	0.0000	0.0000	0.0000	0.0000	105.1870	261.3772	406.8765	(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	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.4968	-38.6001	-57.4167	-66.1931	-72.2467	-67.7270	-66.8241	-62.6040	-55.0369	-44.8777	-29.4802	-22.6961	(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	-13.8377	-30.5455	-64.4348	-101.7484	-138.2983	-140.2908	-138.0318	-114.5195	-80.5855	-44.7048	-18.7440	-10.7891	(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												1736.6411	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2455.2529	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1506.7294	(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	2913.3872	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1736.6411	3.6400	63.2137	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	3.6400	89.3712	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	142.2226	16.4900	23.4525	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-610.1992	16.4900	-100.6218	
PV Unit electricity exported	-896.5302	5.5900	-50.1160	
Total			-150.7379	(252)
Total energy cost			131.4810	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4530	(257)
SAP value		92.6570	
SAP rating (Section 12)		93	(258)
SAP band		A	

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	1736.6411	0.2100	364.6946	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			880.2977	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-610.1992	0.1341	-81.8071	
PV Unit electricity exported	-896.5302	0.1246	-111.7468	
Total			-193.5539	(269)
Total CO2, kg/year			719.2002	(272)
CO2 emissions per m2			12.0900	(273)
EI value			90.7768	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3793 (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) =	0.3224 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.3546	0.3385	0.3385	0.3143	0.3143	0.2740	0.2821	0.2982	0.2902	0.3063	0.3063	0.3385	(22b)
Effective ac	0.5629	0.5573	0.5573	0.5494	0.5494	0.5376	0.5398	0.5445	0.5421	0.5469	0.5469	0.5573	(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	
Windows			23.1000	1.1450	26.4504			(27)
External Wall	44.4600	23.1000	21.3600	0.1800	3.8448	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1100	0.9724	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.2676			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.3430 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	38.6106 (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	28.7312	28.4460	28.4460	28.0431	28.0431	27.4379	27.5523	27.7911	27.6700	27.9154	27.9154	28.4460	(38)
Heat transfer coeff	67.3418	67.0566	67.0566	66.6537	66.6537	66.0485	66.1629	66.4016	66.2806	66.5260	66.5260	67.0566	(39)
Average = Sum(39)m / 12 =												66.6470	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1320	1.1272	1.1272	1.1204	1.1204	1.1102	1.1122	1.1162	1.1141	1.1183	1.1183	1.1272	(40)
HLP (average)												1.1203	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.9672 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day)	97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)
Energy content (annual)										Total = Sum(45)m =		1621.0090	
Distribution loss (46)m = 0.15 x (45)m	25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
									Total per year (kWh/year) = Sum(64)m =			2197.4514	(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

	68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005 (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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)

	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)

Water heating gains (Table 5)

	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)

Total internal gains

	459.6005	458.0031	444.2191	417.8341	391.5129	364.5250	350.4659	353.2092	366.8687	394.0421	422.8692	447.8388	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	12.4928	0.6300	0.7000	0.7700	42.8374	(75)
Southwest	1.3200	39.1209	0.6300	0.7000	0.7700	15.7817	(79)
Northwest	10.5600	12.4928	0.6300	0.7000	0.7700	40.3176	(81)

Solar gains	98.9368	176.8612	310.3275	515.0276	661.2993	750.5418	706.3167	583.4067	413.5229	233.3624	127.7452	83.2863	(83)
Total gains	558.5373	634.8643	754.5466	932.8618	1052.8122	1115.0668	1056.7826	936.6159	780.3916	627.4045	550.6145	531.1252	(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	49.7978	50.0096	50.0096	50.3119	50.3119	50.7729	50.6851	50.5028	50.5951	50.4084	50.4084	50.0096	
alpha	4.3199	4.3340	4.3340	4.3541	4.3541	4.3849	4.3790	4.3669	4.3730	4.3606	4.3606	4.3340	
util living area	0.9683	0.9462	0.8711	0.6866	0.4706	0.2718	0.1565	0.1913	0.4425	0.7891	0.9387	0.9732	(86)
MIT	19.9168	20.1239	20.5153	20.8593	20.9764	20.9984	20.9999	20.9998	20.9873	20.7933	20.3150	19.8742	(87)
Th 2	19.9748	19.9787	19.9787	19.9842	19.9842	19.9925	19.9909	19.9876	19.9893	19.9859	19.9859	19.9787	(88)
util rest of house	0.9603	0.9333	0.8432	0.6370	0.4114	0.2126	0.0933	0.1196	0.3615	0.7344	0.9211	0.9662	(89)
MIT 2	18.7609	19.0190	19.4861	19.8623	19.9686	19.9919	19.9909	19.9876	19.9833	19.8113	19.2650	18.7109	(90)
Living area fraction									fLA = Living area / (4) =			0.4791	(91)
MIT	19.3147	19.5483	19.9792	20.3399	20.4514	20.4741	20.4743	20.4725	20.4643	20.2817	19.7680	19.2682	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1647	19.3983	19.8292	20.1899	20.3014	20.3241	20.3243	20.3225	20.3143	20.1317	19.6180	19.1182	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9522	0.9244	0.8386	0.6475	0.4302	0.2321	0.1142	0.1434	0.3879	0.7430	0.9134	0.9587	(94)
Useful gains	531.8479	586.8732	632.7596	604.0095	452.8762	258.8492	120.6923	134.2743	302.7227	466.1388	502.9357	509.1893	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	926.9364	905.1506	806.6349	652.5347	460.0015	259.1805	120.7003	134.2981	305.8363	534.3192	746.2887	919.8969	(97)
Space heating kWh	293.9458	213.8824	129.3633	34.9381	5.3013	0.0000	0.0000	0.0000	0.0000	50.7262	175.2141	305.5665	(98a)
Space heating requirement - total per year (kWh/year)												1208.9377	
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	293.9458	213.8824	129.3633	34.9381	5.3013	0.0000	0.0000	0.0000	0.0000	50.7262	175.2141	305.5665	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1208.9377	
Space heating per m2											(98c) / (4) =	20.3217	(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 %)	89.5000 (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	293.9458	213.8824	129.3633	34.9381	5.3013	0.0000	0.0000	0.0000	0.0000	50.7262	175.2141	305.5665	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	328.4311	238.9748	144.5399	39.0370	5.9232	0.0000	0.0000	0.0000	0.0000	56.6773	195.7700	341.4150	(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

	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551 (64)
Efficiency of water heater												89.5000 (216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (217)
Fuel for water heating, kWh/month												
	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610 (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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-28.3558	-38.0480	-56.8185	-66.8927	-71.9416	-69.4414	-68.6081	-65.1081	-57.5383	-46.8678	-32.2021	-24.7876 (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	-15.6398	-29.6963	-62.9828	-104.4671	-136.6530	-151.4046	-149.5678	-127.8981	-89.9691	-48.9929	-22.1287	-12.6213 (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	1350.7684 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	89.5000
Water heating fuel used	2455.2529 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
main heating flue fan	45.0000 (230e)
Total electricity for the above, kWh/year	86.0000 (231)
Electricity for lighting (calculated in Appendix L)	142.2226 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1578.6315 (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	2455.6124 (238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1350.7684	6.3400	85.6387	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	6.3400	155.6630	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	142.2226	26.0000	36.9779	(250)
Additional standing charges			113.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-626.6100	26.0000	-162.9186	
PV Unit electricity exported	-952.0215	5.8100	-55.3124	
Total			-218.2310	(252)
Total energy cost			195.4086	(255)

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	1350.7684	0.2100	283.6614	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			799.2645	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-626.6100	0.1341	-84.0020	
PV Unit electricity exported	-952.0215	0.1239	-117.9288	
Total			-201.9308	(269)
Total CO2, kg/year			629.7900	(272)

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	1350.7684	1.1300	1526.3683	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	1.1300	2774.4358	(278)
Space and water heating			4300.8041	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-626.6100	1.4954	-937.0433	
PV Unit electricity exported	-952.0215	0.4545	-432.7043	
Total			-1369.7477	(283)

Total Primary energy kWh/year	3279.3029 (286)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	93 A	**DER**	11.65	**TER**	13.68
Environmental	91 B	**% DER < TER**			14.84
CO_2 Emissions (t/year)	0.59	**DFEE**	33.86	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			-9.85
% DPER < TPER	16.69	**DPER**	60.85	**TPER**	73.05

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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	
Main dwelling								
Windows			23.7600	1.1450	27.2061			(27)
External Wall	73.0600	23.7600	49.3000	0.1800	8.8740	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0801			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020

E17 Corner (inverted - internal area greater than external area)									2.6000	-0.0900	-0.2340		
E18 Party wall between dwellings									15.6000	0.0600	0.9360		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												8.1780	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		44.2581	(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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	74.4310	74.2629	74.0981	73.3240	73.1791	72.5049	72.5049	72.3801	72.7646	73.1791	73.4721	73.7784	(39)
Average = Sum(39)m / 12 =												73.3233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2356	1.2328	1.2300	1.2172	1.2148	1.2036	1.2036	1.2015	1.2079	1.2148	1.2197	1.2247	(40)
HLP (average)												1.2172	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(64)
12Total per year (kWh/year)												2210	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	409.5304	418.6928	401.0072	385.7277	365.0422	347.6769	333.7666	335.1363	346.2356	362.3967	385.4967	400.8498	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	611.5254	772.3402	910.3165	1059.4169	1158.5411	1152.5533	1102.6306	1012.0002	912.0589	760.1100	629.1839	572.5871	(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	66.3005	66.4506	66.5984	67.3015	67.4347	68.0617	68.0617	68.1791	67.8188	67.4347	67.1658	66.8869	

alpha	5.4200	5.4300	5.4399	5.4868	5.4956	5.5374	5.5374	5.5453	5.5213	5.4956	5.4777	5.4591	
util living area	0.9890	0.9649	0.9055	0.7622	0.5740	0.4010	0.2891	0.3285	0.5411	0.8466	0.9717	0.9920	(86)
MIT	20.0190	20.3073	20.6152	20.8771	20.9760	20.9972	20.9996	20.9993	20.9868	20.8187	20.3684	19.9660	(87)
Th 2	19.8916	19.8939	19.8960	19.9063	19.9082	19.9171	19.9171	19.9188	19.9137	19.9082	19.9043	19.9003	(88)
util rest of house	0.9851	0.9536	0.8788	0.7126	0.5116	0.3340	0.2181	0.2516	0.4602	0.7961	0.9605	0.9891	(89)
MIT 2	18.7907	19.1498	19.5158	19.8032	19.8925	19.9159	19.9170	19.9186	19.9072	19.7578	19.2390	18.7305	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.2699	19.6014	19.9447	20.2221	20.3152	20.3378	20.3394	20.3402	20.3284	20.1716	19.6796	19.2125	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1199	19.4514	19.7947	20.0721	20.1652	20.1878	20.1894	20.1902	20.1784	20.0216	19.5296	19.0625	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9814	0.9479	0.8760	0.7205	0.5266	0.3508	0.2360	0.2709	0.4803	0.8020	0.9556	0.9860	(94)
Useful gains	600.1282	732.1372	797.4702	763.3476	610.0743	404.3346	260.1797	274.1895	438.0618	609.5909	601.2581	564.5844	(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	1103.0583	1080.6268	985.1079	819.1837	619.4727	405.1394	260.2467	274.3332	442.2889	689.4670	913.2285	1096.5312	(97)
Space heating kWh	374.1800	234.1850	139.6024	40.2020	6.9924	0.0000	0.0000	0.0000	0.0000	59.4278	224.6187	395.7684	(98a)
Space heating requirement - total per year (kWh/year)												1474.9768	
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	374.1800	234.1850	139.6024	40.2020	6.9924	0.0000	0.0000	0.0000	0.0000	59.4278	224.6187	395.7684	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1474.9768	
Space heating per m2											(98c) / (4) =	24.4850	(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 %)	89.5000	(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	374.1800	234.1850	139.6024	40.2020	6.9924	0.0000	0.0000	0.0000	0.0000	59.4278	224.6187	395.7684	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	418.0782	261.6592	155.9804	44.9184	7.8128	0.0000	0.0000	0.0000	0.0000	66.3998	250.9707	442.1993	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.7818	-39.0126	-58.0255	-66.8880	-72.9973	-68.4257	-67.5115	-63.2508	-55.6113	-45.3525	-29.7956	-22.9403	(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	-13.9936	-30.8887	-65.1576	-102.8889	-139.8487	-141.8655	-139.5833	-115.8084	-81.4933	-45.2091	-18.9556	-10.9108	(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	1648.0188	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1523.1963	(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	2823.4848	(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	1648.0188	0.2100	346.0839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			864.5470	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-616.5930	0.1341	-82.6659	
PV Unit electricity exported	-906.6034	0.1246	-113.0023	
Total			-195.6681	(269)
Total CO2, kg/year			701.5616	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.6500	(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	1648.0188	1.1300	1862.2612	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	1.1300	2789.8248	(278)
Space and water heating			4652.0860	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.7909	1.5338	220.5513	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-616.5930	1.4955	-922.0960	
PV Unit electricity exported	-906.6034	0.4575	-414.7472	
Total			-1336.8432	(283)
Total Primary energy kWh/year			3665.8948	(286)
Dwelling Primary energy Rate (DPER)			60.8500	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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	
Main dwelling								
TER Opening Type			15.0600	1.1450	17.2443			(27)

External Wall	73.0600	15.0600	58.0000	0.1800	10.4400	(29a)
Total net area of external elements Aum(A, m2)			73.0600			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6843	(33)
Main dwelling						
Party Wall 1			25.4800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400	
E3 Sill	10.8000	0.0500	0.5400	
E4 Jamb	35.2000	0.0500	1.7600	
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0900	0.7020	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	
E18 Party wall between dwellings	15.6000	0.0600	0.9360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1780 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)
Average = Sum(39)m / 12 =												64.9274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
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 1.9884 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)

Hot water usage for other uses

34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 93.3125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.5984	49.1285	45.6548	45.5522	42.4079	43.2369	44.5873	44.5162	47.8066	48.1794	50.9589	(61)
Total heat required for water heating calculated for each month	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(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	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(64)
										Total per year (kWh/year) = Sum(64)m =		2108.1738	(64)
12Total per year (kWh/year)												2108	(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	66.0976	58.3058	61.5505	53.5529	51.3998	45.7603	44.9286	47.1696	48.1399	54.2805	58.3246	65.3745	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	88.8408	86.7646	82.7292	74.3790	69.0857	63.5560	60.3879	63.4000	66.8609	72.9576	81.0064	87.8690	(72)
Total internal gains	405.7558	414.8594	396.9068	381.8130	361.4061	344.3318	330.5883	331.7994	342.7166	358.5568	381.7193	397.1263	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)

Northwest			5.3000		11.2829		0.6300		0.7000		0.7700		18.2755 (81)
Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	533.7793	639.0013	719.7115	808.8101	864.3468	854.4863	817.9160	760.8110	701.3427	610.6287	536.1675	505.9725	(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	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area	0.9932	0.9804	0.9472	0.8457	0.6715	0.4774	0.3445	0.3862	0.6185	0.8973	0.9824	0.9950	(86)
MIT	20.1000	20.3176	20.5738	20.8398	20.9652	20.9962	20.9996	20.9992	20.9836	20.8015	20.4046	20.0632	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house	0.9908	0.9737	0.9303	0.8054	0.6099	0.4064	0.2688	0.3053	0.5379	0.8585	0.9752	0.9931	(89)
MIT 2	18.9791	19.2539	19.5684	19.8764	19.9968	20.0285	20.0301	20.0316	20.0180	19.8467	19.3745	18.9392	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.4164	19.6689	19.9606	20.2522	20.3746	20.4060	20.4083	20.4091	20.3947	20.2192	19.7764	19.3777	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4164	19.6689	19.9606	20.2522	20.3746	20.4060	20.4083	20.4091	20.3947	20.2192	19.7764	19.3777	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9708	0.9293	0.8157	0.6327	0.4341	0.2984	0.3369	0.5690	0.8673	0.9729	0.9915	(94)
Useful gains	527.8321	620.3620	668.8360	659.7531	546.8954	370.9267	244.0412	256.3033	399.0707	529.5960	521.6583	501.6698	(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	998.2122	972.7815	884.3906	737.0788	561.9688	372.2166	244.1445	256.5175	405.1798	623.1647	824.9316	992.3560	(97)
Space heating kWh	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98a)
Space heating requirement - total per year (kWh/year)												1467.0928	
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	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1467.0928	
Space heating per m2											(98c) / (4) =	24.3541	(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 %)	92.4000	(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	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	378.7476	256.3051	173.5634	60.2537	12.1370	0.0000	0.0000	0.0000	0.0000	75.3411	236.3169	395.0979	(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	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.4532	84.8925	83.9409	82.2422	80.7949	80.3000	80.3000	80.3000	80.3000	82.5722	84.7103	85.5613	(217)
Fuel for water heating, kWh/month	247.4263	219.8895	235.0513	209.6115	205.3201	184.4921	181.6332	190.4439	194.0560	212.0704	221.1852	244.5721	(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	18.1885	14.5915	13.1380	9.6254	7.4350	6.0744	6.7824	8.8161	11.4512	15.0246	16.9702	18.6940	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4164	-20.1575	-30.8587	-37.0329	-42.0207	-40.0022	-39.5246	-36.2719	-30.9119	-24.0590	-15.1872	-11.4595	(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	-4.2243	-9.1318	-18.6151	-28.6532	-38.5725	-39.0005	-38.5331	-32.3027	-23.2630	-13.2739	-5.7083	-3.3219	(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	1587.7627	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2545.7517	(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)	146.7912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-595.5026	(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	3770.8030	(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	1587.7627	0.2100	333.4302	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2545.7517	0.2100	534.6079	(264)
Space and water heating			868.0380	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	146.7912	0.1443	21.1865	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	0.1333	-45.4303	
PV Unit electricity exported	-254.6002	0.1252	-31.8735	
Total			-77.3038	(269)
Total CO2, kg/year			823.8500	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6800	(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	1587.7627	1.1300	1794.1719	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2545.7517	1.1300	2876.6994	(278)
Space and water heating			4670.8713	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	146.7912	1.5338	225.1533	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	1.4924	-508.7792	
PV Unit electricity exported	-254.6002	0.4595	-116.9892	
Total			-625.7684	(283)
Total Primary energy kWh/year			4400.3569	(286)
Target Primary Energy Rate (TPER)			73.0500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	93 A	**DER**	11.65	**TER**	13.68
Environmental	91 B	**% DER < TER**			14.84
CO_2 Emissions (t/year)	0.59	**DFEE**	33.86	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			-9.85
% DPER < TPER	16.69	**DPER**	60.85	**TPER**	73.05

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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	
Main dwelling								
Windows			23.7600	1.1450	27.2061			(27)
External Wall	73.0600	23.7600	49.3000	0.1800	8.8740	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0801			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)									30.6000	0.0000	0.0000		
E16 Corner (normal)									7.8000	0.0900	0.7020		
E17 Corner (inverted - internal area greater than external area)									2.6000	-0.0900	-0.2340		
E18 Party wall between dwellings									15.6000	0.0600	0.9360		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												8.1780	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		44.2581	(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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff													
	74.4310	74.2629	74.0981	73.3240	73.1791	72.5049	72.5049	72.3801	72.7646	73.1791	73.4721	73.7784	(39)
Average = Sum(39)m / 12 =												73.3233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2356	1.2328	1.2300	1.2172	1.2148	1.2036	1.2036	1.2015	1.2079	1.2148	1.2197	1.2247	(40)
HLP (average)												1.2172	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	24.8754	24.5059	23.9857	23.0265	22.3082	21.5118	21.0816	21.5982	22.1606	23.0129	23.9918	24.7913	(42b)
Hot water usage for other uses													
	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)
Average daily hot water use (litres/day)												54.8755	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	59.8687	58.2268	56.4340	54.2023	52.2116	50.1427	49.7125	51.5015	53.3365	55.4612	57.7127	59.7846	(44)
Energy conte	94.8174	82.9141	86.7370	74.2003	70.2868	61.6562	60.1229	63.7697	65.7693	75.2603	82.2223	93.6082	(45)
Energy content (annual)										Total = Sum(45)m =		911.3646	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(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													
	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(64)
										Total per year (kWh/year) = Sum(64)m =		774.6599	(64)
12Total per year (kWh/year)												775	(64)
Electric shower(s)													
	46.0949	41.0710	44.8479	42.7978	43.6009	41.5910	42.9774	43.6009	42.7978	44.8479	44.0046	46.0949	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		524.3271	(64a)
Heat gains from water heating, kWh/month													
	31.6724	27.8870	29.6436	26.4670	25.8362	23.4997	23.5205	24.4513	24.6754	27.2048	28.4734	31.4155	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)													
	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)													
	42.5705	41.4985	39.8435	36.7597	34.7260	32.6385	31.6135	32.8646	34.2714	36.5656	39.5464	42.2251	(72)
Total internal gains													
	356.4854	366.5933	351.0211	341.1938	324.0464	313.4143	301.8139	301.2641	310.1271	319.1648	337.2593	348.4825	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	558.4804	720.2408	860.3304	1014.8830	1117.5453	1118.2908	1070.6780	978.1280	875.9503	716.8781	580.9465	520.2198	(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	66.3005	66.4506	66.5984	67.3015	67.4347	68.0617	68.0617	68.1791	67.8188	67.4347	67.1658	66.8869	
alpha	5.4200	5.4300	5.4399	5.4868	5.4956	5.5374	5.5374	5.5453	5.5213	5.4956	5.4777	5.4591	
util living area	0.9928	0.9736	0.9218	0.7838	0.5927	0.4131	0.2977	0.3398	0.5615	0.8702	0.9799	0.9949	(86)
MIT	19.9415	20.2397	20.5671	20.8586	20.9720	20.9968	20.9996	20.9991	20.9843	20.7883	20.3034	19.8884	(87)
Th 2	19.8916	19.8939	19.8960	19.9063	19.9082	19.9171	19.9171	19.9188	19.9137	19.9082	19.9043	19.9003	(88)
util rest of house	0.9901	0.9647	0.8983	0.7353	0.5291	0.3441	0.2246	0.2603	0.4784	0.8236	0.9715	0.9930	(89)
MIT 2	18.9577	19.2500	19.5579	19.8126	19.8938	19.9160	19.9170	19.9186	19.9076	19.7683	19.3242	18.9120	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.3415	19.6361	19.9516	20.2207	20.3144	20.3376	20.3393	20.3401	20.3276	20.1662	19.7062	19.2929	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3415	19.6361	19.9516	20.2207	20.3144	20.3376	20.3393	20.3401	20.3276	20.1662	19.7062	19.2929	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9883	0.9622	0.8996	0.7500	0.5533	0.3710	0.2531	0.2913	0.5107	0.8358	0.9696	0.9916	(94)
Useful gains	551.9497	692.9923	773.9934	761.2127	618.2844	414.9119	271.0204	284.9695	447.3209	599.1836	563.2600	515.8382	(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	1119.5516	1094.3426	996.7374	830.0758	630.3952	416.0075	271.1211	285.1869	453.1479	700.0461	926.2060	1113.5306	(97)
Space heating kWh	422.2958	269.7074	165.7216	49.5814	9.0104	0.0000	0.0000	0.0000	0.0000	75.0417	261.3211	444.6831	(98a)
Space heating requirement - total per year (kWh/year)												1697.3625	
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	422.2958	269.7074	165.7216	49.5814	9.0104	0.0000	0.0000	0.0000	0.0000	75.0417	261.3211	444.6831	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1697.3625	
Space heating per m2											(98c) / (4) =	28.1767	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	681.5463	536.5364	550.0885	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9852	0.9941	0.9898	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	671.4896	533.3546	544.4818	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1274.9656	1221.0358	1114.5478	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	434.5027	511.6348	424.1291	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	108.6257	127.9087	106.0323	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												342.5666	(107)
Energy for space heating												28.1767	(99)
Energy for space cooling												5.6867	(108)
Total												33.8634	(109)
Fabric Energy Efficiency (DFEE)												33.9	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) = 0.3210 (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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			15.0600	1.1450	17.2443			(27)
External Wall	73.0600	15.0600	58.0000	0.1800	10.4400			(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6843			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 294.9090 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	15.6000	0.0600	0.9360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1780 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)

Average = Sum(39)m / 12 = 64.9274

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9884 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.8754	24.5059	23.9857	23.0265	22.3082	21.5118	21.0816	21.5982	22.1606	23.0129	23.9918	24.7913	(42b)
Hot water usage for other uses	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 54.8755 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.8687	58.2268	56.4340	54.2023	52.2116	50.1427	49.7125	51.5015	53.3365	55.4612	57.7127	59.7846	(44)
Energy conte	94.8174	82.9141	86.7370	74.2003	70.2868	61.6562	60.1229	63.7697	65.7693	75.2603	82.2223	93.6082	(45)

Energy content (annual) Total = Sum(45)m = 911.3646

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(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	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(64)

Total per year (kWh/year) = Sum(64)m = 774.6599 (64)

12Total per year (kWh/year) 775 (64)

Electric shower(s)	46.0949	41.0710	44.8479	42.7978	43.6009	41.5910	42.9774	43.6009	42.7978	44.8479	44.0046	46.0949	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 524.3271 (64a)

Heat gains from water heating, kWh/month	31.6724	27.8870	29.6436	26.4670	25.8362	23.4997	23.5205	24.4513	24.6754	27.2048	28.4734	31.4155	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)													
	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)													
	42.5705	41.4985	39.8435	36.7597	34.7260	32.6385	31.6135	32.8646	34.2714	36.5656	39.5464	42.2251	(72)
Total internal gains													
	356.4854	366.5933	351.0211	341.1938	324.0464	313.4143	301.8139	301.2641	310.1271	319.1648	337.2593	348.4825	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)
Northwest	5.3000	11.2829	0.6300	0.7000	0.7700	18.2755	(81)

Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	484.5090	590.7352	673.8259	768.1909	826.9871	823.5689	789.1417	730.2756	668.7532	571.2367	491.7075	457.3286	(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	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area													
	0.9959	0.9865	0.9599	0.8679	0.6963	0.4947	0.3570	0.4021	0.6448	0.9190	0.9885	0.9970	(86)
MIT	20.0251	20.2489	20.5188	20.8126	20.9579	20.9954	20.9995	20.9990	20.9796	20.7654	20.3405	19.9885	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house													
	0.9944	0.9817	0.9462	0.8305	0.6341	0.4215	0.2786	0.3180	0.5624	0.8855	0.9835	0.9959	(89)
MIT 2	19.1313	19.3535	19.6152	19.8866	19.9979	20.0285	20.0301	20.0316	20.0181	19.8562	19.4544	19.1021	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.4800	19.7028	19.9677	20.2479	20.3724	20.4057	20.4082	20.4090	20.3932	20.2109	19.8001	19.4479	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4800	19.7028	19.9677	20.2479	20.3724	20.4057	20.4082	20.4090	20.3932	20.2109	19.8001	19.4479	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9798	0.9455	0.8400	0.6571	0.4500	0.3092	0.3509	0.5942	0.8929	0.9821	0.9951	(94)
Useful gains	481.2548	578.8306	637.1084	645.2576	543.4532	370.6289	244.0156	256.2427	397.4041	510.0548	482.8997	455.0689	(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													
	1002.4116	975.0167	884.8590	736.7956	561.8265	372.1998	244.1423	256.5124	405.0832	622.6239	826.4749	996.9467	(97)
Space heating kWh													
	387.7407	266.2371	184.3264	65.9074	13.6697	0.0000	0.0000	0.0000	0.0000	83.7515	247.3741	403.1571	(98a)
Space heating requirement - total per year (kWh/year)												1652.1639	
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													
	387.7407	266.2371	184.3264	65.9074	13.6697	0.0000	0.0000	0.0000	0.0000	83.7515	247.3741	403.1571	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1652.1639	
Space heating per m2											(98c) / (4) =	27.4264	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	602.6254	474.4073	486.2802	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9743	0.9901	0.9836	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	587.1277	469.7292	478.3222	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	930.4854	891.9675	824.8502	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	247.2176	314.1453	257.8168	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	61.8044	78.5363	64.4542	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												204.7949	(107)
Energy for space heating												27.4264	(99)
Energy for space cooling												3.3996	(108)
Total												30.8260	(109)
Fabric Energy Efficiency (TFEE)												30.8	(109)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	93 A	**DER**	11.65	**TER**	13.68
Environmental	91 B	**% DER < TER**			14.84
CO_2 Emissions (t/year)	0.59	**DFEE**	33.86	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			-9.85
% DPER < TPER	16.69	**DPER**	60.85	**TPER**	73.05

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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	
Main dwelling								
Windows			23.7600	1.1450	27.2061			(27)
External Wall	73.0600	23.7600	49.3000	0.1800	8.8740	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0801			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020

E17 Corner (inverted - internal area greater than external area)									2.6000	-0.0900	-0.2340		
E18 Party wall between dwellings									15.6000	0.0600	0.9360		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												8.1780	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		44.2581	(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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	74.4310	74.2629	74.0981	73.3240	73.1791	72.5049	72.5049	72.3801	72.7646	73.1791	73.4721	73.7784	(39)
Average = Sum(39)m / 12 =												73.3233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2356	1.2328	1.2300	1.2172	1.2148	1.2036	1.2036	1.2015	1.2079	1.2148	1.2197	1.2247	(40)
HLP (average)												1.2172	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(64)
12Total per year (kWh/year)												2210	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	409.5304	418.6928	401.0072	385.7277	365.0422	347.6769	333.7666	335.1363	346.2356	362.3967	385.4967	400.8498	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	611.5254	772.3402	910.3165	1059.4169	1158.5411	1152.5533	1102.6306	1012.0002	912.0589	760.1100	629.1839	572.5871	(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	66.3005	66.4506	66.5984	67.3015	67.4347	68.0617	68.0617	68.1791	67.8188	67.4347	67.1658	66.8869	

alpha	5.4200	5.4300	5.4399	5.4868	5.4956	5.5374	5.5374	5.5453	5.5213	5.4956	5.4777	5.4591	
util living area	0.9890	0.9649	0.9055	0.7622	0.5740	0.4010	0.2891	0.3285	0.5411	0.8466	0.9717	0.9920	(86)
MIT	20.0190	20.3073	20.6152	20.8771	20.9760	20.9972	20.9996	20.9993	20.9868	20.8187	20.3684	19.9660	(87)
Th 2	19.8916	19.8939	19.8960	19.9063	19.9082	19.9171	19.9171	19.9188	19.9137	19.9082	19.9043	19.9003	(88)
util rest of house	0.9851	0.9536	0.8788	0.7126	0.5116	0.3340	0.2181	0.2516	0.4602	0.7961	0.9605	0.9891	(89)
MIT 2	18.7907	19.1498	19.5158	19.8032	19.8925	19.9159	19.9170	19.9186	19.9072	19.7578	19.2390	18.7305	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.2699	19.6014	19.9447	20.2221	20.3152	20.3378	20.3394	20.3402	20.3284	20.1716	19.6796	19.2125	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.1199	19.4514	19.7947	20.0721	20.1652	20.1878	20.1894	20.1902	20.1784	20.0216	19.5296	19.0625	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9814	0.9479	0.8760	0.7205	0.5266	0.3508	0.2360	0.2709	0.4803	0.8020	0.9556	0.9860	(94)
Useful gains	600.1282	732.1372	797.4702	763.3476	610.0743	404.3346	260.1797	274.1895	438.0618	609.5909	601.2581	564.5844	(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	1103.0583	1080.6268	985.1079	819.1837	619.4727	405.1394	260.2467	274.3332	442.2889	689.4670	913.2285	1096.5312	(97)
Space heating kWh	374.1800	234.1850	139.6024	40.2020	6.9924	0.0000	0.0000	0.0000	0.0000	59.4278	224.6187	395.7684	(98a)
Space heating requirement - total per year (kWh/year)												1474.9768	
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	374.1800	234.1850	139.6024	40.2020	6.9924	0.0000	0.0000	0.0000	0.0000	59.4278	224.6187	395.7684	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1474.9768	
Space heating per m2											(98c) / (4) =	24.4850	(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 %)	89.5000	(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	374.1800	234.1850	139.6024	40.2020	6.9924	0.0000	0.0000	0.0000	0.0000	59.4278	224.6187	395.7684	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	418.0782	261.6592	155.9804	44.9184	7.8128	0.0000	0.0000	0.0000	0.0000	66.3998	250.9707	442.1993	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.7818	-39.0126	-58.0255	-66.8880	-72.9973	-68.4257	-67.5115	-63.2508	-55.6113	-45.3525	-29.7956	-22.9403	(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	-13.9936	-30.8887	-65.1576	-102.8889	-139.8487	-141.8655	-139.5833	-115.8084	-81.4933	-45.2091	-18.9556	-10.9108	(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	1648.0188	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1523.1963	(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	2823.4848	(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	1648.0188	0.2100	346.0839	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			864.5470	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-616.5930	0.1341	-82.6659	
PV Unit electricity exported	-906.6034	0.1246	-113.0023	
Total			-195.6681	(269)
Total CO2, kg/year			701.5616	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.6500	(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	1648.0188	1.1300	1862.2612	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	1.1300	2789.8248	(278)
Space and water heating			4652.0860	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.7909	1.5338	220.5513	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-616.5930	1.4955	-922.0960	
PV Unit electricity exported	-906.6034	0.4575	-414.7472	
Total			-1336.8432	(283)
Total Primary energy kWh/year			3665.8948	(286)
Dwelling Primary energy Rate (DPER)			60.8500	(287)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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	
Main dwelling								
TER Opening Type			15.0600	1.1450	17.2443			(27)

External Wall	73.0600	15.0600	58.0000	0.1800	10.4400	(29a)
Total net area of external elements Aum(A, m2)			73.0600			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6843	(33)
Main dwelling						
Party Wall 1			25.4800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400	
E3 Sill	10.8000	0.0500	0.5400	
E4 Jamb	35.2000	0.0500	1.7600	
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0900	0.7020	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	
E18 Party wall between dwellings	15.6000	0.0600	0.9360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1780 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)
Average = Sum(39)m / 12 =												64.9274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
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 1.9884 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)

Hot water usage for other uses

34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 93.3125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.5984	49.1285	45.6548	45.5522	42.4079	43.2369	44.5873	44.5162	47.8066	48.1794	50.9589	(61)
Total heat required for water heating calculated for each month	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(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	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(64)
										Total per year (kWh/year) = Sum(64)m =		2108.1738	(64)
12Total per year (kWh/year)												2108	(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	66.0976	58.3058	61.5505	53.5529	51.3998	45.7603	44.9286	47.1696	48.1399	54.2805	58.3246	65.3745	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	88.8408	86.7646	82.7292	74.3790	69.0857	63.5560	60.3879	63.4000	66.8609	72.9576	81.0064	87.8690	(72)
Total internal gains	405.7558	414.8594	396.9068	381.8130	361.4061	344.3318	330.5883	331.7994	342.7166	358.5568	381.7193	397.1263	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)

Northwest			5.3000		11.2829		0.6300		0.7000		0.7700		18.2755 (81)
Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	533.7793	639.0013	719.7115	808.8101	864.3468	854.4863	817.9160	760.8110	701.3427	610.6287	536.1675	505.9725	(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	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area	0.9932	0.9804	0.9472	0.8457	0.6715	0.4774	0.3445	0.3862	0.6185	0.8973	0.9824	0.9950	(86)
MIT	20.1000	20.3176	20.5738	20.8398	20.9652	20.9962	20.9996	20.9992	20.9836	20.8015	20.4046	20.0632	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house	0.9908	0.9737	0.9303	0.8054	0.6099	0.4064	0.2688	0.3053	0.5379	0.8585	0.9752	0.9931	(89)
MIT 2	18.9791	19.2539	19.5684	19.8764	19.9968	20.0285	20.0301	20.0316	20.0180	19.8467	19.3745	18.9392	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.4164	19.6689	19.9606	20.2522	20.3746	20.4060	20.4083	20.4091	20.3947	20.2192	19.7764	19.3777	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4164	19.6689	19.9606	20.2522	20.3746	20.4060	20.4083	20.4091	20.3947	20.2192	19.7764	19.3777	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9708	0.9293	0.8157	0.6327	0.4341	0.2984	0.3369	0.5690	0.8673	0.9729	0.9915	(94)
Useful gains	527.8321	620.3620	668.8360	659.7531	546.8954	370.9267	244.0412	256.3033	399.0707	529.5960	521.6583	501.6698	(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	998.2122	972.7815	884.3906	737.0788	561.9688	372.2166	244.1445	256.5175	405.1798	623.1647	824.9316	992.3560	(97)
Space heating kWh	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98a)
Space heating requirement - total per year (kWh/year)												1467.0928	
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	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1467.0928	
Space heating per m2											(98c) / (4) =	24.3541	(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 %)	92.4000	(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	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	378.7476	256.3051	173.5634	60.2537	12.1370	0.0000	0.0000	0.0000	0.0000	75.3411	236.3169	395.0979	(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	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.4532	84.8925	83.9409	82.2422	80.7949	80.3000	80.3000	80.3000	80.3000	82.5722	84.7103	85.5613	(217)
Fuel for water heating, kWh/month	247.4263	219.8895	235.0513	209.6115	205.3201	184.4921	181.6332	190.4439	194.0560	212.0704	221.1852	244.5721	(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	18.1885	14.5915	13.1380	9.6254	7.4350	6.0744	6.7824	8.8161	11.4512	15.0246	16.9702	18.6940	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4164	-20.1575	-30.8587	-37.0329	-42.0207	-40.0022	-39.5246	-36.2719	-30.9119	-24.0590	-15.1872	-11.4595	(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	-4.2243	-9.1318	-18.6151	-28.6532	-38.5725	-39.0005	-38.5331	-32.3027	-23.2630	-13.2739	-5.7083	-3.3219	(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	1587.7627	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2545.7517	(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)	146.7912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-595.5026	(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	3770.8030	(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	1587.7627	0.2100	333.4302	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2545.7517	0.2100	534.6079	(264)
Space and water heating			868.0380	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	146.7912	0.1443	21.1865	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	0.1333	-45.4303	
PV Unit electricity exported	-254.6002	0.1252	-31.8735	
Total			-77.3038	(269)
Total CO2, kg/year			823.8500	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6800	(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	1587.7627	1.1300	1794.1719	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2545.7517	1.1300	2876.6994	(278)
Space and water heating			4670.8713	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	146.7912	1.5338	225.1533	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	1.4924	-508.7792	
PV Unit electricity exported	-254.6002	0.4595	-116.9892	
Total			-625.7684	(283)
Total Primary energy kWh/year			4400.3569	(286)
Target Primary Energy Rate (TPER)			73.0500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	93 A	**DER**	11.65	**TER**	13.68
Environmental	91 B	**% DER < TER**			14.84
CO_2 Emissions (t/year)	0.59	**DFEE**	33.86	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			-9.85
% DPER < TPER	16.69	**DPER**	60.85	**TPER**	73.05

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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	
Main dwelling								
Windows			23.7600	1.1450	27.2061			(27)
External Wall	73.0600	23.7600	49.3000	0.1800	8.8740	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0801			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020

E17 Corner (inverted - internal area greater than external area)									2.6000	-0.0900	-0.2340		
E18 Party wall between dwellings									15.6000	0.0600	0.9360		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												8.1780	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		44.2581	(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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	74.4310	74.2629	74.0981	73.3240	73.1791	72.5049	72.5049	72.3801	72.7646	73.1791	73.4721	73.7784	(39)
Average = Sum(39)m / 12 =												73.3233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2356	1.2328	1.2300	1.2172	1.2148	1.2036	1.2036	1.2015	1.2079	1.2148	1.2197	1.2247	(40)
HLP (average)												1.2172	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3551	18.0792	14.7030	11.1311	8.3206	7.0246	7.5904	9.8662	13.2425	16.8143	19.6248	20.9208	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	463.6902	462.0848	448.1667	421.6388	395.0537	367.8289	353.6306	356.3892	370.1820	397.5915	426.5911	451.8037	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	665.6853	815.7322	957.4760	1095.3280	1188.5527	1172.7053	1122.4946	1033.2531	936.0053	795.3048	670.2783	623.5410	(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	66.3005	66.4506	66.5984	67.3015	67.4347	68.0617	68.0617	68.1791	67.8188	67.4347	67.1658	66.8869	
alpha	5.4200	5.4300	5.4399	5.4868	5.4956	5.5374	5.5374	5.5453	5.5213	5.4956	5.4777	5.4591	

util living area													
	0.9840	0.9564	0.8890	0.7450	0.5609	0.3943	0.2840	0.3218	0.5283	0.8268	0.9634	0.9882	(86)
MIT	20.0961	20.3611	20.6566	20.8902	20.9785	20.9974	20.9997	20.9993	20.9883	20.8404	20.4213	20.0402	(87)
Th 2	19.8916	19.8939	19.8960	19.9063	19.9082	19.9171	19.9171	19.9188	19.9137	19.9082	19.9043	19.9003	(88)
util rest of house													
	0.9784	0.9429	0.8595	0.6947	0.4994	0.3283	0.2142	0.2464	0.4488	0.7738	0.9495	0.9840	(89)
MIT 2	18.8873	19.2144	19.5611	19.8151	19.8942	19.9160	19.9170	19.9186	19.9079	19.7780	19.3025	18.8238	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.3588	19.6617	19.9885	20.2345	20.3172	20.3379	20.3394	20.3402	20.3294	20.1925	19.7389	19.2983	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2088	19.5117	19.8385	20.0845	20.1672	20.1879	20.1894	20.1902	20.1794	20.0425	19.5889	19.1483	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9739	0.9373	0.8578	0.7033	0.5143	0.3449	0.2318	0.2654	0.4686	0.7810	0.9445	0.9802	(94)
Useful gains	648.3379	764.5580	821.3256	770.3679	611.2293	404.4122	260.1869	274.2070	438.6128	621.0986	633.0741	611.1805	(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	1109.6804	1085.1078	988.3534	820.0912	619.6210	405.1502	260.2480	274.3361	442.3629	690.9918	917.5874	1102.8648	(97)
Space heating kWh	343.2388	215.4095	124.2687	35.8008	6.2434	0.0000	0.0000	0.0000	0.0000	52.0005	204.8496	365.8131	(98a)
Space heating requirement - total per year (kWh/year)												1347.6245	
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	343.2388	215.4095	124.2687	35.8008	6.2434	0.0000	0.0000	0.0000	0.0000	52.0005	204.8496	365.8131	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1347.6245	
Space heating per m2											(98c) / (4) =	22.3709	(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 %)	89.5000	(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	343.2388	215.4095	124.2687	35.8008	6.2434	0.0000	0.0000	0.0000	0.0000	52.0005	204.8496	365.8131	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	383.5070	240.6810	138.8478	40.0009	6.9759	0.0000	0.0000	0.0000	0.0000	58.1011	228.8822	408.7298	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.7818	-39.0126	-58.0255	-66.8880	-72.9973	-68.4257	-67.5115	-63.2508	-55.6113	-45.3525	-29.7956	-22.9403	(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	-13.9936	-30.8887	-65.1576	-102.8889	-139.8487	-141.8655	-139.5833	-115.8084	-81.4933	-45.2091	-18.9556	-10.9108	(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	1505.7257	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1523.1963	(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	2681.1918	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1505.7257	3.6400	54.8084	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	3.6400	89.8669	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	143.7909	16.4900	23.7111	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-616.5930	16.4900	-101.6762	
PV Unit electricity exported	-906.6034	5.5900	-50.6791	
Total			-152.3553	(252)
Total energy cost			122.2125	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4181 (257)
SAP value		93.2233
SAP rating (Section 12)		93 (258)
SAP band		A

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	1505.7257	0.2100	316.2024	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			834.6654	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-616.5930	0.1341	-82.6659	
PV Unit electricity exported	-906.6034	0.1246	-113.0023	
Total			-195.6681	(269)
Total CO2, kg/year			671.6800	(272)
CO2 emissions per m2			11.1500	(273)
EI value			91.4476	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)

Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.3531	0.3371	0.3371	0.3130	0.3130	0.2729	0.2809	0.2970	0.2889	0.3050	0.3050	0.3371	(22b)
Effective ac	0.5624	0.5568	0.5568	0.5490	0.5490	0.5372	0.5395	0.5441	0.5417	0.5465	0.5465	0.5568	(25)

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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	
Windows			23.7600	1.1450	27.2061			(27)
External Wall	73.0600	23.7600	49.3000	0.1800	8.8740	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	36.0801			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	15.6000	0.0600	0.9360

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.1780 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.2581 (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	29.0659	28.7795	28.7795	28.3750	28.3750	27.7674	27.8822	28.1220	28.0004	28.2468	28.2468	28.7795	(38)
Heat transfer coeff	73.3240	73.0376	73.0376	72.6331	72.6331	72.0255	72.1403	72.3801	72.2585	72.5049	72.5049	73.0376	(39)
Average = Sum(39)m / 12 =												72.6264	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2172	1.2124	1.2124	1.2057	1.2057	1.1956	1.1975	1.2015	1.1995	1.2036	1.2036	1.2124	(40)
HLP (average)												1.2056	
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												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3551	18.0792	14.7030	11.1311	8.3206	7.0246	7.5904	9.8662	13.2425	16.8143	19.6248	20.9208	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)

Water heating gains (Table 5)

	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924 (72)
Total internal gains												
	463.6902	462.0848	448.1667	421.6388	395.0537	367.8289	353.6306	356.3892	370.1820	397.5915	426.5911	451.8037 (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	
Southeast	4.8400	39.1209	0.6300	0.7000	0.7700	57.8664	(77)
Southwest	10.5600	39.1209	0.6300	0.7000	0.7700	126.2539	(79)
Northwest	8.3600	12.4928	0.6300	0.7000	0.7700	31.9181	(81)

Solar gains	216.0384	340.0656	493.4265	681.7560	783.4824	853.1628	816.9496	733.1311	607.9192	418.1804	269.2325	188.1218	(83)
Total gains	679.7286	802.1503	941.5932	1103.3948	1178.5362	1220.9917	1170.5802	1089.5203	978.1013	815.7720	695.8235	639.9255	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.3015	67.5653	67.5653	67.9416	67.9416	68.5148	68.4057	68.1791	68.2938	68.0617	68.0617	67.5653	
alpha	5.4868	5.5044	5.5044	5.5294	5.5294	5.5677	5.5604	5.5453	5.5529	5.5374	5.5374	5.5044	
util living area	0.9758	0.9459	0.8561	0.6659	0.4646	0.2712	0.1541	0.1794	0.3902	0.7335	0.9365	0.9812	(86)
MIT	20.2591	20.4691	20.7562	20.9457	20.9931	20.9997	21.0000	21.0000	20.9980	20.9274	20.5953	20.2109	(87)
Th 2	19.9063	19.9101	19.9101	19.9154	19.9154	19.9235	19.9220	19.9188	19.9204	19.9171	19.9171	19.9101	(88)
util rest of house	0.9673	0.9288	0.8186	0.6079	0.4000	0.2078	0.0876	0.1075	0.3115	0.6637	0.9128	0.9744	(89)
MIT 2	19.1027	19.3593	19.6849	19.8750	19.9118	19.9234	19.9220	19.9188	19.9197	19.8668	19.5208	19.0464	(90)
Living area fraction									fLA = Living area / (4) =			0.3901	(91)
MIT	19.5539	19.7922	20.1028	20.2927	20.3336	20.3433	20.3425	20.3406	20.3404	20.2806	19.9400	19.5007	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4039	19.6422	19.9528	20.1427	20.1836	20.1933	20.1925	20.1906	20.1904	20.1306	19.7900	19.3507	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9622	0.9238	0.8202	0.6205	0.4161	0.2237	0.1043	0.1256	0.3312	0.6783	0.9095	0.9698	(94)
Useful gains	654.0683	741.0228	772.3077	684.6082	490.4001	273.1635	122.0977	136.8378	323.9953	553.3072	632.8453	620.5931	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	1026.8183	1003.6987	887.6149	707.6410	492.7157	273.2143	122.0981	136.8390	324.4689	582.2559	825.8313	1018.9235	(97)
Space heating kWh	277.3260	176.5182	85.7885	16.5836	1.7228	0.0000	0.0000	0.0000	0.0000	21.5379	138.9499	296.3578	(98a)
Space heating requirement - total per year (kWh/year)												1014.7848	
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	277.3260	176.5182	85.7885	16.5836	1.7228	0.0000	0.0000	0.0000	0.0000	21.5379	138.9499	296.3578	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1014.7848	
Space heating per m2											(98c) / (4) =	16.8457	(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 %)	89.5000	(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	277.3260	176.5182	85.7885	16.5836	1.7228	0.0000	0.0000	0.0000	0.0000	21.5379	138.9499	296.3578	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	309.8615	197.2270	95.8531	18.5292	1.9250	0.0000	0.0000	0.0000	0.0000	24.0647	155.2513	331.1260	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.6605	-38.4547	-57.4213	-67.5946	-72.6892	-70.1564	-69.3124	-65.7791	-58.1376	-47.3632	-32.5462	-25.0541	(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	-15.8159	-30.0300	-63.6894	-105.6379	-138.1851	-153.1032	-151.2480	-129.3364	-90.9819	-49.5452	-22.3783	-12.7637	(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	1133.8377	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1595.8843	(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	2236.6159	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1133.8377	6.3400	71.8853	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	6.3400	156.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	143.7909	26.0000	37.3856	(250)
Additional standing charges			113.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-633.1693	26.0000	-164.6240	
PV Unit electricity exported	-962.7150	5.8100	-55.9337	
Total			-220.5578	(252)
Total energy cost			180.5996	(255)

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	1133.8377	0.2100	238.1059	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			756.5689	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-633.1693	0.1341	-84.8831	
PV Unit electricity exported	-962.7150	0.1239	-119.2534	
Total			-204.1364	(269)
Total CO2, kg/year			585.1152	(272)

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	1133.8377	1.1300	1281.2366	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	1.1300	2789.8248	(278)
Space and water heating			4071.0615	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.7909	1.5338	220.5513	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-633.1693	1.4954	-946.8587	
PV Unit electricity exported	-962.7150	0.4545	-437.5645	
Total			-1384.4232	(283)
Total Primary energy kWh/year			3037.2903	(286)

SAP 10 EPC IMPROVEMENTS

Flat 8

Current energy efficiency rating:	A 93
Current environmental impact rating:	B 91

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: A 93
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£60	£60	£0
Mains gas	£341	£341	£0
Space heating	£207	£207	£0
Water heating	£157	£157	£0
Lighting	£37	£37	£0
Generated (PV)	-£221	-£221	£0
Total cost of fuels	£180	£180	£0
Total cost of uses	£180	£180	£0
Delivered energy	37 kWh/m²	37 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	50 kWh/m²	50 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400 (1b)	x	2.6000 (2b)	=	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(5)

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2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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	
Main dwelling								
Windows			23.7600	1.1450	27.2061			(27)
External Wall	73.0600	23.7600	49.3000	0.1800	8.8740	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0801			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	15.6000	0.0600	0.9360

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.1780 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	44.2581 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	74.4310	74.2629	74.0981	73.3240	73.1791	72.5049	72.5049	72.3801	72.7646	73.1791	73.4721	73.7784	(39)
Average = Sum(39)m / 12 =												73.3233	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2356	1.2328	1.2300	1.2172	1.2148	1.2036	1.2036	1.2015	1.2079	1.2148	1.2197	1.2247	(40)
HLP (average)												1.2172	
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		1.9884 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)

Hot water usage for other uses

36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)

Average daily hot water use (litres/day)	98.2236 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	

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

25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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

219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
									Total per year (kWh/year) = Sum(64)m =		2209.6400	(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

68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3551	18.0792	14.7030	11.1311	8.3206	7.0246	7.5904	9.8662	13.2425	16.8143	19.6248	20.9208	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	463.6902	462.0848	448.1667	421.6388	395.0537	367.8289	353.6306	356.3892	370.1820	397.5915	426.5911	451.8037	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	665.6853	815.7322	957.4760	1095.3280	1188.5527	1172.7053	1122.4946	1033.2531	936.0053	795.3048	670.2783	623.5410	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.3005	66.4506	66.5984	67.3015	67.4347	68.0617	68.0617	68.1791	67.8188	67.4347	67.1658	66.8869	
alpha	5.4200	5.4300	5.4399	5.4868	5.4956	5.5374	5.5374	5.5453	5.5213	5.4956	5.4777	5.4591	
util living area	0.9840	0.9564	0.8890	0.7450	0.5609	0.3943	0.2840	0.3218	0.5283	0.8268	0.9634	0.9882	(86)
MIT	20.0961	20.3611	20.6566	20.8902	20.9785	20.9974	20.9997	20.9993	20.9883	20.8404	20.4213	20.0402	(87)
Th 2	19.8916	19.8939	19.8960	19.9063	19.9082	19.9171	19.9171	19.9188	19.9137	19.9082	19.9043	19.9003	(88)
util rest of house	0.9784	0.9429	0.8595	0.6947	0.4994	0.3283	0.2142	0.2464	0.4488	0.7738	0.9495	0.9840	(89)
MIT 2	18.8873	19.2144	19.5611	19.8151	19.8942	19.9160	19.9170	19.9186	19.9079	19.7780	19.3025	18.8238	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.3588	19.6617	19.9885	20.2345	20.3172	20.3379	20.3394	20.3402	20.3294	20.1925	19.7389	19.2983	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2088	19.5117	19.8385	20.0845	20.1672	20.1879	20.1894	20.1902	20.1794	20.0425	19.5889	19.1483	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9739	0.9373	0.8578	0.7033	0.5143	0.3449	0.2318	0.2654	0.4686	0.7810	0.9445	0.9802	(94)
Useful gains	648.3379	764.5580	821.3256	770.3679	611.2293	404.4122	260.1869	274.2070	438.6128	621.0986	633.0741	611.1805	(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	1109.6804	1085.1078	988.3534	820.0912	619.6210	405.1502	260.2480	274.3361	442.3629	690.9918	917.5874	1102.8648	(97)
Space heating kWh	343.2388	215.4095	124.2687	35.8008	6.2434	0.0000	0.0000	0.0000	0.0000	52.0005	204.8496	365.8131	(98a)
Space heating requirement - total per year (kWh/year)												1347.6245	
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	343.2388	215.4095	124.2687	35.8008	6.2434	0.0000	0.0000	0.0000	0.0000	52.0005	204.8496	365.8131	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1347.6245	
Space heating per m2											(98c) / (4) =	22.3709	(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 %) 89.5000 (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	343.2388	215.4095	124.2687	35.8008	6.2434	0.0000	0.0000	0.0000	0.0000	52.0005	204.8496	365.8131	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	383.5070	240.6810	138.8478	40.0009	6.9759	0.0000	0.0000	0.0000	0.0000	58.1011	228.8822	408.7298	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.7818	-39.0126	-58.0255	-66.8880	-72.9973	-68.4257	-67.5115	-63.2508	-55.6113	-45.3525	-29.7956	-22.9403	(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	-13.9936	-30.8887	-65.1576	-102.8889	-139.8487	-141.8655	-139.5833	-115.8084	-81.4933	-45.2091	-18.9556	-10.9108	(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 1505.7257 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 2468.8715 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 86.0000 (231)

Electricity for lighting (calculated in Appendix L) 143.7909 (232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1523.1963	(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	2681.1918	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1505.7257	3.6400	54.8084	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	3.6400	89.8669	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	143.7909	16.4900	23.7111	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-616.5930	16.4900	-101.6762	
PV Unit electricity exported	-906.6034	5.5900	-50.6791	
Total			-152.3553	(252)
Total energy cost			122.2125	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4181	(257)
SAP value		93.2233	
SAP rating (Section 12)		93	(258)
SAP band		A	

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	1505.7257	0.2100	316.2024	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			834.6654	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-616.5930	0.1341	-82.6659	
PV Unit electricity exported	-906.6034	0.1246	-113.0023	
Total			-195.6681	(269)
Total CO2, kg/year			671.6800	(272)
CO2 emissions per m2			11.1500	(273)
EI value			91.4476	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b) x	2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1277 (8)
Pressure test		Yes

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3777	(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) =	0.3210	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.3531	0.3371	0.3371	0.3130	0.3130	0.2729	0.2809	0.2970	0.2889	0.3050	0.3050	0.3371	(22b)
Effective ac	0.5624	0.5568	0.5568	0.5490	0.5490	0.5372	0.5395	0.5441	0.5417	0.5465	0.5465	0.5568	(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								
Windows			23.7600	1.1450	27.2061			(27)
External Wall	73.0600	23.7600	49.3000	0.1800	8.8740	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.0801			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	17765.3200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	294.9090	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	15.6000	0.0600	0.9360

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.1780	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	44.2581	(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	29.0659	28.7795	28.7795	28.3750	28.3750	27.7674	27.8822	28.1220	28.0004	28.2468	28.2468	28.7795	(38)
Heat transfer coeff	73.3240	73.0376	73.0376	72.6331	72.6331	72.0255	72.1403	72.3801	72.2585	72.5049	72.5049	73.0376	(39)
Average = Sum(39)m / 12 =												72.6264	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2172	1.2124	1.2124	1.2057	1.2057	1.1956	1.1975	1.2015	1.1995	1.2036	1.2036	1.2124	(40)
HLP (average)												1.2056	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9884	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.3551	18.0792	14.7030	11.1311	8.3206	7.0246	7.5904	9.8662	13.2425	16.8143	19.6248	20.9208	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)													
	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)													
	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains													
	463.6902	462.0848	448.1667	421.6388	395.0537	367.8289	353.6306	356.3892	370.1820	397.5915	426.5911	451.8037	(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	
Southeast	4.8400	39.1209	0.6300	0.7000	0.7700	57.8664	(77)
Southwest	10.5600	39.1209	0.6300	0.7000	0.7700	126.2539	(79)
Northwest	8.3600	12.4928	0.6300	0.7000	0.7700	31.9181	(81)

Solar gains	216.0384	340.0656	493.4265	681.7560	783.4824	853.1628	816.9496	733.1311	607.9192	418.1804	269.2325	188.1218	(83)
Total gains	679.7286	802.1503	941.5932	1103.3948	1178.5362	1220.9917	1170.5802	1089.5203	978.1013	815.7720	695.8235	639.9255	(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	67.3015	67.5653	67.5653	67.9416	67.9416	68.5148	68.4057	68.1791	68.2938	68.0617	68.0617	67.5653	
alpha	5.4868	5.5044	5.5044	5.5294	5.5294	5.5677	5.5604	5.5453	5.5529	5.5374	5.5374	5.5044	
util living area													
	0.9758	0.9459	0.8561	0.6659	0.4646	0.2712	0.1541	0.1794	0.3902	0.7335	0.9365	0.9812	(86)
MIT	20.2591	20.4691	20.7562	20.9457	20.9931	20.9997	21.0000	21.0000	20.9980	20.9274	20.5953	20.2109	(87)
Th 2	19.9063	19.9101	19.9101	19.9154	19.9154	19.9235	19.9220	19.9188	19.9204	19.9171	19.9171	19.9101	(88)
util rest of house													
	0.9673	0.9288	0.8186	0.6079	0.4000	0.2078	0.0876	0.1075	0.3115	0.6637	0.9128	0.9744	(89)
MIT 2	19.1027	19.3593	19.6849	19.8750	19.9118	19.9234	19.9220	19.9188	19.9197	19.8668	19.5208	19.0464	(90)
Living area fraction									fLA = Living area / (4) =			0.3901	(91)
MIT	19.5539	19.7922	20.1028	20.2927	20.3336	20.3433	20.3425	20.3406	20.3404	20.2806	19.9400	19.5007	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4039	19.6422	19.9528	20.1427	20.1836	20.1933	20.1925	20.1906	20.1904	20.1306	19.7900	19.3507	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9622	0.9238	0.8202	0.6205	0.4161	0.2237	0.1043	0.1256	0.3312	0.6783	0.9095	0.9698	(94)
Useful gains	654.0683	741.0228	772.3077	684.6082	490.4001	273.1635	122.0977	136.8378	323.9953	553.3072	632.8453	620.5931	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	1026.8183	1003.6987	887.6149	707.6410	492.7157	273.2143	122.0981	136.8390	324.4689	582.2559	825.8313	1018.9235	(97)
Space heating kWh													
	277.3260	176.5182	85.7885	16.5836	1.7228	0.0000	0.0000	0.0000	0.0000	21.5379	138.9499	296.3578	(98a)
Space heating requirement - total per year (kWh/year)												1014.7848	
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													
	277.3260	176.5182	85.7885	16.5836	1.7228	0.0000	0.0000	0.0000	0.0000	21.5379	138.9499	296.3578	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1014.7848	
Space heating per m2											(98c) / (4) =	16.8457	(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 %)	89.5000	(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													
	277.3260	176.5182	85.7885	16.5836	1.7228	0.0000	0.0000	0.0000	0.0000	21.5379	138.9499	296.3578	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	309.8615	197.2270	95.8531	18.5292	1.9250	0.0000	0.0000	0.0000	0.0000	24.0647	155.2513	331.1260	(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													
	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.6605	-38.4547	-57.4213	-67.5946	-72.6892	-70.1564	-69.3124	-65.7791	-58.1376	-47.3632	-32.5462	-25.0541	(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	-15.8159	-30.0300	-63.6894	-105.6379	-138.1851	-153.1032	-151.2480	-129.3364	-90.9819	-49.5452	-22.3783	-12.7637	(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	1133.8377	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1595.8843	(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	2236.6159	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1133.8377	6.3400	71.8853	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	6.3400	156.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	143.7909	26.0000	37.3856	(250)
Additional standing charges			113.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-633.1693	26.0000	-164.6240	
PV Unit electricity exported	-962.7150	5.8100	-55.9337	
Total			-220.5578	(252)
Total energy cost			180.5996	(255)

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	1133.8377	0.2100	238.1059	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			756.5689	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-633.1693	0.1341	-84.8831	
PV Unit electricity exported	-962.7150	0.1239	-119.2534	
Total			-204.1364	(269)
Total CO2, kg/year			585.1152	(272)

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	1133.8377	1.1300	1281.2366	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	1.1300	2789.8248	(278)
Space and water heating			4071.0615	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.7909	1.5338	220.5513	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-633.1693	1.4954	-946.8587	
PV Unit electricity exported	-962.7150	0.4545	-437.5645	
Total			-1384.4232	(283)
Total Primary energy kWh/year			3037.2903	(286)

Appendix 2

SAP Calculations – Be Lean

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11 - Be Lean	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	16.21	**TER**	16.20
Environmental	89 B	**% DER < TER**			-0.06
CO_2 Emissions (t/year)	0.77	**DFEE**	37.50	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			5.78
% DPER < TPER	-4.04	**DPER**	90.25	**TPER**	86.75

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3161	(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) =	0.2687	(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	0.3426	0.3358	0.3291	0.2955	0.2888	0.2552	0.2552	0.2485	0.2687	0.2888	0.3023	0.3157	(22b)
Effective ac	0.5587	0.5564	0.5542	0.5437	0.5417	0.5326	0.5326	0.5309	0.5361	0.5417	0.5457	0.5498	(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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200

P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312	
E3 Sill	9.8000	0.0460	0.4508	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8552 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.9666 (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	26.1346	26.0280	25.9236	25.4329	25.3411	24.9137	24.9137	24.8346	25.0783	25.3411	25.5268	25.7210	(38)
Heat transfer coeff	63.1012	62.9946	62.8902	62.3995	62.3077	61.8803	61.8803	61.8011	62.0449	62.3077	62.4934	62.6876	(39)
Average = Sum(39)m / 12 =												62.3990	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1707	1.1687	1.1668	1.1577	1.1560	1.1481	1.1481	1.1466	1.1511	1.1560	1.1594	1.1630	(40)
HLP (average)												1.1577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day) 92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)											Total = Sum(45)m =	1543.6206	
Distribution loss (46)m = 0.15 x (45)m	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(64)
12Total per year (kWh/year)												2100	(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	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	378.3502	386.3519	369.7144	355.2825	336.3071	320.0520	307.3081	308.6759	318.8835	334.0705	355.7908	370.4395	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains	463.8386	560.8275	683.5105	867.3425	1020.4886	1047.4505	988.5907	854.5143	700.4012	547.2968	463.4797	440.1538	(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	54.6691	54.7616	54.8526	55.2839	55.3654	55.7478	55.7478	55.8192	55.5999	55.3654	55.2009	55.0299	
alpha	4.6446	4.6508	4.6568	4.6856	4.6910	4.7165	4.7165	4.7213	4.7067	4.6910	4.6801	4.6687	
util living area	0.9875	0.9705	0.9187	0.7626	0.5499	0.3757	0.2750	0.3315	0.5863	0.8861	0.9746	0.9900	(86)
MIT	19.7420	20.0073	20.3998	20.8019	20.9612	20.9947	20.9990	20.9978	20.9630	20.6547	20.1176	19.6943	(87)
Th 2	19.9435	19.9451	19.9467	19.9540	19.9554	19.9618	19.9618	19.9630	19.9593	19.9554	19.9526	19.9497	(88)
util rest of house	0.9839	0.9625	0.8984	0.7188	0.4938	0.3158	0.2103	0.2574	0.5074	0.8492	0.9662	0.9871	(89)
MIT 2	18.5053	18.8392	19.3186	19.7739	19.9269	19.9590	19.9615	19.9622	19.9371	19.6344	18.9876	18.4495	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	19.0445	19.3485	19.7900	20.2221	20.3778	20.4106	20.4139	20.4137	20.3844	20.0792	19.4803	18.9922	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8945	19.1985	19.6400	20.0721	20.2278	20.2606	20.2639	20.2637	20.2344	19.9292	19.3303	18.8422	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9790	0.9553	0.8915	0.7241	0.5087	0.3331	0.2292	0.2789	0.5289	0.8482	0.9598	0.9829	(94)
Useful gains	454.1146	535.7342	609.3419	628.0186	519.1276	348.9450	226.5522	238.3635	370.4452	464.1957	444.8372	432.6267	(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	920.9297	900.7284	826.3762	697.1317	531.3501	350.2776	226.7205	238.7820	380.6060	581.2811	764.3105	917.8849	(97)
Space heating kWh	347.3104	245.2761	161.4736	49.7615	9.0935	0.0000	0.0000	0.0000	0.0000	87.1115	230.0208	361.0321	(98a)
Space heating requirement - total per year (kWh/year)												1491.0794	
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	347.3104	245.2761	161.4736	49.7615	9.0935	0.0000	0.0000	0.0000	0.0000	87.1115	230.0208	361.0321	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1491.0794	
Space heating per m2											(98c) / (4) =	27.6638	(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 %)	89.5000	(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	347.3104	245.2761	161.4736	49.7615	9.0935	0.0000	0.0000	0.0000	0.0000	87.1115	230.0208	361.0321	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	388.0563	274.0515	180.4174	55.5994	10.1603	0.0000	0.0000	0.0000	0.0000	97.3313	257.0064	403.3878	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1666.0105	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	4229.2441	(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	1666.0105	0.2100	349.8622	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			842.7047	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Total CO2, kg/year			873.4496	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.2100	(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	1666.0105	1.1300	1882.5919	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	1.1300	2651.9621	(278)
Space and water heating			4534.5540	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3644	1.5338	199.9573	(282)
Total Primary energy kWh/year			4864.6121	(286)
Dwelling Primary energy Rate (DPER)			90.2500	(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	53.9000	(1b) x	2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1411 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3911 (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) =	0.3324 (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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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								
TER Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.8147 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
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 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 88.3055 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.8637	43.1516	46.4924	43.2050	43.1079	40.1323	40.9169	42.1948	42.1276	45.2414	45.5941	48.7556	(61)
Total heat required for water heating calculated for each month	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(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	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(64)
										Total per year (kWh/year) = Sum(64)m =		1996.2229	(64)
12Total per year (kWh/year)												1996	(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	62.7107	55.1772	58.2478	50.6793	48.6418	43.3049	42.5178	44.6385	45.5568	51.3679	55.1950	61.9994	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	84.2886	82.1089	78.2901	70.3879	65.3787	60.1456	57.1475	59.9980	63.2733	69.0428	76.6597	83.3325	(72)
Total internal gains	374.0741	382.0304	365.5939	351.5778	332.8661	316.8864	304.3004	305.5181	315.5533	330.4367	351.7561	366.1755	(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	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	424.9536	485.8705	552.3527	656.3438	740.0854	749.8333	709.7970	630.3919	542.6195	457.3394	415.8481	407.6671	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area	0.9912	0.9828	0.9596	0.8763	0.7104	0.5131	0.3790	0.4426	0.7137	0.9332	0.9831	0.9927	(86)
MIT	19.6549	19.8588	20.1877	20.6208	20.8886	20.9807	20.9963	20.9926	20.9171	20.5339	20.0273	19.6260	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house	0.9886	0.9778	0.9478	0.8437	0.6503	0.4353	0.2913	0.3462	0.6311	0.9075	0.9773	0.9905	(89)
MIT 2	18.3920	18.6517	19.0643	19.5873	19.8694	19.9565	19.9658	19.9661	19.9091	19.5034	18.8758	18.3620	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	18.9426	19.1780	19.5541	20.0379	20.3138	20.4030	20.4151	20.4137	20.3486	19.9527	19.3779	18.9131	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9426	19.1780	19.5541	20.0379	20.3138	20.4030	20.4151	20.4137	20.3486	19.9527	19.3779	18.9131	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9731	0.9425	0.8466	0.6718	0.4687	0.3296	0.3883	0.6635	0.9074	0.9731	0.9876	(94)
Useful gains	418.6806	472.7919	520.5748	555.6296	497.1834	351.4551	233.9352	244.7515	360.0515	414.9937	404.6643	402.5941	(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	928.4361	902.9864	823.4928	694.2474	535.7034	357.1036	234.7685	246.5038	386.0959	581.6610	767.0712	923.5850	(97)
Space heating kWh	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98a)
Space heating requirement - total per year (kWh/year)												1794.7342	
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	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1794.7342	
Space heating per m2											(98c) / (4) =	33.2975	(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 %) 92.4000 (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	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	410.4525	312.8687	243.9081	108.0139	31.0161	0.0000	0.0000	0.0000	0.0000	134.1997	282.3950	419.4992	(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	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.7226	85.4297	84.7857	83.3609	81.5174	80.3000	80.3000	80.3000	80.3000	83.7684	85.2078	85.7878	(217)
Fuel for water heating, kWh/month	234.1595	206.7820	220.2226	195.7021	192.5810	174.5926	171.8871	180.2249	183.6433	197.8253	208.0946	231.4567	(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	16.4901	13.2290	11.9112	8.7267	6.7407	5.5072	6.1491	7.9929	10.3819	13.6217	15.3856	16.9484	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-12.0404	-18.1098	-27.7558	-33.3520	-37.8870	-36.0888	-35.6638	-32.7112	-27.8473	-21.6382	-13.6382	-10.2824	(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	-3.7437	-8.0968	-16.5111	-25.4209	-34.2241	-34.5992	-34.1786	-28.6462	-20.6258	-11.7655	-5.0582	-2.9433	(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 1942.3531 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 80.3000

Water heating fuel used 2397.1717 (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) 133.0846 (232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-532.8285	(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	4025.7808	(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	1942.3531	0.2100	407.8941	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2397.1717	0.2100	503.4061	(264)
Space and water heating			911.3002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.0846	0.1443	19.2082	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	0.1332	-40.9058	
PV Unit electricity exported	-225.8135	0.1252	-28.2691	
Total			-69.1749	(269)
Total CO2, kg/year			873.2628	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2000	(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	1942.3531	1.1300	2194.8590	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2397.1717	1.1300	2708.8040	(278)
Space and water heating			4903.6630	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.0846	1.5338	204.1296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	1.4923	-458.1722	
PV Unit electricity exported	-225.8135	0.4595	-103.7595	
Total			-561.9317	(283)
Total Primary energy kWh/year			4675.9617	(286)
Target Primary Energy Rate (TPER)			86.7500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11 - Be Lean	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	16.21	**TER**	16.20
Environmental	89 B	**% DER < TER**			-0.06
CO_2 Emissions (t/year)	0.77	**DFEE**	37.50	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			5.78
% DPER < TPER	-4.04	**DPER**	90.25	**TPER**	86.75

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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		2 * 10 =	20.0000 (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) =		20.0000 / (5) =	0.1411 (8)
Pressure test			Yes
Pressure Test Method			Blower Door
Measured/design AP50			3.5000 (17)
Infiltration rate			0.3161 (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) =	0.2687 (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	0.3426	0.3358	0.3291	0.2955	0.2888	0.2552	0.2552	0.2485	0.2687	0.2888	0.3023	0.3157	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5587	0.5564	0.5542	0.5437	0.5417	0.5326	0.5326	0.5309	0.5361	0.5417	0.5457	0.5498	(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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973

E18 Party wall between dwellings	18.4100	0.0250	0.4603	
E14 Flat roof	16.5000	0.0800	1.3200	
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312	
E3 Sill	9.8000	0.0460	0.4508	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8552 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.9666 (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	26.1346	26.0280	25.9236	25.4329	25.3411	24.9137	24.9137	24.8346	25.0783	25.3411	25.5268	25.7210	(38)
Heat transfer coeff	63.1012	62.9946	62.8902	62.3995	62.3077	61.8803	61.8803	61.8011	62.0449	62.3077	62.4934	62.6876	(39)
Average = Sum(39)m / 12 =												62.3990	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1707	1.1687	1.1668	1.1577	1.1560	1.1481	1.1481	1.1466	1.1511	1.1560	1.1594	1.1630	(40)
HLP (average)												1.1577	
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 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.5533	23.2035	22.7109	21.8027	21.1226	20.3685	19.9612	20.4503	20.9829	21.7898	22.7168	23.4737	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 51.9428 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.6690	55.1150	53.4182	51.3057	49.4214	47.4631	47.0558	48.7491	50.4859	52.4971	54.6282	56.5894	(44)
Energy conte	89.7498	78.4830	82.1018	70.2350	66.5307	58.3614	56.9099	60.3616	62.2542	71.2380	77.8279	88.6053	(45)
Energy content (annual)										Total = Sum(45)m =		862.6586	
Distribution loss (46)m = 0.15 x (45)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(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													
	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(64)
										Total per year (kWh/year) = Sum(64)m =		733.2598	(64)
12Total per year (kWh/year)												733	(64)
Electric shower(s)													
	43.6330	38.8774	42.4526	40.5120	41.2722	39.3696	40.6820	41.2722	40.5120	42.4526	41.6543	43.6330	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		496.3227	(64a)
Heat gains from water heating, kWh/month													
	29.9801	26.3970	28.0598	25.0529	24.4558	22.2442	22.2638	23.1449	23.3570	25.7512	26.9520	29.7369	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)													
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)													
	40.2958	39.2812	37.7147	34.7957	32.8707	30.8947	29.9245	31.1087	32.4403	34.6119	37.4333	39.9689	(72)
Total internal gains													
	327.0813	336.2027	322.0185	312.9856	297.3582	287.6355	277.0773	276.6288	284.7203	293.0057	309.5297	319.8119	(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	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains	412.5698	510.6782	635.8146	825.0457	981.5396	1015.0340	958.3599	822.4672	666.2381	506.2320	417.2186	389.5262	(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	54.6691	54.7616	54.8526	55.2839	55.3654	55.7478	55.7478	55.8192	55.5999	55.3654	55.2009	55.0299	
alpha	4.6446	4.6508	4.6568	4.6856	4.6910	4.7165	4.7165	4.7213	4.7067	4.6910	4.6801	4.6687	
util living area	0.9921	0.9791	0.9351	0.7857	0.5689	0.3873	0.2836	0.3441	0.6114	0.9090	0.9829	0.9939	(86)
MIT	19.6391	19.9138	20.3293	20.7739	20.9554	20.9939	20.9989	20.9974	20.9560	20.6022	20.0296	19.5915	(87)
Th 2	19.9435	19.9451	19.9467	19.9540	19.9554	19.9618	19.9618	19.9630	19.9593	19.9554	19.9526	19.9497	(88)
util rest of house	0.9898	0.9732	0.9179	0.7433	0.5117	0.3257	0.2169	0.2673	0.5309	0.8770	0.9770	0.9921	(89)
MIT 2	18.7213	18.9928	19.3929	19.7920	19.9297	19.9593	19.9615	19.9623	19.9384	19.6611	19.1155	18.6790	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.1215	19.3944	19.8012	20.2201	20.3769	20.4104	20.4138	20.4136	20.3821	20.0714	19.5140	19.0768	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1215	19.3944	19.8012	20.2201	20.3769	20.4104	20.4138	20.4136	20.3821	20.0714	19.5140	19.0768	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9874	0.9693	0.9152	0.7547	0.5352	0.3525	0.2460	0.3009	0.5646	0.8811	0.9739	0.9900	(94)
Useful gains	407.3666	495.0021	581.8674	622.6822	525.3188	357.8077	235.7602	247.4394	376.1603	446.0234	406.3172	385.6479	(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	935.2534	913.0674	836.5122	706.3705	540.6361	359.5502	235.9999	248.0437	389.7714	590.1417	775.7926	932.5924	(97)
Space heating kWh	392.7478	280.9399	189.4557	60.2555	11.3961	0.0000	0.0000	0.0000	0.0000	107.2240	266.0223	406.9267	(98a)
Space heating requirement - total per year (kWh/year)												1714.9681	
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	392.7478	280.9399	189.4557	60.2555	11.3961	0.0000	0.0000	0.0000	0.0000	107.2240	266.0223	406.9267	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1714.9681	
Space heating per m2											(98c) / (4) =	31.8176	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	581.6747	457.9141	469.6887	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9793	0.9898	0.9795	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	569.6273	453.2613	460.0423	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1143.3615	1079.4829	924.4844	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	413.0886	465.9088	345.5449	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	103.2722	116.4772	86.3862	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												306.1356	(107)
Energy for space heating												31.8176	(99)
Energy for space cooling												5.6797	(108)
Total												37.4973	(109)
Fabric Energy Efficiency (DFEE)												37.5	(109)

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1411 (8)
Pressure test		Yes

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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								
TER Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.4563	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	35.8147	(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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8051	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.5533	23.2035	22.7109	21.8027	21.1226	20.3685	19.9612	20.4503	20.9829	21.7898	22.7168	23.4737	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day)	51.9428	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.6690	55.1150	53.4182	51.3057	49.4214	47.4631	47.0558	48.7491	50.4859	52.4971	54.6282	56.5894	(44)
Energy conte	89.7498	78.4830	82.1018	70.2350	66.5307	58.3614	56.9099	60.3616	62.2542	71.2380	77.8279	88.6053	(45)
Energy content (annual)										Total = Sum(45)m =		862.6586	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(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	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(64)
										Total per year (kWh/year) = Sum(64)m =		733.2598	(64)
12Total per year (kWh/year)												733	(64)
Electric shower(s)	43.6330	38.8774	42.4526	40.5120	41.2722	39.3696	40.6820	41.2722	40.5120	42.4526	41.6543	43.6330	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		496.3227	(64a)
Heat gains from water heating, kWh/month	29.9801	26.3970	28.0598	25.0529	24.4558	22.2442	22.2638	23.1449	23.3570	25.7512	26.9520	29.7369	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)													
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)													
	40.2958	39.2812	37.7147	34.7957	32.8707	30.8947	29.9245	31.1087	32.4403	34.6119	37.4333	39.9689	(72)
Total internal gains													
	327.0813	336.2027	322.0185	312.9856	297.3582	287.6355	277.0773	276.6288	284.7203	293.0057	309.5297	319.8119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	377.9608	440.0427	508.7773	617.7516	704.5774	720.5824	682.5739	601.5025	511.7865	419.9084	373.6217	361.3035	(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	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area													
	0.9945	0.9883	0.9698	0.8955	0.7347	0.5319	0.3937	0.4627	0.7425	0.9496	0.9889	0.9955	(86)
MIT	19.5593	19.7688	20.1103	20.5743	20.8714	20.9776	20.9956	20.9911	20.9017	20.4745	19.9440	19.5309	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house													
	0.9928	0.9847	0.9605	0.8661	0.6753	0.4521	0.3028	0.3625	0.6609	0.9288	0.9849	0.9942	(89)
MIT 2	18.6388	18.8482	19.1848	19.6288	19.8772	19.9574	19.9658	19.9663	19.9121	19.5505	19.0322	18.6178	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.0401	19.2496	19.5883	20.0410	20.3106	20.4022	20.4148	20.4131	20.3436	19.9534	19.4298	19.0159	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0401	19.2496	19.5883	20.0410	20.3106	20.4022	20.4148	20.4131	20.3436	19.9534	19.4298	19.0159	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9909	0.9817	0.9567	0.8688	0.6965	0.4864	0.3425	0.4062	0.6928	0.9287	0.9823	0.9925	(94)
Useful gains	374.5271	432.0019	486.7499	536.6887	490.7232	350.4639	233.7710	244.3447	354.5892	389.9739	367.0081	358.6038	(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													
	934.6190	907.5144	825.6551	694.4420	535.5095	357.0519	234.7542	246.4677	385.7865	581.6999	770.3121	930.0395	(97)
Space heating kWh													
	416.7084	319.5444	252.1455	113.5823	33.3210	0.0000	0.0000	0.0000	0.0000	142.6442	290.3789	425.1481	(98a)
Space heating requirement - total per year (kWh/year)												1993.4728	
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													
	416.7084	319.5444	252.1455	113.5823	33.3210	0.0000	0.0000	0.0000	0.0000	142.6442	290.3789	425.1481	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1993.4728	
Space heating per m2											(98c) / (4) =	36.9847	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	578.4508	455.3761	466.7628	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9308	0.9631	0.9378	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	538.4380	438.5622	437.7483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	805.0941	762.7081	670.8430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	191.9924	241.1646	173.4225	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	47.9981	60.2911	43.3556	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												151.6449	(107)
Energy for space heating												36.9847	(99)
Energy for space cooling												2.8134	(108)
Total												39.7981	(109)
Fabric Energy Efficiency (TFEE)												39.8	(109)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11 - Be Lean	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	16.21	**TER**	16.20
Environmental	89 B	**% DER < TER**			-0.06
CO_2 Emissions (t/year)	0.77	**DFEE**	37.50	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			5.78
% DPER < TPER	-4.04	**DPER**	90.25	**TPER**	86.75

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3161	(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) =	0.2687	(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	0.3426	0.3358	0.3291	0.2955	0.2888	0.2552	0.2552	0.2485	0.2687	0.2888	0.3023	0.3157	(22b)
Effective ac	0.5587	0.5564	0.5542	0.5437	0.5417	0.5326	0.5326	0.5309	0.5361	0.5417	0.5457	0.5498	(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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200

P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312	
E3 Sill	9.8000	0.0460	0.4508	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8552 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.9666 (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	26.1346	26.0280	25.9236	25.4329	25.3411	24.9137	24.9137	24.8346	25.0783	25.3411	25.5268	25.7210	(38)
Heat transfer coeff	63.1012	62.9946	62.8902	62.3995	62.3077	61.8803	61.8803	61.8011	62.0449	62.3077	62.4934	62.6876	(39)
Average = Sum(39)m / 12 =												62.3990	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1707	1.1687	1.1668	1.1577	1.1560	1.1481	1.1481	1.1466	1.1511	1.1560	1.1594	1.1630	(40)
HLP (average)												1.1577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day) 92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)											Total = Sum(45)m =	1543.6206	
Distribution loss (46)m = 0.15 x (45)m	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(64)
12Total per year (kWh/year)												2100	(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	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	378.3502	386.3519	369.7144	355.2825	336.3071	320.0520	307.3081	308.6759	318.8835	334.0705	355.7908	370.4395	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains	463.8386	560.8275	683.5105	867.3425	1020.4886	1047.4505	988.5907	854.5143	700.4012	547.2968	463.4797	440.1538	(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	54.6691	54.7616	54.8526	55.2839	55.3654	55.7478	55.7478	55.8192	55.5999	55.3654	55.2009	55.0299	
alpha	4.6446	4.6508	4.6568	4.6856	4.6910	4.7165	4.7165	4.7213	4.7067	4.6910	4.6801	4.6687	
util living area	0.9875	0.9705	0.9187	0.7626	0.5499	0.3757	0.2750	0.3315	0.5863	0.8861	0.9746	0.9900	(86)
MIT	19.7420	20.0073	20.3998	20.8019	20.9612	20.9947	20.9990	20.9978	20.9630	20.6547	20.1176	19.6943	(87)
Th 2	19.9435	19.9451	19.9467	19.9540	19.9554	19.9618	19.9618	19.9630	19.9593	19.9554	19.9526	19.9497	(88)
util rest of house	0.9839	0.9625	0.8984	0.7188	0.4938	0.3158	0.2103	0.2574	0.5074	0.8492	0.9662	0.9871	(89)
MIT 2	18.5053	18.8392	19.3186	19.7739	19.9269	19.9590	19.9615	19.9622	19.9371	19.6344	18.9876	18.4495	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	19.0445	19.3485	19.7900	20.2221	20.3778	20.4106	20.4139	20.4137	20.3844	20.0792	19.4803	18.9922	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8945	19.1985	19.6400	20.0721	20.2278	20.2606	20.2639	20.2637	20.2344	19.9292	19.3303	18.8422	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9790	0.9553	0.8915	0.7241	0.5087	0.3331	0.2292	0.2789	0.5289	0.8482	0.9598	0.9829	(94)
Useful gains	454.1146	535.7342	609.3419	628.0186	519.1276	348.9450	226.5522	238.3635	370.4452	464.1957	444.8372	432.6267	(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	920.9297	900.7284	826.3762	697.1317	531.3501	350.2776	226.7205	238.7820	380.6060	581.2811	764.3105	917.8849	(97)
Space heating kWh	347.3104	245.2761	161.4736	49.7615	9.0935	0.0000	0.0000	0.0000	0.0000	87.1115	230.0208	361.0321	(98a)
Space heating requirement - total per year (kWh/year)												1491.0794	
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	347.3104	245.2761	161.4736	49.7615	9.0935	0.0000	0.0000	0.0000	0.0000	87.1115	230.0208	361.0321	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1491.0794	
Space heating per m2											(98c) / (4) =	27.6638	(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 %)	89.5000	(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	347.3104	245.2761	161.4736	49.7615	9.0935	0.0000	0.0000	0.0000	0.0000	87.1115	230.0208	361.0321	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	388.0563	274.0515	180.4174	55.5994	10.1603	0.0000	0.0000	0.0000	0.0000	97.3313	257.0064	403.3878	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1666.0105	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	4229.2441	(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	1666.0105	0.2100	349.8622	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			842.7047	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Total CO2, kg/year			873.4496	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			16.2100	(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	1666.0105	1.1300	1882.5919	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	1.1300	2651.9621	(278)
Space and water heating			4534.5540	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3644	1.5338	199.9573	(282)
Total Primary energy kWh/year			4864.6121	(286)
Dwelling Primary energy Rate (DPER)			90.2500	(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	53.9000	(1b) x	2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1411 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3911 (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) =	0.3324 (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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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								
TER Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.4563 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.8147 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
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 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 88.3055 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.8637	43.1516	46.4924	43.2050	43.1079	40.1323	40.9169	42.1948	42.1276	45.2414	45.5941	48.7556	(61)
Total heat required for water heating calculated for each month	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(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	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(64)
										Total per year (kWh/year) = Sum(64)m =		1996.2229	(64)
12Total per year (kWh/year)												1996	(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	62.7107	55.1772	58.2478	50.6793	48.6418	43.3049	42.5178	44.6385	45.5568	51.3679	55.1950	61.9994	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	84.2886	82.1089	78.2901	70.3879	65.3787	60.1456	57.1475	59.9980	63.2733	69.0428	76.6597	83.3325	(72)
Total internal gains	374.0741	382.0304	365.5939	351.5778	332.8661	316.8864	304.3004	305.5181	315.5533	330.4367	351.7561	366.1755	(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	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	424.9536	485.8705	552.3527	656.3438	740.0854	749.8333	709.7970	630.3919	542.6195	457.3394	415.8481	407.6671	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area	0.9912	0.9828	0.9596	0.8763	0.7104	0.5131	0.3790	0.4426	0.7137	0.9332	0.9831	0.9927	(86)
MIT	19.6549	19.8588	20.1877	20.6208	20.8886	20.9807	20.9963	20.9926	20.9171	20.5339	20.0273	19.6260	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house	0.9886	0.9778	0.9478	0.8437	0.6503	0.4353	0.2913	0.3462	0.6311	0.9075	0.9773	0.9905	(89)
MIT 2	18.3920	18.6517	19.0643	19.5873	19.8694	19.9565	19.9658	19.9661	19.9091	19.5034	18.8758	18.3620	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	18.9426	19.1780	19.5541	20.0379	20.3138	20.4030	20.4151	20.4137	20.3486	19.9527	19.3779	18.9131	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9426	19.1780	19.5541	20.0379	20.3138	20.4030	20.4151	20.4137	20.3486	19.9527	19.3779	18.9131	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9731	0.9425	0.8466	0.6718	0.4687	0.3296	0.3883	0.6635	0.9074	0.9731	0.9876	(94)
Useful gains	418.6806	472.7919	520.5748	555.6296	497.1834	351.4551	233.9352	244.7515	360.0515	414.9937	404.6643	402.5941	(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	928.4361	902.9864	823.4928	694.2474	535.7034	357.1036	234.7685	246.5038	386.0959	581.6610	767.0712	923.5850	(97)
Space heating kWh	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98a)
Space heating requirement - total per year (kWh/year)												1794.7342	
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	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1794.7342	
Space heating per m2											(98c) / (4) =	33.2975	(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 %) 92.4000 (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	379.2581	289.0907	225.3711	99.8048	28.6589	0.0000	0.0000	0.0000	0.0000	124.0005	260.9330	387.6172	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	410.4525	312.8687	243.9081	108.0139	31.0161	0.0000	0.0000	0.0000	0.0000	134.1997	282.3950	419.4992	(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	200.7277	176.6533	186.7172	163.1390	156.9869	140.1978	138.0253	144.7206	147.4655	165.7151	177.3129	198.5615	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.7226	85.4297	84.7857	83.3609	81.5174	80.3000	80.3000	80.3000	80.3000	83.7684	85.2078	85.7878	(217)
Fuel for water heating, kWh/month	234.1595	206.7820	220.2226	195.7021	192.5810	174.5926	171.8871	180.2249	183.6433	197.8253	208.0946	231.4567	(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	16.4901	13.2290	11.9112	8.7267	6.7407	5.5072	6.1491	7.9929	10.3819	13.6217	15.3856	16.9484	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-12.0404	-18.1098	-27.7558	-33.3520	-37.8870	-36.0888	-35.6638	-32.7112	-27.8473	-21.6382	-13.6382	-10.2824	(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	-3.7437	-8.0968	-16.5111	-25.4209	-34.2241	-34.5992	-34.1786	-28.6462	-20.6258	-11.7655	-5.0582	-2.9433	(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 1942.3531 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 80.3000

Water heating fuel used 2397.1717 (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) 133.0846 (232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-532.8285	(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	4025.7808	(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	1942.3531	0.2100	407.8941	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2397.1717	0.2100	503.4061	(264)
Space and water heating			911.3002	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.0846	0.1443	19.2082	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	0.1332	-40.9058	
PV Unit electricity exported	-225.8135	0.1252	-28.2691	
Total			-69.1749	(269)
Total CO2, kg/year			873.2628	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.2000	(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	1942.3531	1.1300	2194.8590	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2397.1717	1.1300	2708.8040	(278)
Space and water heating			4903.6630	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.0846	1.5338	204.1296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	1.4923	-458.1722	
PV Unit electricity exported	-225.8135	0.4595	-103.7595	
Total			-561.9317	(283)
Total Primary energy kWh/year			4675.9617	(286)
Target Primary Energy Rate (TPER)			86.7500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11 - Be Lean	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	84 B	**DER**	16.21	**TER**	16.20
Environmental	89 B	**% DER < TER**			-0.06
CO_2 Emissions (t/year)	0.77	**DFEE**	37.50	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			5.78
% DPER < TPER	-4.04	**DPER**	90.25	**TPER**	86.75

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1411 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.5000 (17)
Infiltration rate		0.3161 (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) =	0.2687 (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	0.3426	0.3358	0.3291	0.2955	0.2888	0.2552	0.2552	0.2485	0.2687	0.2888	0.3023	0.3157	(22b)
Effective ac	0.5587	0.5564	0.5542	0.5437	0.5417	0.5326	0.5326	0.5309	0.5361	0.5417	0.5457	0.5498	(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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200

P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560		
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312		
E3 Sill	9.8000	0.0460	0.4508		
E4 Jamb	26.4000	0.0590	1.5576		
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				6.8552	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	36.9666	(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	26.1346	26.0280	25.9236	25.4329	25.3411	24.9137	24.9137	24.8346	25.0783	25.3411	25.5268	25.7210	(38)
Heat transfer coeff	63.1012	62.9946	62.8902	62.3995	62.3077	61.8803	61.8803	61.8011	62.0449	62.3077	62.4934	62.6876	(39)
Average = Sum(39)m / 12 =												62.3990	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1707	1.1687	1.1668	1.1577	1.1560	1.1481	1.1481	1.1466	1.1511	1.1560	1.1594	1.1630	(40)
HLP (average)												1.1577	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.8051	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)
Hot water usage for other uses	34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)
Average daily hot water use (litres/day)												92.9531	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)										Total = Sum(45)m =		1543.6206	
Distribution loss (46)m = 0.15 x (45)m	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(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	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4544	16.3911	13.3301	10.0917	7.5437	6.3687	6.8816	8.9450	12.0059	15.2443	17.7923	18.9673	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	428.6012	426.8405	413.6187	388.9887	364.6647	339.4707	326.4657	329.0926	341.7423	367.1274	394.1963	417.7839	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains	514.0896	601.3161	727.4148	901.0487	1048.8462	1066.8691	1007.7482	874.9310	723.2600	580.3536	501.8852	487.4982	(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	54.6691	54.7616	54.8526	55.2839	55.3654	55.7478	55.7478	55.8192	55.5999	55.3654	55.2009	55.0299	
alpha	4.6446	4.6508	4.6568	4.6856	4.6910	4.7165	4.7165	4.7213	4.7067	4.6910	4.6801	4.6687	
util living area													
	0.9814	0.9622	0.9021	0.7444	0.5366	0.3690	0.2698	0.3238	0.5704	0.8665	0.9661	0.9851	(86)
MIT	19.8401	20.0798	20.4597	20.8216	20.9648	20.9951	20.9991	20.9980	20.9670	20.6926	20.1878	19.7884	(87)
Th 2	19.9435	19.9451	19.9467	19.9540	19.9554	19.9618	19.9618	19.9630	19.9593	19.9554	19.9526	19.9497	(88)
util rest of house													
	0.9763	0.9523	0.8791	0.6998	0.4814	0.3101	0.2063	0.2514	0.4926	0.8261	0.9554	0.9809	(89)
MIT 2	18.6286	18.9282	19.3875	19.7932	19.9297	19.9593	19.9615	19.9623	19.9396	19.6742	19.0735	18.5680	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	19.1569	19.4303	19.8550	20.2415	20.3810	20.4109	20.4139	20.4138	20.3875	20.1182	19.5593	19.1001	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0069	19.2803	19.7050	20.0915	20.2310	20.2609	20.2639	20.2638	20.2375	19.9682	19.4093	18.9501	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9445	0.8730	0.7060	0.4963	0.3272	0.2248	0.2725	0.5140	0.8267	0.9483	0.9755	(94)
Useful gains	498.7877	567.9617	635.0648	636.1411	520.5059	349.0621	226.5688	238.4125	371.7644	479.7513	475.9514	475.5745	(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													
	928.0202	905.8817	830.4624	698.3465	531.5493	350.2953	226.7234	238.7903	380.8024	583.7106	769.2516	924.6472	(97)
Space heating kWh													
	319.3490	227.0823	145.3758	44.7879	8.2163	0.0000	0.0000	0.0000	0.0000	77.3457	211.1762	334.1101	(98a)
Space heating requirement - total per year (kWh/year)												1367.4432	
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													
	319.3490	227.0823	145.3758	44.7879	8.2163	0.0000	0.0000	0.0000	0.0000	77.3457	211.1762	334.1101	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1367.4432	
Space heating per m2											(98c) / (4) =	25.3700	(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 %)	89.5000	(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													
	319.3490	227.0823	145.3758	44.7879	8.2163	0.0000	0.0000	0.0000	0.0000	77.3457	211.1762	334.1101	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	356.8145	253.7232	162.4311	50.0423	9.1802	0.0000	0.0000	0.0000	0.0000	86.4198	235.9510	373.3074	(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													
	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1527.8696	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	4091.1031	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1527.8696	3.6400	55.6145	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	3.6400	85.4260	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	130.3644	16.4900	21.4971	(250)
Additional standing charges			92.0000	(251)
Total energy cost			268.7190	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9781	(257)
SAP value		84.1442	
SAP rating (Section 12)		84	(258)
SAP band		B	

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	1527.8696	0.2100	320.8526	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			813.6951	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Total CO2, kg/year			844.4400	(272)
CO2 emissions per m2			15.6700	(273)
EI value			88.5586	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		53.9000	(1b) x	2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3161	(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) =	0.2687	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.2955	0.2821	0.2821	0.2620	0.2620	0.2284	0.2351	0.2485	0.2418	0.2552	0.2552	0.2821	(22b)
Effective ac	0.5437	0.5398	0.5398	0.5343	0.5343	0.5261	0.5276	0.5309	0.5292	0.5326	0.5326	0.5398	(25)

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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	
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312
E3 Sill	9.8000	0.0460	0.4508
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.8552 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.9666 (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	25.4329	25.2514	25.2514	24.9950	24.9950	24.6098	24.6826	24.8346	24.7575	24.9137	24.9137	25.2514	(38)
Heat transfer coeff	62.3995	62.2180	62.2180	61.9615	61.9615	61.5764	61.6492	61.8011	61.7241	61.8803	61.8803	62.2180	(39)
Average = Sum(39)m / 12 =												61.9573	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1577	1.1543	1.1543	1.1496	1.1496	1.1424	1.1438	1.1466	1.1452	1.1481	1.1481	1.1543	(40)
HLP (average)												1.1495	
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		1.8051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day)	92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)										Total = Sum(45)m =		1543.6206	
Distribution loss (46)m = 0.15 x (45)m	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(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	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4544	16.3911	13.3301	10.0917	7.5437	6.3687	6.8816	8.9450	12.0059	15.2443	17.7923	18.9673	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	428.6012	426.8405	413.6187	388.9887	364.6647	339.4707	326.4657	329.0926	341.7423	367.1274	394.1963	417.7839	(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	
Northeast	8.5800	12.4928	0.6300	0.7000	0.7700	32.7580	(75)
Northwest	12.9800	12.4928	0.6300	0.7000	0.7700	49.5570	(81)
Southeast	1.0800	29.0000	0.6300	0.7000	1.0000	12.4309	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	94.7460	174.3423	315.5033	533.7966	690.4518	785.1152	738.3094	606.9961	424.3747	233.0378	123.4245	79.0326	(83)
Total gains	523.3472	601.1828	729.1220	922.7853	1055.1165	1124.5859	1064.7751	936.0887	766.1169	600.1652	517.6208	496.8165	(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	55.2839	55.4452	55.4452	55.6747	55.6747	56.0229	55.9568	55.8192	55.8888	55.7478	55.7478	55.4452	
alpha	4.6856	4.6963	4.6963	4.7116	4.7116	4.7349	4.7305	4.7213	4.7259	4.7165	4.7165	4.6963	
util living area	0.9740	0.9520	0.8697	0.6635	0.4407	0.2516	0.1447	0.1782	0.4226	0.7878	0.9461	0.9785	(86)
MIT	20.0183	20.2222	20.6035	20.9056	20.9875	20.9993	21.0000	20.9999	20.9928	20.8348	20.3850	19.9737	(87)
Th 2	19.9540	19.9567	19.9567	19.9606	19.9606	19.9663	19.9652	19.9630	19.9641	19.9618	19.9618	19.9567	(88)
util rest of house	0.9665	0.9390	0.8392	0.6110	0.3826	0.1952	0.0848	0.1098	0.3421	0.7290	0.9287	0.9722	(89)
MIT 2	18.8610	19.1139	19.5640	19.8829	19.9529	19.9661	19.9652	19.9630	19.9611	19.8285	19.3230	18.8077	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.3656	19.5971	20.0172	20.3288	20.4040	20.4166	20.4164	20.4151	20.4109	20.2672	19.7860	19.3161	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2156	19.4471	19.8672	20.1788	20.2540	20.2666	20.2664	20.2651	20.2609	20.1172	19.6360	19.1661	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9313	0.8363	0.6224	0.3992	0.2116	0.1023	0.1297	0.3654	0.7386	0.9220	0.9659	(94)
Useful gains	502.2776	559.8995	609.7670	574.3876	421.1803	237.9709	108.8937	121.4364	279.9438	443.2817	477.2640	479.8915	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	862.0872	842.8731	750.7975	605.9080	424.6846	238.0914	108.8958	121.4432	281.5187	496.1086	695.2872	856.4975	(97)
Space heating kWh	267.6983	190.1583	104.9267	22.6947	2.6073	0.0000	0.0000	0.0000	0.0000	39.3032	156.9767	280.1949	(98a)
Space heating requirement - total per year (kWh/year)												1064.5600	
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	267.6983	190.1583	104.9267	22.6947	2.6073	0.0000	0.0000	0.0000	0.0000	39.3032	156.9767	280.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1064.5600	
Space heating per m2										(98c) / (4) =		19.7506	(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 %) 89.5000 (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	267.6983	190.1583	104.9267	22.6947	2.6073	0.0000	0.0000	0.0000	0.0000	39.3032	156.9767	280.1949	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	299.1043	212.4673	117.2365	25.3572	2.9131	0.0000	0.0000	0.0000	0.0000	43.9142	175.3930	313.0669	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													

(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	1189.4525	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3752.6860	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1189.4525	6.3400	75.4113	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	6.3400	148.7915	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	130.3644	26.0000	33.8947	(250)
Additional standing charges			113.0000	(251)
Total energy cost			393.4575	(255)

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	1189.4525	0.2100	249.7850	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			742.6275	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Total CO2, kg/year			773.3724	(272)

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	1189.4525	1.1300	1344.0813	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	1.1300	2651.9621	(278)
Space and water heating			3996.0434	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3644	1.5338	199.9573	(282)
Total Primary energy kWh/year			4326.1015	(286)

SAP 10 EPC IMPROVEMENTS

Flat 11 - Be Lean

Current energy efficiency rating: B 84
Current environmental impact rating: B 89

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 84
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

Current	Potential	Saving

Electricity	£56	£56	£0
Mains gas	£337	£337	£0
Space heating	£211	£211	£0
Water heating	£149	£149	£0
Lighting	£34	£34	£0
Total cost of fuels	£393	£393	£0
Total cost of uses	£394	£394	£0
Delivered energy	70 kWh/m²	70 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.8 tonnes	0.0 tonnes
CO2 emissions per m²	14 kg/m²	14 kg/m²	0 kg/m²
Primary energy	80 kWh/m²	80 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3161	(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) =	0.2687	(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	0.3426	0.3358	0.3291	0.2955	0.2888	0.2552	0.2552	0.2485	0.2687	0.2888	0.3023	0.3157	(22b)
Effective ac	0.5587	0.5564	0.5542	0.5437	0.5417	0.5326	0.5326	0.5309	0.5361	0.5417	0.5457	0.5498	(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								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12418.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							230.4059	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312
E3 Sill	9.8000	0.0460	0.4508
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.8552 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.9666 (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	26.1346	26.0280	25.9236	25.4329	25.3411	24.9137	24.9137	24.8346	25.0783	25.3411	25.5268	25.7210	(38)
Heat transfer coeff	63.1012	62.9946	62.8902	62.3995	62.3077	61.8803	61.8803	61.8011	62.0449	62.3077	62.4934	62.6876	(39)
Average = Sum(39)m / 12 =												62.3990	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1707	1.1687	1.1668	1.1577	1.1560	1.1481	1.1481	1.1466	1.1511	1.1560	1.1594	1.1630	(40)
HLP (average)												1.1577	
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 1.8051 (42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

	34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day) 92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)											Total = Sum(45)m =	1543.6206	
Distribution loss (46)m = 0.15 x (45)m	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(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	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4544	16.3911	13.3301	10.0917	7.5437	6.3687	6.8816	8.9450	12.0059	15.2443	17.7923	18.9673	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	428.6012	426.8405	413.6187	388.9887	364.6647	339.4707	326.4657	329.0926	341.7423	367.1274	394.1963	417.7839	(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	
Northeast	8.5800	11.2829	0.6300	0.7000	0.7700	29.5857	(75)
Northwest	12.9800	11.2829	0.6300	0.7000	0.7700	44.7578	(81)
Southeast	1.0800	26.0000	0.6300	0.7000	1.0000	11.1450	(82)

Solar gains	85.4884	174.4755	313.7961	512.0600	684.1815	727.3985	681.2825	545.8384	381.5178	213.2262	107.6889	69.7143	(83)
Total gains	514.0896	601.3161	727.4148	901.0487	1048.8462	1066.8691	1007.7482	874.9310	723.2600	580.3536	501.8852	487.4982	(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	54.6691	54.7616	54.8526	55.2839	55.3654	55.7478	55.7478	55.8192	55.5999	55.3654	55.2009	55.0299	
alpha	4.6446	4.6508	4.6568	4.6856	4.6910	4.7165	4.7165	4.7213	4.7067	4.6910	4.6801	4.6687	
util living area	0.9814	0.9622	0.9021	0.7444	0.5366	0.3690	0.2698	0.3238	0.5704	0.8665	0.9661	0.9851	(86)
MIT	19.8401	20.0798	20.4597	20.8216	20.9648	20.9951	20.9991	20.9980	20.9670	20.6926	20.1878	19.7884	(87)
Th 2	19.9435	19.9451	19.9467	19.9540	19.9554	19.9618	19.9618	19.9630	19.9593	19.9554	19.9526	19.9497	(88)
util rest of house													

	0.9763	0.9523	0.8791	0.6998	0.4814	0.3101	0.2063	0.2514	0.4926	0.8261	0.9554	0.9809	(89)
MIT 2	18.6286	18.9282	19.3875	19.7932	19.9297	19.9593	19.9615	19.9623	19.9396	19.6742	19.0735	18.5680	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	19.1569	19.4303	19.8550	20.2415	20.3810	20.4109	20.4139	20.4138	20.3875	20.1182	19.5593	19.1001	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.0069	19.2803	19.7050	20.0915	20.2310	20.2609	20.2639	20.2638	20.2375	19.9682	19.4093	18.9501	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9702	0.9445	0.8730	0.7060	0.4963	0.3272	0.2248	0.2725	0.5140	0.8267	0.9483	0.9755	(94)
Useful gains	498.7877	567.9617	635.0648	636.1411	520.5059	349.0621	226.5688	238.4125	371.7644	479.7513	475.9514	475.5745	(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	928.0202	905.8817	830.4624	698.3465	531.5493	350.2953	226.7234	238.7903	380.8024	583.7106	769.2516	924.6472	(97)
Space heating kWh	319.3490	227.0823	145.3758	44.7879	8.2163	0.0000	0.0000	0.0000	0.0000	77.3457	211.1762	334.1101	(98a)
Space heating requirement - total per year (kWh/year)												1367.4432	
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	319.3490	227.0823	145.3758	44.7879	8.2163	0.0000	0.0000	0.0000	0.0000	77.3457	211.1762	334.1101	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1367.4432	
Space heating per m2											(98c) / (4) =	25.3700	(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 %)	89.5000	(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													
	319.3490	227.0823	145.3758	44.7879	8.2163	0.0000	0.0000	0.0000	0.0000	77.3457	211.1762	334.1101	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	356.8145	253.7232	162.4311	50.0423	9.1802	0.0000	0.0000	0.0000	0.0000	86.4198	235.9510	373.3074	(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													
	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1527.8696	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	4091.1031	(238)

10a. Fuel costs - using Table 12 prices

	Fuel	Fuel price	Fuel cost

	kWh/year	p/kWh	£/year	
Space heating - main system 1	1527.8696	3.6400	55.6145	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	3.6400	85.4260	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	130.3644	16.4900	21.4971	(250)
Additional standing charges			92.0000	(251)
Total energy cost			268.7190	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9781	(257)
SAP value		84.1442	
SAP rating (Section 12)		84	(258)
SAP band		B	

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	1527.8696	0.2100	320.8526	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			813.6951	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Total CO2, kg/year			844.4400	(272)
CO2 emissions per m2			15.6700	(273)
EI value			88.5586	
EI rating			89	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b) x	2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3161	(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) =	0.2687	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.2955	0.2821	0.2821	0.2620	0.2620	0.2284	0.2351	0.2485	0.2418	0.2552	0.2552	0.2821	(22b)
Effective ac	0.5437	0.5398	0.5398	0.5343	0.5343	0.5261	0.5276	0.5309	0.5292	0.5326	0.5326	0.5398	(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								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)

External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400 (30)
Total net area of external elements Aum(A, m2)			97.3300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114		(33)
Main dwelling							
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000 (32)
Party Floor 1			53.9400			30.0000	1618.2000 (32d)
Internal Wall 1			49.9600			9.0000	449.6400 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312
E3 Sill	9.8000	0.0460	0.4508
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8552 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.9666 (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	25.4329	25.2514	25.2514	24.9950	24.9950	24.6098	24.6826	24.8346	24.7575	24.9137	24.9137	25.2514	(38)
Heat transfer coeff	62.3995	62.2180	62.2180	61.9615	61.9615	61.5764	61.6492	61.8011	61.7241	61.8803	61.8803	62.2180	(39)
Average = Sum(39)m / 12 =												61.9573	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1577	1.1543	1.1543	1.1496	1.1496	1.1424	1.1438	1.1466	1.1452	1.1481	1.1481	1.1543	(40)
HLP (average)												1.1495	
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 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.0767	65.0954	63.7134	61.1654	59.2575	57.1419	55.9992	57.3714	58.8656	61.1293	63.7298	65.8533	(42b)

Hot water usage for other uses

34.8586	33.5910	32.3234	31.0558	29.7882	28.5206	28.5206	29.7882	31.0558	32.3234	33.5910	34.8586	(42c)

Average daily hot water use (litres/day) 92.9531 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.9353	98.6863	96.0368	92.2212	89.0457	85.6626	84.5198	87.1597	89.9214	93.4527	97.3208	100.7119	(44)
Energy conte	159.8568	140.5280	147.6051	126.2463	119.8727	105.3321	102.2194	107.9219	110.8821	126.8145	138.6513	157.6905	(45)
Energy content (annual)										Total = Sum(45)m =		1543.6206	
Distribution loss (46)m = 0.15 x (45)m	23.9785	21.0792	22.1408	18.9369	17.9809	15.7998	15.3329	16.1883	16.6323	19.0222	20.7977	23.6536	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.4228	48.9393	45.4790	45.3767	42.2446	43.0704	44.4156	44.3448	47.6225	47.9938	50.9589	(61)
Total heat required for water heating calculated for each month	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
										Total per year (kWh/year) = Sum(64)m =		2100.4479	(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	65.8921	58.0813	61.3135	53.3466	51.2019	45.5841	44.7556	46.9879	47.9545	54.0714	58.1000	65.1718	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4544	16.3911	13.3301	10.0917	7.5437	6.3687	6.8816	8.9450	12.0059	15.2443	17.7923	18.9673	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	88.5647	86.4305	82.4106	74.0925	68.8197	63.3112	60.1553	63.1558	66.6035	72.6767	80.6945	87.5965	(72)
Total internal gains	428.6012	426.8405	413.6187	388.9887	364.6647	339.4707	326.4657	329.0926	341.7423	367.1274	394.1963	417.7839	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W

				W/m2	or Table 6b		or Table 6c		Table 6d				
Northeast				8.5800	12.4928		0.6300		0.7000		0.7700	32.7580	(75)
Northwest				12.9800	12.4928		0.6300		0.7000		0.7700	49.5570	(81)
Southeast				1.0800	29.0000		0.6300		0.7000		1.0000	12.4309	(82)
Solar gains	94.7460	174.3423	315.5033	533.7966	690.4518	785.1152	738.3094	606.9961	424.3747	233.0378	123.4245	79.0326	(83)
Total gains	523.3472	601.1828	729.1220	922.7853	1055.1165	1124.5859	1064.7751	936.0887	766.1169	600.1652	517.6208	496.8165	(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	55.2839	55.4452	55.4452	55.6747	55.6747	56.0229	55.9568	55.8192	55.8888	55.7478	55.7478	55.4452	
alpha	4.6856	4.6963	4.6963	4.7116	4.7116	4.7349	4.7305	4.7213	4.7259	4.7165	4.7165	4.6963	
util living area	0.9740	0.9520	0.8697	0.6635	0.4407	0.2516	0.1447	0.1782	0.4226	0.7878	0.9461	0.9785	(86)
MIT	20.0183	20.2222	20.6035	20.9056	20.9875	20.9993	21.0000	20.9999	20.9928	20.8348	20.3850	19.9737	(87)
Th 2	19.9540	19.9567	19.9567	19.9606	19.9606	19.9663	19.9652	19.9630	19.9641	19.9618	19.9618	19.9567	(88)
util rest of house	0.9665	0.9390	0.8392	0.6110	0.3826	0.1952	0.0848	0.1098	0.3421	0.7290	0.9287	0.9722	(89)
MIT 2	18.8610	19.1139	19.5640	19.8829	19.9529	19.9661	19.9652	19.9630	19.9611	19.8285	19.3230	18.8077	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.3656	19.5971	20.0172	20.3288	20.4040	20.4166	20.4164	20.4151	20.4109	20.2672	19.7860	19.3161	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2156	19.4471	19.8672	20.1788	20.2540	20.2666	20.2664	20.2651	20.2609	20.1172	19.6360	19.1661	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9597	0.9313	0.8363	0.6224	0.3992	0.2116	0.1023	0.1297	0.3654	0.7386	0.9220	0.9659	(94)
Useful gains	502.2776	559.8995	609.7670	574.3876	421.1803	237.9709	108.8937	121.4364	279.9438	443.2817	477.2640	479.8915	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	862.0872	842.8731	750.7975	605.9080	424.6846	238.0914	108.8958	121.4432	281.5187	496.1086	695.2872	856.4975	(97)
Space heating kWh	267.6983	190.1583	104.9267	22.6947	2.6073	0.0000	0.0000	0.0000	0.0000	39.3032	156.9767	280.1949	(98a)
Space heating requirement - total per year (kWh/year)												1064.5600	
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	267.6983	190.1583	104.9267	22.6947	2.6073	0.0000	0.0000	0.0000	0.0000	39.3032	156.9767	280.1949	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1064.5600	
Space heating per m2											(98c) / (4) =	19.7506	(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 %)	89.5000	(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	267.6983	190.1583	104.9267	22.6947	2.6073	0.0000	0.0000	0.0000	0.0000	39.3032	156.9767	280.1949	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	299.1043	212.4673	117.2365	25.3572	2.9131	0.0000	0.0000	0.0000	0.0000	43.9142	175.3930	313.0669	(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	210.8157	185.9508	196.5444	171.7253	165.2494	147.5767	145.2898	152.3375	155.2269	174.4370	186.6451	208.6494	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	235.5483	207.7663	219.6027	191.8718	184.6362	164.8901	162.3350	170.2095	173.4378	194.9016	208.5421	233.1278	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	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	16.1531	12.9586	11.6678	8.5483	6.6030	5.3947	6.0234	7.8295	10.1697	13.3432	15.0712	16.6020	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1189.4525	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)

Efficiency of water heater	89.5000	
Water heating fuel used	2346.8691	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	130.3644	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3752.6860	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1189.4525	6.3400	75.4113	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	6.3400	148.7915	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	130.3644	26.0000	33.8947	(250)
Additional standing charges			113.0000	(251)
Total energy cost			393.4575	(255)

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	1189.4525	0.2100	249.7850	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2346.8691	0.2100	492.8425	(264)
Space and water heating			742.6275	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	130.3644	0.1443	18.8156	(268)
Total CO2, kg/year			773.3724	(272)

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	1189.4525	1.1300	1344.0813	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2346.8691	1.1300	2651.9621	(278)
Space and water heating			3996.0434	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	130.3644	1.5338	199.9573	(282)
Total Primary energy kWh/year			4326.1015	(286)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10 - Be Lean	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	85 B	**DER**	14.74	**TER**	16.46
Environmental	90 B	**% DER < TER**			10.45
CO_2 Emissions (t/year)	0.7	**DFEE**	32.90	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			19.71
% DPER < TPER	6.53	**DPER**	82.40	**TPER**	88.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3170	(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) =	0.2694	(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	0.3435	0.3368	0.3301	0.2964	0.2896	0.2560	0.2560	0.2492	0.2694	0.2896	0.3031	0.3166	(22b)
Effective ac	0.5590	0.5567	0.5545	0.5439	0.5419	0.5328	0.5328	0.5311	0.5363	0.5419	0.5459	0.5501	(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	
Main dwelling								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800

P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200		
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696		
E3 Sill	8.4000	0.0460	0.3864		
E4 Jamb	26.4000	0.0590	1.5576		
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080		
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.4676	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	39.0951	(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	25.9852	25.8787	25.7743	25.2840	25.1922	24.7651	24.7651	24.6860	24.9296	25.1922	25.3778	25.5719	(38)
Heat transfer coeff	65.0804	64.9739	64.8695	64.3791	64.2874	63.8603	63.8603	63.7812	64.0248	64.2874	64.4730	64.6670	(39)
Average = Sum(39)m / 12 =												64.3787	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2151	1.2131	1.2112	1.2020	1.2003	1.1923	1.1923	1.1908	1.1954	1.2003	1.2038	1.2074	(40)
HLP (average)												1.2020	
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 1.7951 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)
Total heat required for water heating calculated for each month	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
									Total per year (kWh/year) = Sum(64)m =			1990.0464	(64)
12Total per year (kWh/year)												1990	(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	62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)
Total internal gains	372.3406	380.2470	363.8928	349.9354	331.3157	315.3955	302.8723	304.0903	314.0776	328.9090	350.1283	364.4837	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	553.7086	702.5197	837.6904	987.8524	1089.2155	1086.0835	1038.3549	947.8047	844.6385	694.1947	569.8563	518.0513	(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	76.4746	76.5999	76.7232	77.3076	77.4179	77.9357	77.9357	78.0323	77.7354	77.4179	77.1951	76.9634	
alpha	6.0983	6.1067	6.1149	6.1538	6.1612	6.1957	6.1957	6.2022	6.1824	6.1612	6.1463	6.1309	
util living area													
	0.9919	0.9693	0.9041	0.7413	0.5427	0.3758	0.2705	0.3094	0.5184	0.8437	0.9766	0.9944	(86)
MIT	20.1588	20.4285	20.7131	20.9268	20.9894	20.9991	20.9999	20.9998	20.9939	20.8700	20.4676	20.1052	(87)
Th 2	19.9079	19.9095	19.9111	19.9184	19.9198	19.9262	19.9262	19.9273	19.9237	19.9198	19.9170	19.9141	(88)
util rest of house													
	0.9886	0.9582	0.8752	0.6890	0.4822	0.3130	0.2046	0.2373	0.4399	0.7899	0.9660	0.9921	(89)
MIT 2	18.9676	19.3029	19.6362	19.8606	19.9134	19.9258	19.9261	19.9273	19.9210	19.8175	19.3622	18.9046	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.6014	19.9019	20.2092	20.4279	20.4859	20.4969	20.4975	20.4980	20.4919	20.3776	19.9504	19.5434	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4514	19.7519	20.0592	20.2779	20.3359	20.3469	20.3475	20.3480	20.3419	20.2276	19.8004	19.3934	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9563	0.8795	0.7070	0.5057	0.3376	0.2305	0.2656	0.4707	0.8065	0.9646	0.9906	(94)
Useful gains	546.3950	671.8009	736.7672	698.4307	550.8642	366.7058	239.2958	251.7569	397.5674	559.8825	549.6746	513.1608	(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													
	986.0614	964.9828	879.5779	732.4995	555.1807	366.9984	239.3165	251.8066	399.6380	618.9306	818.8346	982.5143	(97)
Space heating kWh													
	327.1117	197.0182	106.2511	24.5295	3.2115	0.0000	0.0000	0.0000	0.0000	43.9318	193.7951	349.1990	(98a)
Space heating requirement - total per year (kWh/year)												1245.0481	
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													
	327.1117	197.0182	106.2511	24.5295	3.2115	0.0000	0.0000	0.0000	0.0000	43.9318	193.7951	349.1990	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1245.0481	
Space heating per m2											(98c) / (4) =	23.2459	(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 %)												89.5000	(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													
	327.1117	197.0182	106.2511	24.5295	3.2115	0.0000	0.0000	0.0000	0.0000	43.9318	193.7951	349.1990	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	365.4880	220.1321	118.7163	27.4073	3.5882	0.0000	0.0000	0.0000	0.0000	49.0859	216.5309	390.1665	(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													
	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	223.5828	196.7672	207.9770	181.7142	174.8617	156.1610	153.7411	161.1987	164.2562	184.5837	197.5020	221.1700	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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												1391.1152	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2223.5155	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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	3830.2667	(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	1391.1152	0.2100	292.1342	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2223.5155	0.2100	466.9383	(264)
Space and water heating			759.0724	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Total CO2, kg/year			789.7122	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.7400	(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	1391.1152	1.1300	1571.9601	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2223.5155	1.1300	2512.5725	(278)
Space and water heating			4084.5327	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6360	1.5338	198.8400	(282)
Total Primary energy kWh/year			4413.4735	(286)
Dwelling Primary energy Rate (DPER)			82.4000	(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	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 = 20.0000	(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) =	20.0000 / (5) = 0.1420	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3920	(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) = 0.3332	(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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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								
TER Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.2108			(33)

Main dwelling

Party Wall 1	32.8000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0900	0.7020	
E18 Party wall between dwellings	15.6000	0.0600	0.9360	
E14 Flat roof	26.0000	0.0800	2.0800	
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200	
E3 Sill	8.4000	0.0500	0.4200	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)

Heat transfer coeff

	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)

Average = Sum(39)m / 12 = 68.5665

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
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 1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)

Energy content (annual) Total = Sum(45)m = 1461.9023

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

22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)

Total heat required for water heating calculated for each month

200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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

200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)

Total per year (kWh/year) = Sum(64)m = 1990.0464 (64)

12Total per year (kWh/year) 1990 (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

62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)

-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)

Water heating gains (Table 5)

84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)

Total internal gains

372.3406	380.2470	363.8928	349.9354	331.3157	315.3955	302.8723	304.0903	314.0776	328.9090	350.1283	364.4837	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)

Northwest			3.7800		11.2829		0.6300		0.7000		0.7700		13.0342 (81)
Southeast			1.1600		26.0000		0.6300		0.7000		1.0000		11.9705 (82)
Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	492.2504	593.2989	677.0812	771.5625	832.2109	824.7298	788.9450	729.5357	664.7708	570.3864	495.3965	466.0156	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area	0.9959	0.9878	0.9644	0.8829	0.7201	0.5202	0.3772	0.4250	0.6765	0.9303	0.9894	0.9970	(86)
MIT	19.9600	20.1764	20.4552	20.7698	20.9425	20.9927	20.9991	20.9982	20.9695	20.7192	20.2795	19.9242	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house	0.9942	0.9827	0.9499	0.8421	0.6480	0.4311	0.2806	0.3215	0.5787	0.8948	0.9840	0.9957	(89)
MIT 2	18.6646	18.9397	19.2857	19.6545	19.8206	19.8651	19.8679	19.8694	19.8496	19.6134	19.0810	18.6260	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.3539	19.5978	19.9080	20.2480	20.4176	20.4651	20.4698	20.4701	20.4455	20.2018	19.7187	19.3168	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3539	19.5978	19.9080	20.2480	20.4176	20.4651	20.4698	20.4701	20.4455	20.2018	19.7187	19.3168	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9813	0.9509	0.8574	0.6845	0.4786	0.3321	0.3767	0.6304	0.9070	0.9832	0.9948	(94)
Useful gains	488.8865	582.2180	643.8031	661.5051	569.6782	394.6975	262.0055	274.8063	419.0467	517.3632	487.0844	463.6138	(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	1048.3454	1021.1525	929.4023	778.0996	596.5158	397.5013	262.2707	275.3509	431.6551	657.0234	867.0405	1043.1710	(97)
Space heating kWh	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98a)
Space heating requirement - total per year (kWh/year)												1836.2687	
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	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.2687	
Space heating per m2											(98c) / (4) =	34.2843	(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 %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	450.4734	319.2251	229.9630	90.8528	21.6095	0.0000	0.0000	0.0000	0.0000	112.4537	296.0697	466.6564	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9127	85.4776	84.6659	83.0347	81.1887	80.3000	80.3000	80.3000	80.3000	83.4157	85.3136	86.0020	(217)
Fuel for water heating, kWh/month	232.9185	206.0266	219.8518	195.8630	192.7624	174.0524	171.3552	179.6673	183.0750	198.0470	207.1936	230.1657	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	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	16.3980	13.1551	11.8447	8.6779	6.7031	5.4765	6.1148	7.9482	10.3239	13.5456	15.2997	16.8537	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.9664	-17.9997	-27.5889	-33.1538	-37.6644	-35.8780	-35.4558	-32.5194	-27.6824	-21.5080	-13.5549	-10.2192	(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	-3.7180	-8.0416	-16.3987	-25.2483	-33.9919	-34.3642	-33.9460	-28.4509	-20.4850	-11.6850	-5.0235	-2.9231	(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												1987.3037	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2390.9786	(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)	132.3410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-529.4674	(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	4067.1559	(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	1987.3037	0.2100	417.3338	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2390.9786	0.2100	502.1055	(264)
Space and water heating			919.4393	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.3410	0.1443	19.1009	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	0.1332	-40.6623	
PV Unit electricity exported	-224.2764	0.1252	-28.0767	
Total			-68.7389	(269)
Total CO2, kg/year			881.7305	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.4600	(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	1987.3037	1.1300	2245.6532	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2390.9786	1.1300	2701.8059	(278)
Space and water heating			4947.4591	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.3410	1.5338	202.9890	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	1.4923	-455.4483	
PV Unit electricity exported	-224.2764	0.4595	-103.0532	
Total			-558.5015	(283)
Total Primary energy kWh/year			4722.0474	(286)
Target Primary Energy Rate (TPER)			88.1600	(287)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10 - Be Lean	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	85 B	**DER**	14.74	**TER**	16.46
Environmental	90 B	**% DER < TER**			10.45
CO_2 Emissions (t/year)	0.7	**DFEE**	32.90	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			19.71
% DPER < TPER	6.53	**DPER**	82.40	**TPER**	88.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3170	(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) =	0.2694	(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	0.3435	0.3368	0.3301	0.2964	0.2896	0.2560	0.2560	0.2492	0.2694	0.2896	0.3031	0.3166	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5590	0.5567	0.5545	0.5439	0.5419	0.5328	0.5328	0.5311	0.5363	0.5419	0.5459	0.5501	(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	
Main dwelling								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184

E18 Party wall between dwellings	15.6000	0.0160	0.2496	
E14 Flat roof	26.0000	0.0800	2.0800	
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696	
E3 Sill	8.4000	0.0460	0.3864	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4676 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0951 (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	25.9852	25.8787	25.7743	25.2840	25.1922	24.7651	24.7651	24.6860	24.9296	25.1922	25.3778	25.5719	(38)
Heat transfer coeff	65.0804	64.9739	64.8695	64.3791	64.2874	63.8603	63.8603	63.7812	64.0248	64.2874	64.4730	64.6670	(39)
Average = Sum(39)m / 12 =												64.3787	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2151	1.2131	1.2112	1.2020	1.2003	1.1923	1.1923	1.1908	1.1954	1.2003	1.2038	1.2074	(40)
HLP (average)												1.2020	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.4812	23.1325	22.6414	21.7359	21.0579	20.3061	19.9000	20.3877	20.9186	21.7231	22.6472	23.4018	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 51.7828 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.4944	54.9452	53.2536	51.1477	49.2692	47.3169	46.9108	48.5989	50.3304	52.3353	54.4599	56.4150	(44)
Energy conte	89.4733	78.2412	81.8488	70.0186	66.3258	58.1816	56.7346	60.1756	62.0624	71.0185	77.5881	88.3322	(45)
Energy content (annual)										Total = Sum(45)m =		860.0008	

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(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

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(64)
									Total per year (kWh/year) = Sum(64)m =		731.0006	(64)
12Total per year (kWh/year)											731	(64)

Electric shower(s)

43.4986	38.7576	42.3219	40.3872	41.1451	39.2484	40.5567	41.1451	40.3872	42.3219	41.5261	43.4986	(64a)
									Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		494.7945	(64a)

Heat gains from water heating, kWh/month

29.8877	26.3157	27.9733	24.9758	24.3805	22.1757	22.1953	23.0736	23.2851	25.6719	26.8690	29.6453	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	40.1717	39.1602	37.5986	34.6886	32.7695	30.7996	29.8324	31.0129	32.3404	34.5052	37.3180	39.8458	(72)
Total internal gains	325.4845	334.5524	320.4435	311.4538	295.9088	286.2356	275.7339	275.2908	283.3405	291.5851	308.0238	318.2549	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	506.8525	656.8251	794.2411	949.3708	1053.8086	1056.9235	1011.2165	919.0052	813.9013	656.8708	527.7518	471.8225	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.4746	76.5999	76.7232	77.3076	77.4179	77.9357	77.9357	78.0323	77.7354	77.4179	77.1951	76.9634	
alpha	6.0983	6.1067	6.1149	6.1538	6.1612	6.1957	6.1957	6.2022	6.1824	6.1612	6.1463	6.1309	
util living area	0.9949	0.9775	0.9210	0.7629	0.5597	0.3860	0.2778	0.3191	0.5370	0.8678	0.9838	0.9966	(86)
MIT	20.0884	20.3676	20.6726	20.9143	20.9874	20.9989	20.9999	20.9997	20.9927	20.8455	20.4092	20.0348	(87)
Th 2	19.9079	19.9095	19.9111	19.9184	19.9198	19.9262	19.9262	19.9273	19.9237	19.9198	19.9170	19.9141	(88)
util rest of house	0.9927	0.9689	0.8954	0.7113	0.4979	0.3216	0.2100	0.2448	0.4561	0.8179	0.9761	0.9951	(89)
MIT 2	19.1059	19.3792	19.6625	19.8650	19.9139	19.9258	19.9261	19.9273	19.9211	19.8227	19.4292	19.0578	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.6287	19.9052	20.2000	20.4233	20.4851	20.4968	20.4975	20.4980	20.4913	20.3669	19.9507	19.5777	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6287	19.9052	20.2000	20.4233	20.4851	20.4968	20.4975	20.4980	20.4913	20.3669	19.9507	19.5777	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9920	0.9689	0.9029	0.7362	0.5305	0.3559	0.2461	0.2843	0.4992	0.8402	0.9764	0.9945	(94)
Useful gains	502.8068	636.3776	717.1012	698.9714	559.0907	376.1677	248.8633	261.2957	406.2825	551.9143	515.2749	469.2440	(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	997.5989	974.9437	888.7094	741.8626	564.7723	376.5731	248.8950	261.3724	409.2023	627.8913	828.5212	994.4285	(97)
Space heating kWh	368.1253	227.5164	127.6765	30.8817	4.2271	0.0000	0.0000	0.0000	0.0000	56.5269	225.5373	390.7373	(98a)
Space heating requirement - total per year (kWh/year)												1431.2286	
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	368.1253	227.5164	127.6765	30.8817	4.2271	0.0000	0.0000	0.0000	0.0000	56.5269	225.5373	390.7373	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1431.2286	
Space heating per m2											(98c) / (4) =	26.7220	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	600.2866	472.5660	484.7370	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9926	0.9974	0.9950	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	595.8408	471.3406	482.3367	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1183.4027	1132.8357	1030.3424	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	423.0446	492.1523	407.7163	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	105.7611	123.0381	101.9291	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												330.7283	(107)
Energy for space heating												26.7220	(99)
Energy for space cooling												6.1749	(108)
Total												32.8969	(109)
Fabric Energy Efficiency (DFEE)												32.9	(109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 =	20.0000 (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) = 20.0000 / (5) = 0.1420 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3920 (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) = 0.3332 (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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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 Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.2108			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)

Average = Sum(39)m / 12 = 68.5665

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.4812	23.1325	22.6414	21.7359	21.0579	20.3061	19.9000	20.3877	20.9186	21.7231	22.6472	23.4018	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 51.7828 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.4944	54.9452	53.2536	51.1477	49.2692	47.3169	46.9108	48.5989	50.3304	52.3353	54.4599	56.4150	(44)
Energy conte	89.4733	78.2412	81.8488	70.0186	66.3258	58.1816	56.7346	60.1756	62.0624	71.0185	77.5881	88.3322	(45)

Energy content (annual) Total = Sum(45)m = 860.0008

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(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

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(64)

Total per year (kWh/year) = Sum(64)m = 731.0006 (64)
12Total per year (kWh/year) 731 (64)
Electric shower(s)

43.4986	38.7576	42.3219	40.3872	41.1451	39.2484	40.5567	41.1451	40.3872	42.3219	41.5261	43.4986	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 494.7945 (64a)

Heat gains from water heating, kWh/month

29.8877	26.3157	27.9733	24.9758	24.3805	22.1757	22.1953	23.0736	23.2851	25.6719	26.8690	29.6453	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	40.1717	39.1602	37.5986	34.6886	32.7695	30.7996	29.8324	31.0129	32.3404	34.5052	37.3180	39.8458	(72)
Total internal gains													
	325.4845	334.5524	320.4435	311.4538	295.9088	286.2356	275.7339	275.2908	283.3405	291.5851	308.0238	318.2549	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)
Northwest	3.7800	11.2829	0.6300	0.7000	0.7700	13.0342	(81)
Southeast	1.1600	26.0000	0.6300	0.7000	1.0000	11.9705	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	445.3943	547.6042	633.6319	733.0809	796.8040	795.5699	761.8066	700.7362	634.0337	533.0624	453.2919	419.7867	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area													
	0.9976	0.9917	0.9732	0.9010	0.7437	0.5382	0.3905	0.4421	0.7027	0.9463	0.9931	0.9983	(86)
MIT	19.8890	20.1099	20.3990	20.7378	20.9321	20.9913	20.9989	20.9978	20.9630	20.6786	20.2175	19.8537	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house													
	0.9965	0.9881	0.9618	0.8640	0.6719	0.4466	0.2906	0.3346	0.6039	0.9167	0.9895	0.9975	(89)
MIT 2	18.8537	19.0742	19.3570	19.6737	19.8230	19.8653	19.8679	19.8695	19.8500	19.6338	19.1913	18.8260	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.4046	19.6253	19.9115	20.2399	20.4132	20.4645	20.4697	20.4698	20.4423	20.1898	19.7374	19.3728	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4046	19.6253	19.9115	20.2399	20.4132	20.4645	20.4697	20.4698	20.4423	20.1898	19.7374	19.3728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9959	0.9872	0.9626	0.8777	0.7082	0.4954	0.3438	0.3920	0.6561	0.9267	0.9891	0.9970	(94)
Useful gains	443.5769	540.6174	609.9222	643.4155	564.3148	394.1044	261.9440	274.6626	415.9954	493.9855	448.3328	418.5396	(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													
	1051.8760	1023.0659	929.6433	777.5452	596.2139	397.4569	262.2642	275.3362	431.4343	656.1968	868.3227	1047.0379	(97)
Space heating kWh													
	452.5746	324.2054	237.8725	96.5734	23.7330	0.0000	0.0000	0.0000	0.0000	120.6852	302.3927	467.6027	(98a)
Space heating requirement - total per year (kWh/year)												2025.6395	
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													
	452.5746	324.2054	237.8725	96.5734	23.7330	0.0000	0.0000	0.0000	0.0000	120.6852	302.3927	467.6027	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2025.6395	
Space heating per m2											(98c) / (4) =	37.8200	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	637.0731	501.5256	514.1612	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9552	0.9811	0.9694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	608.5295	492.0559	498.4446	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	885.9655	848.9164	781.5350	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	199.7539	265.5042	210.6193	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	49.9385	66.3761	52.6548	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												168.9694	(107)
Energy for space heating												37.8200	(99)
Energy for space cooling												3.1548	(108)
Total												40.9748	(109)
Fabric Energy Efficiency (TFEE)												41.0	(109)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10 - Be Lean	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	85 B	**DER**	14.74	**TER**	16.46
Environmental	90 B	**% DER < TER**			10.45
CO_2 Emissions (t/year)	0.7	**DFEE**	32.90	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			19.71
% DPER < TPER	6.53	**DPER**	82.40	**TPER**	88.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3170	(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) =	0.2694	(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	0.3435	0.3368	0.3301	0.2964	0.2896	0.2560	0.2560	0.2492	0.2694	0.2896	0.3031	0.3166	(22b)
Effective ac	0.5590	0.5567	0.5545	0.5439	0.5419	0.5328	0.5328	0.5311	0.5363	0.5419	0.5459	0.5501	(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	
Main dwelling								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800

P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200		
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696		
E3 Sill	8.4000	0.0460	0.3864		
E4 Jamb	26.4000	0.0590	1.5576		
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080		
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.4676	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	39.0951	(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	25.9852	25.8787	25.7743	25.2840	25.1922	24.7651	24.7651	24.6860	24.9296	25.1922	25.3778	25.5719	(38)
Heat transfer coeff	65.0804	64.9739	64.8695	64.3791	64.2874	63.8603	63.8603	63.7812	64.0248	64.2874	64.4730	64.6670	(39)
Average = Sum(39)m / 12 =												64.3787	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2151	1.2131	1.2112	1.2020	1.2003	1.1923	1.1923	1.1908	1.1954	1.2003	1.2038	1.2074	(40)
HLP (average)												1.2020	
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 1.7951 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)
Total heat required for water heating calculated for each month	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
									Total per year (kWh/year) = Sum(64)m =			1990.0464	(64)
12Total per year (kWh/year)												1990	(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	62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)
Total internal gains	372.3406	380.2470	363.8928	349.9354	331.3157	315.3955	302.8723	304.0903	314.0776	328.9090	350.1283	364.4837	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	553.7086	702.5197	837.6904	987.8524	1089.2155	1086.0835	1038.3549	947.8047	844.6385	694.1947	569.8563	518.0513	(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	76.4746	76.5999	76.7232	77.3076	77.4179	77.9357	77.9357	78.0323	77.7354	77.4179	77.1951	76.9634	
alpha	6.0983	6.1067	6.1149	6.1538	6.1612	6.1957	6.1957	6.2022	6.1824	6.1612	6.1463	6.1309	
util living area													
	0.9919	0.9693	0.9041	0.7413	0.5427	0.3758	0.2705	0.3094	0.5184	0.8437	0.9766	0.9944	(86)
MIT	20.1588	20.4285	20.7131	20.9268	20.9894	20.9991	20.9999	20.9998	20.9939	20.8700	20.4676	20.1052	(87)
Th 2	19.9079	19.9095	19.9111	19.9184	19.9198	19.9262	19.9262	19.9273	19.9237	19.9198	19.9170	19.9141	(88)
util rest of house													
	0.9886	0.9582	0.8752	0.6890	0.4822	0.3130	0.2046	0.2373	0.4399	0.7899	0.9660	0.9921	(89)
MIT 2	18.9676	19.3029	19.6362	19.8606	19.9134	19.9258	19.9261	19.9273	19.9210	19.8175	19.3622	18.9046	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.6014	19.9019	20.2092	20.4279	20.4859	20.4969	20.4975	20.4980	20.4919	20.3776	19.9504	19.5434	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.4514	19.7519	20.0592	20.2779	20.3359	20.3469	20.3475	20.3480	20.3419	20.2276	19.8004	19.3934	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9563	0.8795	0.7070	0.5057	0.3376	0.2305	0.2656	0.4707	0.8065	0.9646	0.9906	(94)
Useful gains	546.3950	671.8009	736.7672	698.4307	550.8642	366.7058	239.2958	251.7569	397.5674	559.8825	549.6746	513.1608	(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													
	986.0614	964.9828	879.5779	732.4995	555.1807	366.9984	239.3165	251.8066	399.6380	618.9306	818.8346	982.5143	(97)
Space heating kWh													
	327.1117	197.0182	106.2511	24.5295	3.2115	0.0000	0.0000	0.0000	0.0000	43.9318	193.7951	349.1990	(98a)
Space heating requirement - total per year (kWh/year)												1245.0481	
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													
	327.1117	197.0182	106.2511	24.5295	3.2115	0.0000	0.0000	0.0000	0.0000	43.9318	193.7951	349.1990	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1245.0481	
Space heating per m2											(98c) / (4) =	23.2459	(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 %)												89.5000	(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													
	327.1117	197.0182	106.2511	24.5295	3.2115	0.0000	0.0000	0.0000	0.0000	43.9318	193.7951	349.1990	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	365.4880	220.1321	118.7163	27.4073	3.5882	0.0000	0.0000	0.0000	0.0000	49.0859	216.5309	390.1665	(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													
	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	223.5828	196.7672	207.9770	181.7142	174.8617	156.1610	153.7411	161.1987	164.2562	184.5837	197.5020	221.1700	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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												1391.1152	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2223.5155	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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	3830.2667	(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	1391.1152	0.2100	292.1342	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2223.5155	0.2100	466.9383	(264)
Space and water heating			759.0724	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Total CO2, kg/year			789.7122	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.7400	(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	1391.1152	1.1300	1571.9601	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2223.5155	1.1300	2512.5725	(278)
Space and water heating			4084.5327	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6360	1.5338	198.8400	(282)
Total Primary energy kWh/year			4413.4735	(286)
Dwelling Primary energy Rate (DPER)			82.4000	(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	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 = 20.0000	(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) =	20.0000 / (5) = 0.1420	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3920	(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) = 0.3332	(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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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								
TER Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.2108			(33)

Main dwelling

Party Wall 1	32.8000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0900	0.7020	
E18 Party wall between dwellings	15.6000	0.0600	0.9360	
E14 Flat roof	26.0000	0.0800	2.0800	
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200	
E3 Sill	8.4000	0.0500	0.4200	
E4 Jamb	26.4000	0.0500	1.3200	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)

Heat transfer coeff

	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)

Average = Sum(39)m / 12 = 68.5665

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
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 1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)

Energy content (annual) Total = Sum(45)m = 1461.9023

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

22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)

Total heat required for water heating calculated for each month

200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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

200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)

Total per year (kWh/year) = Sum(64)m = 1990.0464 (64)

12Total per year (kWh/year) 1990 (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

62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)

-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)

Water heating gains (Table 5)

84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)

Total internal gains

372.3406	380.2470	363.8928	349.9354	331.3157	315.3955	302.8723	304.0903	314.0776	328.9090	350.1283	364.4837	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)

Northwest			3.7800		11.2829		0.6300		0.7000		0.7700		13.0342 (81)
Southeast			1.1600		26.0000		0.6300		0.7000		1.0000		11.9705 (82)
Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	492.2504	593.2989	677.0812	771.5625	832.2109	824.7298	788.9450	729.5357	664.7708	570.3864	495.3965	466.0156	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area	0.9959	0.9878	0.9644	0.8829	0.7201	0.5202	0.3772	0.4250	0.6765	0.9303	0.9894	0.9970	(86)
MIT	19.9600	20.1764	20.4552	20.7698	20.9425	20.9927	20.9991	20.9982	20.9695	20.7192	20.2795	19.9242	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house	0.9942	0.9827	0.9499	0.8421	0.6480	0.4311	0.2806	0.3215	0.5787	0.8948	0.9840	0.9957	(89)
MIT 2	18.6646	18.9397	19.2857	19.6545	19.8206	19.8651	19.8679	19.8694	19.8496	19.6134	19.0810	18.6260	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.3539	19.5978	19.9080	20.2480	20.4176	20.4651	20.4698	20.4701	20.4455	20.2018	19.7187	19.3168	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3539	19.5978	19.9080	20.2480	20.4176	20.4651	20.4698	20.4701	20.4455	20.2018	19.7187	19.3168	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9813	0.9509	0.8574	0.6845	0.4786	0.3321	0.3767	0.6304	0.9070	0.9832	0.9948	(94)
Useful gains	488.8865	582.2180	643.8031	661.5051	569.6782	394.6975	262.0055	274.8063	419.0467	517.3632	487.0844	463.6138	(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	1048.3454	1021.1525	929.4023	778.0996	596.5158	397.5013	262.2707	275.3509	431.6551	657.0234	867.0405	1043.1710	(97)
Space heating kWh	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98a)
Space heating requirement - total per year (kWh/year)												1836.2687	
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	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1836.2687	
Space heating per m2											(98c) / (4) =	34.2843	(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 %)												92.4000	(206)
Efficiency of main space heating system 2 (in %)												0.0000	(207)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement	416.2375	294.9640	212.4858	83.9480	19.9672	0.0000	0.0000	0.0000	0.0000	103.9072	273.5684	431.1906	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	450.4734	319.2251	229.9630	90.8528	21.6095	0.0000	0.0000	0.0000	0.0000	112.4537	296.0697	466.6564	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.9127	85.4776	84.6659	83.0347	81.1887	80.3000	80.3000	80.3000	80.3000	83.4157	85.3136	86.0020	(217)
Fuel for water heating, kWh/month	232.9185	206.0266	219.8518	195.8630	192.7624	174.0524	171.3552	179.6673	183.0750	198.0470	207.1936	230.1657	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	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	16.3980	13.1551	11.8447	8.6779	6.7031	5.4765	6.1148	7.9482	10.3239	13.5456	15.2997	16.8537	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-11.9664	-17.9997	-27.5889	-33.1538	-37.6644	-35.8780	-35.4558	-32.5194	-27.6824	-21.5080	-13.5549	-10.2192	(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	-3.7180	-8.0416	-16.3987	-25.2483	-33.9919	-34.3642	-33.9460	-28.4509	-20.4850	-11.6850	-5.0235	-2.9231	(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												1987.3037	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2390.9786	(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)	132.3410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-529.4674	(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	4067.1559	(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	1987.3037	0.2100	417.3338	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2390.9786	0.2100	502.1055	(264)
Space and water heating			919.4393	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.3410	0.1443	19.1009	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	0.1332	-40.6623	
PV Unit electricity exported	-224.2764	0.1252	-28.0767	
Total			-68.7389	(269)
Total CO2, kg/year			881.7305	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.4600	(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	1987.3037	1.1300	2245.6532	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2390.9786	1.1300	2701.8059	(278)
Space and water heating			4947.4591	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.3410	1.5338	202.9890	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	1.4923	-455.4483	
PV Unit electricity exported	-224.2764	0.4595	-103.0532	
Total			-558.5015	(283)
Total Primary energy kWh/year			4722.0474	(286)
Target Primary Energy Rate (TPER)			88.1600	(287)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10 - Be Lean	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	85 B	**DER**	14.74	**TER**	16.46
Environmental	90 B	**% DER < TER**			10.45
CO_2 Emissions (t/year)	0.7	**DFEE**	32.90	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			19.71
% DPER < TPER	6.53	**DPER**	82.40	**TPER**	88.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3170	(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) =	0.2694	(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	0.3435	0.3368	0.3301	0.2964	0.2896	0.2560	0.2560	0.2492	0.2694	0.2896	0.3031	0.3166	(22b)
Effective ac	0.5590	0.5567	0.5545	0.5439	0.5419	0.5328	0.5328	0.5311	0.5363	0.5419	0.5459	0.5501	(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	
Main dwelling								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800

P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696	
E3 Sill	8.4000	0.0460	0.3864	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				7.4676 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	39.0951 (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	25.9852	25.8787	25.7743	25.2840	25.1922	24.7651	24.7651	24.6860	24.9296	25.1922	25.3778	25.5719	(38)
Heat transfer coeff	65.0804	64.9739	64.8695	64.3791	64.2874	63.8603	63.8603	63.7812	64.0248	64.2874	64.4730	64.6670	(39)
Average = Sum(39)m / 12 =												64.3787	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2151	1.2131	1.2112	1.2020	1.2003	1.1923	1.1923	1.1908	1.1954	1.2003	1.2038	1.2074	(40)
HLP (average)												1.2020	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)
Total heat required for water heating calculated for each month	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
									Total per year (kWh/year) = Sum(64)m =			1990.0464	(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	62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3513	16.2995	13.2556	10.0354	7.5015	6.3331	6.8432	8.8950	11.9389	15.1591	17.6929	18.8614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)
Total internal gains	422.3788	420.5774	407.6198	383.5213	359.5829	334.7737	321.9908	324.4610	336.8767	361.8492	388.3872	411.6316	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	603.7468	742.8501	881.4174	1021.4382	1117.4827	1105.4617	1057.4734	968.1754	867.4376	727.1349	608.1152	565.1992	(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	76.4746	76.5999	76.7232	77.3076	77.4179	77.9357	77.9357	78.0323	77.7354	77.4179	77.1951	76.9634	
alpha	6.0983	6.1067	6.1149	6.1538	6.1612	6.1957	6.1957	6.2022	6.1824	6.1612	6.1463	6.1309	
util living area	0.9875	0.9607	0.8858	0.7227	0.5297	0.3692	0.2657	0.3029	0.5054	0.8218	0.9684	0.9912	(86)
MIT	20.2323	20.4797	20.7497	20.9361	20.9907	20.9991	20.9999	20.9998	20.9947	20.8886	20.5184	20.1758	(87)
Th 2	19.9079	19.9095	19.9111	19.9184	19.9198	19.9262	19.9262	19.9273	19.9237	19.9198	19.9170	19.9141	(88)
util rest of house	0.9826	0.9471	0.8538	0.6702	0.4704	0.3075	0.2009	0.2324	0.4285	0.7653	0.9548	0.9876	(89)
MIT 2	19.0596	19.3640	19.6752	19.8685	19.9142	19.9258	19.9261	19.9273	19.9214	19.8340	19.4229	18.9936	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.6836	19.9577	20.2469	20.4366	20.4870	20.4970	20.4975	20.4980	20.4925	20.3952	20.0058	19.6227	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5336	19.8077	20.0969	20.2866	20.3370	20.3470	20.3475	20.3480	20.3425	20.2452	19.8558	19.4727	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9804	0.9457	0.8597	0.6887	0.4935	0.3318	0.2263	0.2600	0.4587	0.7836	0.9539	0.9858	(94)
Useful gains	591.9290	702.4793	757.7954	703.4258	551.4684	366.7378	239.2983	251.7637	397.8782	569.7700	580.0941	557.1555	(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	991.4077	968.6105	882.0268	733.0579	555.2493	367.0024	239.3169	251.8077	399.6754	620.0615	822.4068	987.6366	(97)
Space heating kWh	297.2122	178.8401	92.4282	21.3351	2.8130	0.0000	0.0000	0.0000	0.0000	37.4169	174.4651	320.2779	(98a)
Space heating requirement - total per year (kWh/year)												1124.7886	
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	297.2122	178.8401	92.4282	21.3351	2.8130	0.0000	0.0000	0.0000	0.0000	37.4169	174.4651	320.2779	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1124.7886	
Space heating per m2											(98c) / (4) =	21.0005	(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 %) 89.5000 (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	297.2122	178.8401	92.4282	21.3351	2.8130	0.0000	0.0000	0.0000	0.0000	37.4169	174.4651	320.2779	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	332.0806	199.8214	103.2717	23.8382	3.1430	0.0000	0.0000	0.0000	0.0000	41.8066	194.9331	357.8524	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	223.5828	196.7672	207.9770	181.7142	174.8617	156.1610	153.7411	161.1987	164.2562	184.5837	197.5020	221.1700	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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 1256.7470 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 89.5000
Water heating fuel used 2223.5155 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
central heating pump 41.0000 (230c)
main heating flue fan 45.0000 (230e)
Total electricity for the above, kWh/year 86.0000 (231)
Electricity for lighting (calculated in Appendix L) 129.6360 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation 0.0000 (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	3695.8986	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1256.7470	3.6400	45.7456	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2223.5155	3.6400	80.9360	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	129.6360	16.4900	21.3770	(250)
Additional standing charges			92.0000	(251)
Total energy cost			254.2399	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9286	(257)
SAP value		84.9468	
SAP rating (Section 12)		85	(258)
SAP band		B	

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	1256.7470	0.2100	263.9169	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2223.5155	0.2100	466.9383	(264)
Space and water heating			730.8551	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Total CO2, kg/year			761.4949	(272)
CO2 emissions per m2			14.2200	(273)
EI value			89.6469	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.8628	(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	2 * 10 = 20.0000	(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) =	20.0000 / (5) = 0.1420	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.5000	(17)
Infiltration rate	0.3170	(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) = 0.2694	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.2964	0.2829	0.2829	0.2627	0.2627	0.2290	0.2358	0.2492	0.2425	0.2560	0.2560	0.2829	(22b)
Effective ac	0.5439	0.5400	0.5400	0.5345	0.5345	0.5262	0.5278	0.5311	0.5294	0.5328	0.5328	0.5400	(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	
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0280	0.2184	
E18 Party wall between dwellings	15.6000	0.0160	0.2496	
E14 Flat roof	26.0000	0.0800	2.0800	
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696	
E3 Sill	8.4000	0.0460	0.3864	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4676 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0951 (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	25.2840	25.1026	25.1026	24.8463	24.8463	24.4614	24.5342	24.6860	24.6091	24.7651	24.7651	25.1026	(38)
Heat transfer coeff	64.3791	64.1977	64.1977	63.9415	63.9415	63.5566	63.6293	63.7812	63.7042	63.8603	63.8603	64.1977	(39)
Average = Sum(39)m / 12 =												63.9373	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2020	1.1986	1.1986	1.1938	1.1938	1.1866	1.1880	1.1908	1.1894	1.1923	1.1923	1.1986	(40)
HLP (average)												1.1938	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)
Total heat required for water heating calculated for each month	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
									Total per year (kWh/year) = Sum(64)m =			1990.0464	(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	62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3513	16.2995	13.2556	10.0354	7.5015	6.3331	6.8432	8.8950	11.9389	15.1591	17.6929	18.8614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													

	84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747 (72)
Total internal gains	422.3788	420.5774	407.6198	383.5213	359.5829	334.7737	321.9908	324.4610	336.8767	361.8492	388.3872	411.6316 (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	
Southeast	3.5200	39.1209	0.6300	0.7000	0.7700	42.0846	(77)
Southwest	9.2400	39.1209	0.6300	0.7000	0.7700	110.4722	(79)
Northwest	5.7200	12.4928	0.6300	0.7000	0.7700	21.8387	(81)
Southeast	1.7600	29.0000	0.6300	0.7000	1.0000	20.2578	(82)

Solar gains	194.6533	311.0266	460.5420	646.9968	749.2493	817.5814	782.2483	698.4730	571.7118	385.4704	243.6259	168.7893	(83)
Total gains	617.0321	731.6040	868.1618	1030.5181	1108.8322	1152.3551	1104.2391	1022.9340	908.5885	747.3196	632.0131	580.4209	(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	77.3076	77.5260	77.5260	77.8367	77.8367	78.3081	78.2186	78.0323	78.1266	77.9357	77.9357	77.5260	
alpha	6.1538	6.1684	6.1684	6.1891	6.1891	6.2205	6.2146	6.2022	6.2084	6.1957	6.1957	6.1684	
util living area	0.9801	0.9501	0.8499	0.6400	0.4368	0.2537	0.1441	0.1683	0.3711	0.7217	0.9417	0.9852	(86)
MIT	20.3737	20.5699	20.8281	20.9714	20.9974	20.9999	21.0000	21.0000	20.9993	20.9545	20.6712	20.3261	(87)
Th 2	19.9184	19.9211	19.9211	19.9249	19.9249	19.9307	19.9296	19.9273	19.9285	19.9262	19.9262	19.9211	(88)
util rest of house	0.9722	0.9326	0.8093	0.5815	0.3757	0.1947	0.0824	0.1015	0.2964	0.6494	0.9174	0.9790	(89)
MIT 2	19.2449	19.4828	19.7691	19.9051	19.9237	19.9307	19.9296	19.9273	19.9283	19.8970	19.6115	19.1886	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.8456	20.0612	20.3326	20.4725	20.4950	20.4996	20.4992	20.4981	20.4982	20.4597	20.1753	19.7939	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6956	19.9112	20.1826	20.3225	20.3450	20.3496	20.3492	20.3481	20.3482	20.3097	20.0253	19.6439	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9701	0.9324	0.8199	0.6035	0.3997	0.2178	0.1066	0.1277	0.3257	0.6763	0.9201	0.9770	(94)
Useful gains	598.6115	682.1812	711.7931	621.9604	443.1502	251.0110	117.6619	130.6308	295.9193	505.3965	581.4848	567.0641	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	920.3353	899.4891	794.9365	634.4586	444.0754	251.0260	117.6620	130.6311	296.1086	524.2721	742.3977	914.4248	(97)
Space heating kWh	239.3625	146.0309	61.8587	8.9988	0.6884	0.0000	0.0000	0.0000	0.0000	14.0434	115.8573	258.4363	(98a)
Space heating requirement - total per year (kWh/year)												845.2762	
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	239.3625	146.0309	61.8587	8.9988	0.6884	0.0000	0.0000	0.0000	0.0000	14.0434	115.8573	258.4363	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												845.2762	
Space heating per m2											(98c) / (4) =	15.7819	(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 %)	89.5000 (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	239.3625	146.0309	61.8587	8.9988	0.6884	0.0000	0.0000	0.0000	0.0000	14.0434	115.8573	258.4363	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	267.4441	163.1631	69.1158	10.0545	0.7691	0.0000	0.0000	0.0000	0.0000	15.6910	129.4495	288.7557	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	223.5828	196.7672	207.9770	181.7142	174.8617	156.1610	153.7411	161.1987	164.2562	184.5837	197.5020	221.1700	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	944.4427	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2223.5155	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3383.5942	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	944.4427	6.3400	59.8777	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2223.5155	6.3400	140.9709	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	129.6360	26.0000	33.7054	(250)
Additional standing charges			113.0000	(251)
Total energy cost			369.9139	(255)

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	944.4427	0.2100	198.3330	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2223.5155	0.2100	466.9383	(264)
Space and water heating			665.2712	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Total CO2, kg/year			695.9110	(272)

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	944.4427	1.1300	1067.2203	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2223.5155	1.1300	2512.5725	(278)
Space and water heating			3579.7928	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6360	1.5338	198.8400	(282)
Total Primary energy kWh/year			3908.7336	(286)

SAP 10 EPC IMPROVEMENTS

Flat 10 - Be Lean

Current energy efficiency rating: B 85
Current environmental impact rating: B 90

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 85
Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)

Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£56	£56	£0
Mains gas	£314	£314	£0
Space heating	£195	£195	£0
Water heating	£141	£141	£0
Lighting	£34	£34	£0
Total cost of fuels	£370	£370	£0
Total cost of uses	£370	£370	£0
Delivered energy	63 kWh/m²	63 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	13 kg/m²	13 kg/m²	0 kg/m²
Primary energy	73 kWh/m²	73 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1420 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.5000 (17)
Infiltration rate		0.3170 (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) =	0.2694 (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	0.3435	0.3368	0.3301	0.2964	0.2896	0.2560	0.2560	0.2492	0.2694	0.2896	0.3031	0.3166	(22b)
Effective ac	0.5590	0.5567	0.5545	0.5439	0.5419	0.5328	0.5328	0.5311	0.5363	0.5419	0.5459	0.5501	(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								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696
E3 Sill	8.4000	0.0460	0.3864
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080

E17 Corner (inverted - internal area greater than external area) 2.6000 -0.0900 -0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4676 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 39.0951 (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	25.9852	25.8787	25.7743	25.2840	25.1922	24.7651	24.7651	24.6860	24.9296	25.1922	25.3778	25.5719	(38)
Heat transfer coeff	65.0804	64.9739	64.8695	64.3791	64.2874	63.8603	63.8603	63.7812	64.0248	64.2874	64.4730	64.6670	(39)

Average = Sum(39)m / 12 = 64.3787

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2151	1.2131	1.2112	1.2020	1.2003	1.1923	1.1923	1.1908	1.1954	1.2003	1.2038	1.2074	(40)
HLP (average)												1.2020	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)

Energy content (annual) Total = Sum(45)m = 1461.9023

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

22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)

Total heat required for water heating calculated for each month

200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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

200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)

Total per year (kWh/year) = Sum(64)m = 1990.0464 (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

62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3513	16.2995	13.2556	10.0354	7.5015	6.3331	6.8432	8.8950	11.9389	15.1591	17.6929	18.8614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)
Total internal gains	422.3788	420.5774	407.6198	383.5213	359.5829	334.7737	321.9908	324.4610	336.8767	361.8492	388.3872	411.6316	(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	
Southeast	3.5200	36.7938	0.6300	0.7000	0.7700	39.5813	(77)
Southwest	9.2400	36.7938	0.6300	0.7000	0.7700	103.9008	(79)
Northwest	5.7200	11.2829	0.6300	0.7000	0.7700	19.7238	(81)
Southeast	1.7600	26.0000	0.6300	0.7000	1.0000	18.1621	(82)

Solar gains	181.3680	322.2727	473.7976	637.9170	757.8998	770.6880	735.4826	643.7144	530.5608	365.2857	219.7280	153.5676	(83)
Total gains	603.7468	742.8501	881.4174	1021.4382	1117.4827	1105.4617	1057.4734	968.1754	867.4376	727.1349	608.1152	565.1992	(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	76.4746	76.5999	76.7232	77.3076	77.4179	77.9357	77.9357	78.0323	77.7354	77.4179	77.1951	76.9634
alpha	6.0983	6.1067	6.1149	6.1538	6.1612	6.1957	6.1957	6.2022	6.1824	6.1612	6.1463	6.1309

util living area													
	0.9875	0.9607	0.8858	0.7227	0.5297	0.3692	0.2657	0.3029	0.5054	0.8218	0.9684	0.9912	(86)
MIT	20.2323	20.4797	20.7497	20.9361	20.9907	20.9991	20.9999	20.9998	20.9947	20.8886	20.5184	20.1758	(87)
Th 2	19.9079	19.9095	19.9111	19.9184	19.9198	19.9262	19.9262	19.9273	19.9237	19.9198	19.9170	19.9141	(88)
util rest of house													
	0.9826	0.9471	0.8538	0.6702	0.4704	0.3075	0.2009	0.2324	0.4285	0.7653	0.9548	0.9876	(89)
MIT 2	19.0596	19.3640	19.6752	19.8685	19.9142	19.9258	19.9261	19.9273	19.9214	19.8340	19.4229	18.9936	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.6836	19.9577	20.2469	20.4366	20.4870	20.4970	20.4975	20.4980	20.4925	20.3952	20.0058	19.6227	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5336	19.8077	20.0969	20.2866	20.3370	20.3470	20.3475	20.3480	20.3425	20.2452	19.8558	19.4727	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9804	0.9457	0.8597	0.6887	0.4935	0.3318	0.2263	0.2600	0.4587	0.7836	0.9539	0.9858	(94)
Useful gains	591.9290	702.4793	757.7954	703.4258	551.4684	366.7378	239.2983	251.7637	397.8782	569.7700	580.0941	557.1555	(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													
	991.4077	968.6105	882.0268	733.0579	555.2493	367.0024	239.3169	251.8077	399.6754	620.0615	822.4068	987.6366	(97)
Space heating kWh													
	297.2122	178.8401	92.4282	21.3351	2.8130	0.0000	0.0000	0.0000	0.0000	37.4169	174.4651	320.2779	(98a)
Space heating requirement - total per year (kWh/year)												1124.7886	
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													
	297.2122	178.8401	92.4282	21.3351	2.8130	0.0000	0.0000	0.0000	0.0000	37.4169	174.4651	320.2779	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1124.7886	
Space heating per m2											(98c) / (4) =	21.0005	(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 %)												89.5000	(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													
	297.2122	178.8401	92.4282	21.3351	2.8130	0.0000	0.0000	0.0000	0.0000	37.4169	174.4651	320.2779	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	332.0806	199.8214	103.2717	23.8382	3.1430	0.0000	0.0000	0.0000	0.0000	41.8066	194.9331	357.8524	(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													
	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	223.5828	196.7672	207.9770	181.7142	174.8617	156.1610	153.7411	161.1987	164.2562	184.5837	197.5020	221.1700	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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												1256.7470	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2223.5155	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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												3695.8986	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1256.7470	3.6400	45.7456	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2223.5155	3.6400	80.9360	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	129.6360	16.4900	21.3770	(250)
Additional standing charges			92.0000	(251)
Total energy cost			254.2399	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.9286	(257)
SAP value		84.9468	
SAP rating (Section 12)		85	(258)
SAP band		B	

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	1256.7470	0.2100	263.9169	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2223.5155	0.2100	466.9383	(264)
Space and water heating			730.8551	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Total CO2, kg/year			761.4949	(272)
CO2 emissions per m2			14.2200	(273)
EI value			89.6469	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600	(1b) x	2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3170	(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) =	0.2694	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.2964	0.2829	0.2829	0.2627	0.2627	0.2290	0.2358	0.2492	0.2425	0.2560	0.2560	0.2829	(22b)
Effective ac	0.5439	0.5400	0.5400	0.5345	0.5345	0.5262	0.5278	0.5311	0.5294	0.5328	0.5328	0.5400	(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	
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696
E3 Sill	8.4000	0.0460	0.3864
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.4676 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.0951 (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	25.2840	25.1026	25.1026	24.8463	24.8463	24.4614	24.5342	24.6860	24.6091	24.7651	24.7651	25.1026	(38)
Heat transfer coeff	64.3791	64.1977	64.1977	63.9415	63.9415	63.5566	63.6293	63.7812	63.7042	63.8603	63.8603	64.1977	(39)
Average = Sum(39)m / 12 =												63.9373	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2020	1.1986	1.1986	1.1938	1.1938	1.1866	1.1880	1.1908	1.1894	1.1923	1.1923	1.1986	(40)
HLP (average)												1.1938	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.7951 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day)		88.0322 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	48.7125	43.0181	46.3485	43.0713	42.9745	40.0082	40.7903	42.0643	41.9972	45.1014	45.4531	48.6047	(61)
Total heat required for water heating calculated for each month	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
									Total per year (kWh/year) = Sum(64)m =			1990.0464	(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	62.5167	55.0065	58.0676	50.5225	48.4913	43.1709	42.3862	44.5004	45.4158	51.2089	55.0242	61.8075	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3513	16.2995	13.2556	10.0354	7.5015	6.3331	6.8432	8.8950	11.9389	15.1591	17.6929	18.8614	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	84.0278	81.8549	78.0479	70.1701	65.1764	59.9596	56.9707	59.8124	63.0775	68.8292	76.4226	83.0747	(72)
Total internal gains	422.3788	420.5774	407.6198	383.5213	359.5829	334.7737	321.9908	324.4610	336.8767	361.8492	388.3872	411.6316	(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	
Southeast	3.5200	39.1209	0.6300	0.7000	0.7700	42.0846	(77)
Southwest	9.2400	39.1209	0.6300	0.7000	0.7700	110.4722	(79)
Northwest	5.7200	12.4928	0.6300	0.7000	0.7700	21.8387	(81)
Southeast	1.7600	29.0000	0.6300	0.7000	1.0000	20.2578	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	194.6533	311.0266	460.5420	646.9968	749.2493	817.5814	782.2483	698.4730	571.7118	385.4704	243.6259	168.7893	(83)
Total gains	617.0321	731.6040	868.1618	1030.5181	1108.8322	1152.3551	1104.2391	1022.9340	908.5885	747.3196	632.0131	580.4209	(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	77.3076	77.5260	77.5260	77.8367	77.8367	78.3081	78.2186	78.0323	78.1266	77.9357	77.9357	77.5260	
alpha	6.1538	6.1684	6.1684	6.1891	6.1891	6.2205	6.2146	6.2022	6.2084	6.1957	6.1957	6.1684	
util living area	0.9801	0.9501	0.8499	0.6400	0.4368	0.2537	0.1441	0.1683	0.3711	0.7217	0.9417	0.9852	(86)
MIT	20.3737	20.5699	20.8281	20.9714	20.9974	20.9999	21.0000	21.0000	20.9993	20.9545	20.6712	20.3261	(87)
Th 2	19.9184	19.9211	19.9211	19.9249	19.9249	19.9307	19.9296	19.9273	19.9285	19.9262	19.9262	19.9211	(88)
util rest of house	0.9722	0.9326	0.8093	0.5815	0.3757	0.1947	0.0824	0.1015	0.2964	0.6494	0.9174	0.9790	(89)
MIT 2	19.2449	19.4828	19.7691	19.9051	19.9237	19.9307	19.9296	19.9273	19.9283	19.8970	19.6115	19.1886	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.8456	20.0612	20.3326	20.4725	20.4950	20.4996	20.4992	20.4981	20.4982	20.4597	20.1753	19.7939	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6956	19.9112	20.1826	20.3225	20.3450	20.3496	20.3492	20.3481	20.3482	20.3097	20.0253	19.6439	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9701	0.9324	0.8199	0.6035	0.3997	0.2178	0.1066	0.1277	0.3257	0.6763	0.9201	0.9770	(94)
Useful gains	598.6115	682.1812	711.7931	621.9604	443.1502	251.0110	117.6619	130.6308	295.9193	505.3965	581.4848	567.0641	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	920.3353	899.4891	794.9365	634.4586	444.0754	251.0260	117.6620	130.6311	296.1086	524.2721	742.3977	914.4248	(97)
Space heating kWh	239.3625	146.0309	61.8587	8.9988	0.6884	0.0000	0.0000	0.0000	0.0000	14.0434	115.8573	258.4363	(98a)
Space heating requirement - total per year (kWh/year)												845.2762	
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	239.3625	146.0309	61.8587	8.9988	0.6884	0.0000	0.0000	0.0000	0.0000	14.0434	115.8573	258.4363	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												845.2762	
Space heating per m2										(98c) / (4) =		15.7819	(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 %)	89.5000 (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	239.3625	146.0309	61.8587	8.9988	0.6884	0.0000	0.0000	0.0000	0.0000	14.0434	115.8573	258.4363	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	267.4441	163.1631	69.1158	10.0545	0.7691	0.0000	0.0000	0.0000	0.0000	15.6910	129.4495	288.7557	(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	200.1066	176.1067	186.1394	162.6342	156.5012	139.7641	137.5983	144.2729	147.0093	165.2024	176.7643	197.9472	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	223.5828	196.7672	207.9770	181.7142	174.8617	156.1610	153.7411	161.1987	164.2562	184.5837	197.5020	221.1700	(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	16.0628	12.8862	11.6026	8.5005	6.5661	5.3645	5.9898	7.7857	10.1129	13.2687	14.9870	16.5092	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	944.4427	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2223.5155	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	129.6360	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3383.5942	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	944.4427	6.3400	59.8777	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2223.5155	6.3400	140.9709	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	129.6360	26.0000	33.7054	(250)
Additional standing charges			113.0000	(251)
Total energy cost			369.9139	(255)

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	944.4427	0.2100	198.3330	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2223.5155	0.2100	466.9383	(264)
Space and water heating			665.2712	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	129.6360	0.1443	18.7105	(268)
Total CO2, kg/year			695.9110	(272)

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	944.4427	1.1300	1067.2203	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2223.5155	1.1300	2512.5725	(278)
Space and water heating			3579.7928	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	129.6360	1.5338	198.8400	(282)
Total Primary energy kWh/year			3908.7336	(286)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9 - Be Lean	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	85 B	**DER**	13.75	**TER**	14.07
Environmental	90 B	**% DER < TER**			2.27
CO_2 Emissions (t/year)	0.73	**DFEE**	28.25	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			12.05
% DPER < TPER	-2.29	**DPER**	76.88	**TPER**	75.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1293 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.5000 (17)
Infiltration rate		0.3043 (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) =	0.2587 (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	0.3298	0.3233	0.3169	0.2845	0.2781	0.2457	0.2457	0.2393	0.2587	0.2781	0.2910	0.3039	(22b)
Effective ac	0.5544	0.5523	0.5502	0.5405	0.5387	0.5302	0.5302	0.5286	0.5335	0.5387	0.5423	0.5462	(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								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12072.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							202.9333	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100

E3 Sill	10.5000	0.0230	0.2415	
E4 Jamb	30.8000	0.0240	0.7392	
E14 Flat roof	8.2000	0.0800	0.6560	
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	28.2969	28.1891	28.0835	27.5873	27.4944	27.0622	27.0622	26.9822	27.2287	27.4944	27.6822	27.8786	(38)
Heat transfer coeff	57.2510	57.1432	57.0375	56.5413	56.4485	56.0162	56.0162	55.9362	56.1827	56.4485	56.6363	56.8326	(39)

Average = Sum(39)m / 12 = 56.5409

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9624	0.9606	0.9588	0.9504	0.9489	0.9416	0.9416	0.9403	0.9444	0.9489	0.9520	0.9553	(40)
HLP (average)												0.9504	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)

Energy content (annual) Total = Sum(45)m = 1621.0090

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

25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)

Total per year (kWh/year) = Sum(64)m = 2197.4514 (64)

12Total per year (kWh/year) 2197 (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

68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains	405.8951	414.9480	397.4377	382.1784	361.6923	344.4564	330.6821	332.0518	343.0471	359.0948	382.0868	397.3043	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	495.8401	593.1036	707.4587	877.3725	1017.7242	1040.3349	983.0267	857.5870	716.1173	573.8603	494.3631	471.3390	(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	58.5749	58.6854	58.7941	59.3101	59.4077	59.8661	59.8661	59.9517	59.6887	59.4077	59.2107	59.0061	
alpha	4.9050	4.9124	4.9196	4.9540	4.9605	4.9911	4.9911	4.9968	4.9792	4.9605	4.9474	4.9337	
util living area													
	0.9804	0.9556	0.8888	0.7150	0.5063	0.3435	0.2505	0.2995	0.5293	0.8416	0.9603	0.9842	(86)
MIT	19.9634	20.2206	20.5624	20.8742	20.9785	20.9974	20.9996	20.9990	20.9810	20.7696	20.3091	19.9156	(87)
Th 2	20.1148	20.1163	20.1178	20.1248	20.1262	20.1323	20.1323	20.1334	20.1299	20.1262	20.1235	20.1207	(88)
util rest of house													
	0.9757	0.9458	0.8674	0.6763	0.4616	0.2974	0.2012	0.2434	0.4670	0.8041	0.9498	0.9804	(89)
MIT 2	18.9216	19.2428	19.6559	20.0076	20.1095	20.1308	20.1321	20.1330	20.1176	19.9095	19.3631	18.8658	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.4207	19.7112	20.0902	20.4228	20.5258	20.5460	20.5477	20.5479	20.5312	20.3216	19.8163	19.3687	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2707	19.5612	19.9402	20.2728	20.3758	20.3960	20.3977	20.3979	20.3812	20.1716	19.6663	19.2187	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9700	0.9385	0.8626	0.6831	0.4745	0.3114	0.2163	0.2605	0.4853	0.8062	0.9432	0.9754	(94)
Useful gains	480.9882	556.6206	610.2550	599.3179	482.9000	324.0008	212.6529	223.4272	347.5387	462.6446	466.2603	459.7242	(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													
	857.0866	837.7872	766.5964	643.0331	489.7350	324.6695	212.7331	223.6275	352.8952	540.3008	711.7095	853.5540	(97)
Space heating kWh													
	279.8172	188.9440	116.3180	31.4749	5.0853	0.0000	0.0000	0.0000	0.0000	57.7762	176.7234	293.0094	(98a)
Space heating requirement - total per year (kWh/year)												1149.1484	
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													
	279.8172	188.9440	116.3180	31.4749	5.0853	0.0000	0.0000	0.0000	0.0000	57.7762	176.7234	293.0094	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1149.1484	
Space heating per m2											(98c) / (4) =	19.3167	(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 %)	89.5000	(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													
	279.8172	188.9440	116.3180	31.4749	5.0853	0.0000	0.0000	0.0000	0.0000	57.7762	176.7234	293.0094	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	312.6450	211.1106	129.9642	35.1675	5.6819	0.0000	0.0000	0.0000	0.0000	64.5544	197.4563	327.3848	(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													
	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1283.9646	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2455.2529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3967.4401	(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	1283.9646	0.2100	269.6326	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			785.2357	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Total CO2, kg/year			817.6921	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.7500	(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	1283.9646	1.1300	1450.8800	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	1.1300	2774.4358	(278)
Space and water heating			4225.3159	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Total Primary energy kWh/year			4573.5624	(286)
Dwelling Primary energy Rate (DPER)			76.8800	(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	59.4900	(1b) x	2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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								
TER Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.6683 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
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 1.9672 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3150	48.8232	45.3711	45.2691	42.1443	42.9682	44.3102	44.2396	47.5095	47.8800	50.9589	(61)
Total heat required for water heating calculated for each month	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(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	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(64)
										Total per year (kWh/year) = Sum(64)m =		2095.7066	(64)
12Total per year (kWh/year)												2096	(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	65.7660	57.9435	61.1681	53.2201	51.0804	45.4759	44.6494	46.8765	47.8407	53.9432	57.9622	65.0474	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	88.3952	86.2254	82.2151	73.9168	68.6564	63.1610	60.0126	63.0060	66.4454	72.5042	80.5030	87.4293	(72)
Total internal gains	402.1439	411.0321	393.2564	378.2880	358.0788	341.1321	327.5236	328.7357	339.5500	355.2788	378.2265	393.6040	(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	
Northeast	7.2200	11.2829	0.6300	0.7000	0.7700	24.8961	(75)
Southwest	0.8500	36.7938	0.6300	0.7000	0.7700	9.5580	(79)
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479	(81)

Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	460.0459	525.7184	592.8279	697.0592	780.3840	789.0869	747.4547	667.0375	579.7075	493.5318	450.5039	441.2638	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area	0.9863	0.9737	0.9418	0.8389	0.6606	0.4681	0.3435	0.4001	0.6569	0.9045	0.9739	0.9885	(86)
MIT	19.7871	19.9981	20.3146	20.7069	20.9222	20.9878	20.9978	20.9956	20.9447	20.6282	20.1495	19.7565	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house	0.9829	0.9673	0.9280	0.8061	0.6078	0.4048	0.2736	0.3231	0.5850	0.8759	0.9665	0.9857	(89)
MIT 2	18.6658	18.9332	19.3274	19.7969	20.0231	20.0888	20.0952	20.0960	20.0545	19.7218	19.1350	18.6336	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.2030	19.4434	19.8003	20.2328	20.4538	20.5195	20.5276	20.5270	20.4810	20.1560	19.6210	19.1716	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2030	19.4434	19.8003	20.2328	20.4538	20.5195	20.5276	20.5270	20.4810	20.1560	19.6210	19.1716	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9620	0.9232	0.8118	0.6296	0.4347	0.3071	0.3600	0.6168	0.8783	0.9618	0.9820	(94)
Useful gains	450.2692	505.7239	547.3013	565.8583	491.3636	343.0503	229.5475	240.1168	357.5812	433.4859	433.3061	433.3037	(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	901.6609	877.4700	800.2875	673.1648	518.7107	346.7884	230.0948	241.2596	375.4734	566.2453	745.5903	896.0798	(97)
Space heating kWh	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98a)
Space heating requirement - total per year (kWh/year)												1539.4004	
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	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.4004	
Space heating per m2											(98c) / (4) =	25.8766	(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 %) 92.4000 (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	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	363.4582	270.3608	203.7031	83.6154	22.0197	0.0000	0.0000	0.0000	0.0000	106.8971	243.3383	372.6250	(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	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3776	85.0198	84.2939	82.7892	81.1626	80.3000	80.3000	80.3000	80.3000	83.2147	84.7866	85.4506	(217)
Fuel for water heating, kWh/month	246.4774	218.1959	232.6126	206.9325	203.1200	183.3457	180.5045	189.2604	192.8501	209.1254	219.6130	243.7376	(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	17.9901	14.4323	12.9947	9.5205	7.3539	6.0082	6.7085	8.7199	11.3263	14.8607	16.7851	18.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.2539	-19.9158	-30.4928	-36.5992	-41.5339	-39.5415	-39.0700	-35.8526	-30.5508	-23.7735	-15.0044	-11.3205	(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	-4.1671	-9.0087	-18.3650	-28.2691	-38.0559	-38.4777	-38.0158	-31.8682	-22.9496	-13.0946	-5.6310	-3.2769	(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 1666.0177 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 80.3000

Water heating fuel used 2525.7750 (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) 145.1902 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -588.0885 (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	3834.8944	(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	1666.0177	0.2100	349.8637	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2525.7750	0.2100	530.4127	(264)
Space and water heating			880.2765	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	145.1902	0.1443	20.9554	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	0.1333	-44.8970	
PV Unit electricity exported	-251.1796	0.1252	-31.4452	
Total			-76.3422	(269)
Total CO2, kg/year			836.8190	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0700	(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	1666.0177	1.1300	1882.6001	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2525.7750	1.1300	2854.1257	(278)
Space and water heating			4736.7258	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	145.1902	1.5338	222.6975	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	1.4924	-502.8150	
PV Unit electricity exported	-251.1796	0.4595	-115.4171	
Total			-618.2321	(283)
Total Primary energy kWh/year			4471.2920	(286)
Target Primary Energy Rate (TPER)			75.1600	(287)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9 - Be Lean	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	85 B	**DER**	13.75	**TER**	14.07
Environmental	90 B	**% DER < TER**			2.27
CO_2 Emissions (t/year)	0.73	**DFEE**	28.25	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			12.05
% DPER < TPER	-2.29	**DPER**	76.88	**TPER**	75.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3043	(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) =	0.2587	(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	0.3298	0.3233	0.3169	0.2845	0.2781	0.2457	0.2457	0.2393	0.2587	0.2781	0.2910	0.3039	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5544	0.5523	0.5502	0.5405	0.5387	0.5302	0.5302	0.5286	0.5335	0.5387	0.5423	0.5462	(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	
Main dwelling								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962

E18 Party wall between dwellings	23.4000	0.0160	0.3744	
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100	
E3 Sill	10.5000	0.0230	0.2415	
E4 Jamb	30.8000	0.0240	0.7392	
E14 Flat roof	8.2000	0.0800	0.6560	
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	28.2969	28.1891	28.0835	27.5873	27.4944	27.0622	27.0622	26.9822	27.2287	27.4944	27.6822	27.8786	(38)
Heat transfer coeff	57.2510	57.1432	57.0375	56.5413	56.4485	56.0162	56.0162	55.9362	56.1827	56.4485	56.6363	56.8326	(39)

Average = Sum(39)m / 12 = 56.5409

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9624	0.9606	0.9588	0.9504	0.9489	0.9416	0.9416	0.9403	0.9444	0.9489	0.9520	0.9553	(40)
HLP (average)												0.9504	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.7223	24.3551	23.8381	22.8847	22.1709	21.3794	20.9518	21.4652	22.0242	22.8712	23.8442	24.6387	(42b)
Hot water usage for other uses	34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 54.5359 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.4981	57.8664	56.0848	53.8669	51.8885	49.8323	49.4048	51.1828	53.0064	55.1179	57.3555	59.4145	(44)
Energy conte	94.2305	82.4010	86.2002	73.7410	69.8518	61.2747	59.7508	63.3750	65.3622	74.7945	81.7134	93.0288	(45)

Energy content (annual) Total = Sum(45)m = 905.7239

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(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	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(64)

Total per year (kWh/year) = Sum(64)m = 769.8653 (64)

12Total per year (kWh/year) 770 (64)

Electric shower(s)	45.8098	40.8169	44.5705	42.5331	43.3312	41.3338	42.7116	43.3312	42.5331	44.5705	43.7324	45.8098	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 521.0839 (64a)

Heat gains from water heating, kWh/month	31.4764	27.7144	29.4602	26.3032	25.6763	23.3543	23.3749	24.3000	24.5227	27.0365	28.2972	31.2211	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	42.3070	41.2417	39.5970	36.5323	34.5112	32.4365	31.4179	32.6613	34.0594	36.3393	39.3017	41.9638	(72)
Total internal gains	353.0558	363.0484	347.6383	337.9036	320.9336	310.4076	298.9289	298.3910	307.1639	316.1139	334.0251	345.1385	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	443.0008	541.2040	657.6592	833.0977	976.9655	1006.2862	951.2735	823.9262	680.2341	530.8793	446.3014	419.1732	(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	58.5749	58.6854	58.7941	59.3101	59.4077	59.8661	59.8661	59.9517	59.6887	59.4077	59.2107	59.0061	
alpha	4.9050	4.9124	4.9196	4.9540	4.9605	4.9911	4.9911	4.9968	4.9792	4.9605	4.9474	4.9337	
util living area	0.9875	0.9682	0.9107	0.7411	0.5256	0.3549	0.2589	0.3117	0.5545	0.8712	0.9729	0.9903	(86)
MIT	19.8562	20.1263	20.4964	20.8524	20.9747	20.9970	20.9995	20.9988	20.9767	20.7244	20.2196	19.8078	(87)
Th 2	20.1148	20.1163	20.1178	20.1248	20.1262	20.1323	20.1323	20.1334	20.1299	20.1262	20.1235	20.1207	(88)
util rest of house	0.9844	0.9609	0.8921	0.7030	0.4797	0.3074	0.2079	0.2533	0.4901	0.8375	0.9654	0.9878	(89)
MIT 2	19.0797	19.3452	19.6984	20.0165	20.1108	20.1309	20.1321	20.1330	20.1180	19.9202	19.4454	19.0366	(90)
Living area fraction											fLA = Living area / (4) =	0.4791	(91)
MIT	19.4517	19.7194	20.0807	20.4170	20.5246	20.5459	20.5477	20.5478	20.5294	20.3055	19.8163	19.4061	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4517	19.7194	20.0807	20.4170	20.5246	20.5459	20.5477	20.5478	20.5294	20.3055	19.8163	19.4061	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9815	0.9569	0.8912	0.7162	0.5009	0.3301	0.2323	0.2812	0.5201	0.8451	0.9622	0.9853	(94)
Useful gains	434.8199	517.8938	586.1290	596.6442	489.3382	332.1699	221.0174	231.7169	353.8056	448.6204	429.4143	413.0093	(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	867.4494	846.8267	774.6092	651.1838	498.1377	333.0650	221.1341	232.0133	361.2219	547.8577	720.2025	864.2015	(97)
Space heating kWh	321.8764	221.0429	140.2293	39.2686	6.5469	0.0000	0.0000	0.0000	0.0000	73.8326	209.3675	335.6870	(98a)
Space heating requirement - total per year (kWh/year)												1347.8511	
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	321.8764	221.0429	140.2293	39.2686	6.5469	0.0000	0.0000	0.0000	0.0000	73.8326	209.3675	335.6870	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1347.8511	
Space heating per m2											(98c) / (4) =	22.6568	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	526.5527	414.5202	425.1152	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9887	0.9948	0.9893	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	520.5942	412.3838	420.5526	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1144.4683	1081.8714	934.6918	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	449.1893	498.0988	382.5195	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction											fC = cooled area / (4) =	1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.2973	124.5247	95.6299	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												332.4519	(107)
Energy for space heating												22.6568	(99)
Energy for space cooling												5.5884	(108)
Total												28.2451	(109)
Fabric Energy Efficiency (DFEE)												28.2	(109)

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.3430	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	30.6683	(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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9672	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.7223	24.3551	23.8381	22.8847	22.1709	21.3794	20.9518	21.4652	22.0242	22.8712	23.8442	24.6387	(42b)
Hot water usage for other uses	34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)
Average daily hot water use (litres/day)												54.5359	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.4981	57.8664	56.0848	53.8669	51.8885	49.8323	49.4048	51.1828	53.0064	55.1179	57.3555	59.4145	(44)
Energy conte	94.2305	82.4010	86.2002	73.7410	69.8518	61.2747	59.7508	63.3750	65.3622	74.7945	81.7134	93.0288	(45)
Energy content (annual)										Total = Sum(45)m =		905.7239	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(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	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(64)
									Total per year (kWh/year) = Sum(64)m =			769.8653	(64)
12Total per year (kWh/year)												770	(64)
Electric shower(s)	45.8098	40.8169	44.5705	42.5331	43.3312	41.3338	42.7116	43.3312	42.5331	44.5705	43.7324	45.8098	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							521.0839	(64a)
Heat gains from water heating, kWh/month	31.4764	27.7144	29.4602	26.3032	25.6763	23.3543	23.3749	24.3000	24.5227	27.0365	28.2972	31.2211	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	42.3070	41.2417	39.5970	36.5323	34.5112	32.4365	31.4179	32.6613	34.0594	36.3393	39.3017	41.9638	(72)
Total internal gains													
	353.0558	363.0484	347.6383	337.9036	320.9336	310.4076	298.9289	298.3910	307.1639	316.1139	334.0251	345.1385	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.2200	11.2829	0.6300	0.7000	0.7700	24.8961	(75)
Southwest	0.8500	36.7938	0.6300	0.7000	0.7700	9.5580	(79)
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	410.9577	477.7347	547.2098	656.6747	743.2388	758.3624	718.8601	636.6928	547.3214	454.3669	406.3025	392.7983	(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	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area													
	0.9913	0.9817	0.9556	0.8616	0.6855	0.4859	0.3569	0.4185	0.6863	0.9259	0.9824	0.9929	(86)
MIT	19.6860	19.9045	20.2374	20.6654	20.9090	20.9858	20.9974	20.9946	20.9334	20.5719	20.0629	19.6555	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house													
	0.9890	0.9770	0.9444	0.8313	0.6327	0.4206	0.2844	0.3383	0.6141	0.9019	0.9772	0.9910	(89)
MIT 2	18.8759	19.0934	19.4194	19.8254	20.0281	20.0894	20.0953	20.0961	20.0563	19.7531	19.2602	18.8527	(90)
Living area fraction									fLA = Living area / (4) =			0.4791	(91)
MIT	19.2640	19.4820	19.8113	20.2278	20.4501	20.5188	20.5275	20.5266	20.4765	20.1454	19.6447	19.2373	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2640	19.4820	19.8113	20.2278	20.4501	20.5188	20.5275	20.5266	20.4765	20.1454	19.6447	19.2373	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9734	0.9407	0.8364	0.6544	0.4514	0.3192	0.3767	0.6459	0.9036	0.9740	0.9888	(94)
Useful gains	405.3938	465.0063	514.7763	549.2498	486.3603	342.3588	229.4366	239.8433	353.5072	410.5796	395.7406	388.3949	(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													
	905.3524	879.7984	800.9463	672.8648	518.4908	346.7482	230.0854	241.2357	375.2067	565.6127	747.0026	900.0151	(97)
Space heating kWh													
	371.9692	278.7403	212.9105	89.0028	23.9051	0.0000	0.0000	0.0000	0.0000	115.3447	252.9086	380.6454	(98a)
Space heating requirement - total per year (kWh/year)												1725.4267	
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													
	371.9692	278.7403	212.9105	89.0028	23.9051	0.0000	0.0000	0.0000	0.0000	115.3447	252.9086	380.6454	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1725.4267	
Space heating per m2										(98c) / (4) =		29.0036	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	550.6871	433.5196	444.2913	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9536	0.9765	0.9595	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	525.1236	423.3349	426.2937	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	854.6873	810.2194	715.8476	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	237.2859	287.8420	215.4281	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	59.3215	71.9605	53.8570	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.1390	(107)
Energy for space heating												29.0036	(99)
Energy for space cooling												3.1121	(108)
Total												32.1157	(109)
Fabric Energy Efficiency (TFEE)												32.1	(109)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9 - Be Lean	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	85 B	**DER**	13.75	**TER**	14.07
Environmental	90 B	**% DER < TER**			2.27
CO_2 Emissions (t/year)	0.73	**DFEE**	28.25	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			12.05
% DPER < TPER	-2.29	**DPER**	76.88	**TPER**	75.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1293 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.5000 (17)
Infiltration rate		0.3043 (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) =	0.2587 (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	0.3298	0.3233	0.3169	0.2845	0.2781	0.2457	0.2457	0.2393	0.2587	0.2781	0.2910	0.3039	(22b)
Effective ac	0.5544	0.5523	0.5502	0.5405	0.5387	0.5302	0.5302	0.5286	0.5335	0.5387	0.5423	0.5462	(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								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12072.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							202.9333	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100

E3 Sill	10.5000	0.0230	0.2415	
E4 Jamb	30.8000	0.0240	0.7392	
E14 Flat roof	8.2000	0.0800	0.6560	
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	28.2969	28.1891	28.0835	27.5873	27.4944	27.0622	27.0622	26.9822	27.2287	27.4944	27.6822	27.8786	(38)
Heat transfer coeff	57.2510	57.1432	57.0375	56.5413	56.4485	56.0162	56.0162	55.9362	56.1827	56.4485	56.6363	56.8326	(39)

Average = Sum(39)m / 12 = 56.5409

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9624	0.9606	0.9588	0.9504	0.9489	0.9416	0.9416	0.9403	0.9444	0.9489	0.9520	0.9553	(40)
HLP (average)												0.9504	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)

Energy content (annual) Total = Sum(45)m = 1621.0090

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

25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)

Water storage loss (or HIU loss):

Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)

Total per year (kWh/year) = Sum(64)m = 2197.4514 (64)

12Total per year (kWh/year) 2197 (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

68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains	405.8951	414.9480	397.4377	382.1784	361.6923	344.4564	330.6821	332.0518	343.0471	359.0948	382.0868	397.3043	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	495.8401	593.1036	707.4587	877.3725	1017.7242	1040.3349	983.0267	857.5870	716.1173	573.8603	494.3631	471.3390	(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	58.5749	58.6854	58.7941	59.3101	59.4077	59.8661	59.8661	59.9517	59.6887	59.4077	59.2107	59.0061	
alpha	4.9050	4.9124	4.9196	4.9540	4.9605	4.9911	4.9911	4.9968	4.9792	4.9605	4.9474	4.9337	
util living area													
	0.9804	0.9556	0.8888	0.7150	0.5063	0.3435	0.2505	0.2995	0.5293	0.8416	0.9603	0.9842	(86)
MIT	19.9634	20.2206	20.5624	20.8742	20.9785	20.9974	20.9996	20.9990	20.9810	20.7696	20.3091	19.9156	(87)
Th 2	20.1148	20.1163	20.1178	20.1248	20.1262	20.1323	20.1323	20.1334	20.1299	20.1262	20.1235	20.1207	(88)
util rest of house													
	0.9757	0.9458	0.8674	0.6763	0.4616	0.2974	0.2012	0.2434	0.4670	0.8041	0.9498	0.9804	(89)
MIT 2	18.9216	19.2428	19.6559	20.0076	20.1095	20.1308	20.1321	20.1330	20.1176	19.9095	19.3631	18.8658	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.4207	19.7112	20.0902	20.4228	20.5258	20.5460	20.5477	20.5479	20.5312	20.3216	19.8163	19.3687	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.2707	19.5612	19.9402	20.2728	20.3758	20.3960	20.3977	20.3979	20.3812	20.1716	19.6663	19.2187	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9700	0.9385	0.8626	0.6831	0.4745	0.3114	0.2163	0.2605	0.4853	0.8062	0.9432	0.9754	(94)
Useful gains	480.9882	556.6206	610.2550	599.3179	482.9000	324.0008	212.6529	223.4272	347.5387	462.6446	466.2603	459.7242	(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													
	857.0866	837.7872	766.5964	643.0331	489.7350	324.6695	212.7331	223.6275	352.8952	540.3008	711.7095	853.5540	(97)
Space heating kWh													
	279.8172	188.9440	116.3180	31.4749	5.0853	0.0000	0.0000	0.0000	0.0000	57.7762	176.7234	293.0094	(98a)
Space heating requirement - total per year (kWh/year)												1149.1484	
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													
	279.8172	188.9440	116.3180	31.4749	5.0853	0.0000	0.0000	0.0000	0.0000	57.7762	176.7234	293.0094	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1149.1484	
Space heating per m2											(98c) / (4) =	19.3167	(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 %)	89.5000	(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													
	279.8172	188.9440	116.3180	31.4749	5.0853	0.0000	0.0000	0.0000	0.0000	57.7762	176.7234	293.0094	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	312.6450	211.1106	129.9642	35.1675	5.6819	0.0000	0.0000	0.0000	0.0000	64.5544	197.4563	327.3848	(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													
	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1283.9646	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2455.2529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3967.4401	(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	1283.9646	0.2100	269.6326	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			785.2357	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Total CO2, kg/year			817.6921	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			13.7500	(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	1283.9646	1.1300	1450.8800	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	1.1300	2774.4358	(278)
Space and water heating			4225.3159	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Total Primary energy kWh/year			4573.5624	(286)
Dwelling Primary energy Rate (DPER)			76.8800	(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	59.4900	(1b) x	2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(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								
TER Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 30.6683 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
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 1.9672 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.3150	48.8232	45.3711	45.2691	42.1443	42.9682	44.3102	44.2396	47.5095	47.8800	50.9589	(61)
Total heat required for water heating calculated for each month	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(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	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(64)
										Total per year (kWh/year) = Sum(64)m =		2095.7066	(64)
12Total per year (kWh/year)												2096	(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	65.7660	57.9435	61.1681	53.2201	51.0804	45.4759	44.6494	46.8765	47.8407	53.9432	57.9622	65.0474	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	88.3952	86.2254	82.2151	73.9168	68.6564	63.1610	60.0126	63.0060	66.4454	72.5042	80.5030	87.4293	(72)
Total internal gains	402.1439	411.0321	393.2564	378.2880	358.0788	341.1321	327.5236	328.7357	339.5500	355.2788	378.2265	393.6040	(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	
Northeast	7.2200	11.2829	0.6300	0.7000	0.7700	24.8961	(75)
Southwest	0.8500	36.7938	0.6300	0.7000	0.7700	9.5580	(79)
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479	(81)

Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	460.0459	525.7184	592.8279	697.0592	780.3840	789.0869	747.4547	667.0375	579.7075	493.5318	450.5039	441.2638	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area	0.9863	0.9737	0.9418	0.8389	0.6606	0.4681	0.3435	0.4001	0.6569	0.9045	0.9739	0.9885	(86)
MIT	19.7871	19.9981	20.3146	20.7069	20.9222	20.9878	20.9978	20.9956	20.9447	20.6282	20.1495	19.7565	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house	0.9829	0.9673	0.9280	0.8061	0.6078	0.4048	0.2736	0.3231	0.5850	0.8759	0.9665	0.9857	(89)
MIT 2	18.6658	18.9332	19.3274	19.7969	20.0231	20.0888	20.0952	20.0960	20.0545	19.7218	19.1350	18.6336	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.2030	19.4434	19.8003	20.2328	20.4538	20.5195	20.5276	20.5270	20.4810	20.1560	19.6210	19.1716	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2030	19.4434	19.8003	20.2328	20.4538	20.5195	20.5276	20.5270	20.4810	20.1560	19.6210	19.1716	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9787	0.9620	0.9232	0.8118	0.6296	0.4347	0.3071	0.3600	0.6168	0.8783	0.9618	0.9820	(94)
Useful gains	450.2692	505.7239	547.3013	565.8583	491.3636	343.0503	229.5475	240.1168	357.5812	433.4859	433.3061	433.3037	(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	901.6609	877.4700	800.2875	673.1648	518.7107	346.7884	230.0948	241.2596	375.4734	566.2453	745.5903	896.0798	(97)
Space heating kWh	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98a)
Space heating requirement - total per year (kWh/year)												1539.4004	
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	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1539.4004	
Space heating per m2											(98c) / (4) =	25.8766	(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 %) 92.4000 (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	335.8354	249.8134	188.2217	77.2606	20.3462	0.0000	0.0000	0.0000	0.0000	98.7729	224.8446	344.3055	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	363.4582	270.3608	203.7031	83.6154	22.0197	0.0000	0.0000	0.0000	0.0000	106.8971	243.3383	372.6250	(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	210.4364	185.5097	196.0781	171.3178	164.8574	147.2266	144.9451	151.9761	154.8586	174.0231	186.2023	208.2753	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.3776	85.0198	84.2939	82.7892	81.1626	80.3000	80.3000	80.3000	80.3000	83.2147	84.7866	85.4506	(217)
Fuel for water heating, kWh/month	246.4774	218.1959	232.6126	206.9325	203.1200	183.3457	180.5045	189.2604	192.8501	209.1254	219.6130	243.7376	(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	17.9901	14.4323	12.9947	9.5205	7.3539	6.0082	6.7085	8.7199	11.3263	14.8607	16.7851	18.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.2539	-19.9158	-30.4928	-36.5992	-41.5339	-39.5415	-39.0700	-35.8526	-30.5508	-23.7735	-15.0044	-11.3205	(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	-4.1671	-9.0087	-18.3650	-28.2691	-38.0559	-38.4777	-38.0158	-31.8682	-22.9496	-13.0946	-5.6310	-3.2769	(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 1666.0177 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 80.3000

Water heating fuel used 2525.7750 (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) 145.1902 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation -588.0885 (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	3834.8944	(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	1666.0177	0.2100	349.8637	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2525.7750	0.2100	530.4127	(264)
Space and water heating			880.2765	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	145.1902	0.1443	20.9554	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	0.1333	-44.8970	
PV Unit electricity exported	-251.1796	0.1252	-31.4452	
Total			-76.3422	(269)
Total CO2, kg/year			836.8190	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			14.0700	(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	1666.0177	1.1300	1882.6001	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2525.7750	1.1300	2854.1257	(278)
Space and water heating			4736.7258	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	145.1902	1.5338	222.6975	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	1.4924	-502.8150	
PV Unit electricity exported	-251.1796	0.4595	-115.4171	
Total			-618.2321	(283)
Total Primary energy kWh/year			4471.2920	(286)
Target Primary Energy Rate (TPER)			75.1600	(287)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9 - Be Lean	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	85 B	**DER**	13.75	**TER**	14.07
Environmental	90 B	**% DER < TER**			2.27
CO_2 Emissions (t/year)	0.73	**DFEE**	28.25	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			12.05
% DPER < TPER	-2.29	**DPER**	76.88	**TPER**	75.16

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

			Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling								
Ground floor			59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)		59.4900						(4)
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(5)

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2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3043	(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) =	0.2587	(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	0.3298	0.3233	0.3169	0.2845	0.2781	0.2457	0.2457	0.2393	0.2587	0.2781	0.2910	0.3039	(22b)
Effective ac	0.5544	0.5523	0.5502	0.5405	0.5387	0.5302	0.5302	0.5286	0.5335	0.5387	0.5423	0.5462	(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	
Main dwelling								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100

E3 Sill	10.5000	0.0230	0.2415		
E4 Jamb	30.8000	0.0240	0.7392		
E14 Flat roof	8.2000	0.0800	0.6560		
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.8681	(36)
Point Thermal bridges			(36a) =	0.0000	
Total fabric heat loss			(33) + (36) + (36a) =	28.9540	(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	28.2969	28.1891	28.0835	27.5873	27.4944	27.0622	27.0622	26.9822	27.2287	27.4944	27.6822	27.8786	(38)
Heat transfer coeff	57.2510	57.1432	57.0375	56.5413	56.4485	56.0162	56.0162	55.9362	56.1827	56.4485	56.6363	56.8326	(39)
Average = Sum(39)m / 12 =												56.5409	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9624	0.9606	0.9588	0.9504	0.9489	0.9416	0.9416	0.9403	0.9444	0.9489	0.9520	0.9553	(40)
HLP (average)												0.9504	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9672	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)
Hot water usage for other uses	36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)
Average daily hot water use (litres/day)												97.6133	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)
Energy content (annual)										Total = Sum(45)m =		1621.0090	
Distribution loss (46)m = 0.15 x (45)m	25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
										Total per year (kWh/year) = Sum(64)m =		2197.4514	(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	68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains	459.6005	458.0031	444.2191	417.8341	391.5129	364.5250	350.4659	353.2092	366.8687	394.0421	422.8692	447.8388	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	549.5456	636.1586	754.2401	913.0282	1047.5448	1060.4035	1002.8104	878.7444	739.9389	608.8076	535.1456	521.8735	(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	58.5749	58.6854	58.7941	59.3101	59.4077	59.8661	59.8661	59.9517	59.6887	59.4077	59.2107	59.0061	
alpha	4.9050	4.9124	4.9196	4.9540	4.9605	4.9911	4.9911	4.9968	4.9792	4.9605	4.9474	4.9337	
util living area													
	0.9708	0.9432	0.8669	0.6945	0.4929	0.3371	0.2456	0.2924	0.5137	0.8167	0.9473	0.9763	(86)
MIT	20.0679	20.2940	20.6178	20.8894	20.9809	20.9977	20.9996	20.9991	20.9833	20.8013	20.3803	20.0164	(87)
Th 2	20.1148	20.1163	20.1178	20.1248	20.1262	20.1323	20.1323	20.1334	20.1299	20.1262	20.1235	20.1207	(88)
util rest of house													
	0.9642	0.9314	0.8430	0.6556	0.4491	0.2918	0.1973	0.2375	0.4527	0.7767	0.9341	0.9709	(89)
MIT 2	19.0519	19.3320	19.7188	20.0225	20.1113	20.1309	20.1321	20.1331	20.1191	19.9420	19.4492	18.9921	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.5387	19.7929	20.1495	20.4378	20.5279	20.5462	20.5477	20.5480	20.5331	20.3537	19.8952	19.4828	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3887	19.6429	19.9995	20.2878	20.3779	20.3962	20.3977	20.3980	20.3831	20.2037	19.7452	19.3328	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9575	0.9239	0.8395	0.6631	0.4618	0.3056	0.2121	0.2543	0.4707	0.7806	0.9274	0.9647	(94)
Useful gains	526.1807	587.7614	633.2098	605.4312	483.7803	324.0656	212.6615	223.4526	348.3153	475.2094	496.2780	503.4743	(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													
	863.8402	842.4547	769.9770	643.8799	489.8546	324.6788	212.7345	223.6314	353.0039	542.1127	716.1795	860.0382	(97)
Space heating kWh													
	251.2186	171.1539	101.7548	27.6831	4.5193	0.0000	0.0000	0.0000	0.0000	49.7760	158.3291	265.2835	(98a)
Space heating requirement - total per year (kWh/year)												1029.7184	
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													
	251.2186	171.1539	101.7548	27.6831	4.5193	0.0000	0.0000	0.0000	0.0000	49.7760	158.3291	265.2835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1029.7184	
Space heating per m2											(98c) / (4) =	17.3091	(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 %)	89.5000	(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													
	251.2186	171.1539	101.7548	27.6831	4.5193	0.0000	0.0000	0.0000	0.0000	49.7760	158.3291	265.2835	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	280.6912	191.2334	113.6925	30.9308	5.0495	0.0000	0.0000	0.0000	0.0000	55.6157	176.9041	296.4061	(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													
	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1150.5234	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2455.2529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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 3833.9988 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1150.5234	3.6400	41.8791	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	3.6400	89.3712	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	142.2226	16.4900	23.4525	(250)
Additional standing charges			92.0000	(251)
Total energy cost			260.8842	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8988	(257)
SAP value		85.4300	
SAP rating (Section 12)		85	(258)
SAP band		B	

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	1150.5234	0.2100	241.6099	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			757.2130	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Total CO2, kg/year			789.6694	(272)
CO2 emissions per m2			13.2700	(273)
EI value			89.8731	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b) x	2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	2 * 10 = 20.0000	(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) =	20.0000 / (5) = 0.1293	(8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.5000	(17)
Infiltration rate	0.3043	(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) = 0.2587	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.2845	0.2716	0.2716	0.2522	0.2522	0.2199	0.2263	0.2393	0.2328	0.2457	0.2457	0.2716	(22b)
Effective ac	0.5405	0.5369	0.5369	0.5318	0.5318	0.5242	0.5256	0.5286	0.5271	0.5302	0.5302	0.5369	(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	
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 202.9333 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100
E3 Sill	10.5000	0.0230	0.2415
E4 Jamb	30.8000	0.0240	0.7392
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	27.5873	27.4037	27.4037	27.1444	27.1444	26.7549	26.8285	26.9822	26.9043	27.0622	27.0622	27.4037	(38)
Heat transfer coeff	56.5413	56.3577	56.3577	56.0984	56.0984	55.7089	55.7825	55.9362	55.8583	56.0162	56.0162	56.3577	(39)

Average = Sum(39)m / 12 = 56.0942

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9504	0.9473	0.9473	0.9430	0.9430	0.9364	0.9377	0.9403	0.9390	0.9416	0.9416	0.9473	(40)
HLP (average)												0.9429	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)

Energy content (annual) Total = Sum(45)m = 1621.0090

Distribution loss (46)m = 0.15 x (45)m												
25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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												
218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)

Total per year (kWh/year) = Sum(64)m = 2197.4514 (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

68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains													
	459.6005	458.0031	444.2191	417.8341	391.5129	364.5250	350.4659	353.2092	366.8687	394.0421	422.8692	447.8388	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	12.4928	0.6300	0.7000	0.7700	42.8374	(75)
Southwest	1.3200	39.1209	0.6300	0.7000	0.7700	15.7817	(79)
Northwest	10.5600	12.4928	0.6300	0.7000	0.7700	40.3176	(81)

Solar gains	98.9368	176.8612	310.3275	515.0276	661.2993	750.5418	706.3167	583.4067	413.5229	233.3624	127.7452	83.2863	(83)
Total gains	558.5373	634.8643	754.5466	932.8618	1052.8122	1115.0668	1056.7826	936.6159	780.3916	627.4045	550.6145	531.1252	(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	59.3101	59.5033	59.5033	59.7784	59.7784	60.1963	60.1169	59.9517	60.0353	59.8661	59.8661	59.5033	
alpha	4.9540	4.9669	4.9669	4.9852	4.9852	5.0131	5.0078	4.9968	5.0024	4.9911	4.9911	4.9669	
util living area													
	0.9592	0.9283	0.8265	0.6112	0.4023	0.2297	0.1320	0.1612	0.3775	0.7253	0.9177	0.9659	(86)
MIT	20.2342	20.4209	20.7337	20.9457	20.9938	20.9997	21.0000	21.0000	20.9968	20.9037	20.5558	20.1897	(87)
Th 2	20.1248	20.1274	20.1274	20.1311	20.1311	20.1366	20.1356	20.1334	20.1345	20.1323	20.1323	20.1274	(88)
util rest of house													
	0.9498	0.9131	0.7963	0.5677	0.3573	0.1866	0.0863	0.1095	0.3167	0.6725	0.8974	0.9579	(89)
MIT 2	19.2677	19.4967	19.8607	20.0847	20.1270	20.1365	20.1356	20.1334	20.1330	20.0526	19.6686	19.2152	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.7307	19.9395	20.2790	20.4972	20.5422	20.5501	20.5497	20.5486	20.5468	20.4603	20.0936	19.6820	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5807	19.7895	20.1290	20.3472	20.3922	20.4001	20.3997	20.3986	20.3968	20.3103	19.9436	19.5320	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9427	0.9064	0.7963	0.5787	0.3709	0.1998	0.1003	0.1253	0.3352	0.6838	0.8923	0.9511	(94)
Useful gains	526.5585	575.4440	600.8681	539.8810	390.4549	222.7834	105.9691	117.3819	261.6085	429.0502	491.3291	505.1605	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	801.7938	782.7789	694.8323	558.0226	392.2526	222.8390	105.9701	117.3851	262.3556	459.9105	646.6302	796.4496	(97)
Space heating kWh	204.7751	139.3290	69.9093	13.0619	1.3375	0.0000	0.0000	0.0000	0.0000	22.9601	111.8168	216.7191	(98a)
Space heating requirement - total per year (kWh/year)												779.9089	
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	204.7751	139.3290	69.9093	13.0619	1.3375	0.0000	0.0000	0.0000	0.0000	22.9601	111.8168	216.7191	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												779.9089	
Space heating per m2											(98c) / (4) =	13.1099	(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 %)	89.5000	(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													
	204.7751	139.3290	69.9093	13.0619	1.3375	0.0000	0.0000	0.0000	0.0000	22.9601	111.8168	216.7191	(98)
Space heating efficiency (main heating system 1)													
	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)													
	228.7990	155.6749	78.1110	14.5944	1.4944	0.0000	0.0000	0.0000	0.0000	25.6537	124.9350	242.1442	(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													
	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month													
	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	871.4065	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2455.2529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3554.8820	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	871.4065	6.3400	55.2472	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	6.3400	155.6630	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	142.2226	26.0000	36.9779	(250)
Additional standing charges			113.0000	(251)
Total energy cost			383.2481	(255)

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	871.4065	0.2100	182.9954	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			698.5985	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Total CO2, kg/year			731.0549	(272)

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	871.4065	1.1300	984.6894	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	1.1300	2774.4358	(278)
Space and water heating			3759.1252	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Total Primary energy kWh/year			4107.3717	(286)

SAP 10 EPC IMPROVEMENTS

Flat 9 - Be Lean

Current energy efficiency rating:	B 85
Current environmental impact rating:	B 90

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	B 85
Potential environmental impact rating:	B 90

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£59	£59	£0
Mains gas	£324	£324	£0

Space heating	£191	£191	£0
Water heating	£156	£156	£0
Lighting	£37	£37	£0
Total cost of fuels	£383	£383	£0
Total cost of uses	£384	£384	£0
Delivered energy	60 kWh/m²	60 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	12 kg/m²	12 kg/m²	0 kg/m²
Primary energy	69 kWh/m²	69 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1293 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.5000 (17)
Infiltration rate		0.3043 (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) =	0.2587 (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	0.3298	0.3233	0.3169	0.2845	0.2781	0.2457	0.2457	0.2393	0.2587	0.2781	0.2910	0.3039	(22b)
Effective ac	0.5544	0.5523	0.5502	0.5405	0.5387	0.5302	0.5302	0.5286	0.5335	0.5387	0.5423	0.5462	(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								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100
E3 Sill	10.5000	0.0230	0.2415
E4 Jamb	30.8000	0.0240	0.7392
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		2.8681 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	28.9540 (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	28.2969	28.1891	28.0835	27.5873	27.4944	27.0622	27.0622	26.9822	27.2287	27.4944	27.6822	27.8786	(38)

Heat transfer coeff

	57.2510	57.1432	57.0375	56.5413	56.4485	56.0162	56.0162	55.9362	56.1827	56.4485	56.6363	56.8326 (39)
Average = Sum(39)m / 12 =												56.5409

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9624	0.9606	0.9588	0.9504	0.9489	0.9416	0.9416	0.9403	0.9444	0.9489	0.9520	0.9553	(40)
HLP (average)												0.9504	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)

Hot water usage for baths

	69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548 (42b)

Hot water usage for other uses

	36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062 (42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)
Energy content (annual)										Total = Sum(45)m =		1621.0090	
Distribution loss (46)m = 0.15 x (45)m													
	25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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													
	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
									Total per year (kWh/year) = Sum(64)m =			2197.4514	(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													
	68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)
Total internal gains													
	459.6005	458.0031	444.2191	417.8341	391.5129	364.5250	350.4659	353.2092	366.8687	394.0421	422.8692	447.8388	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.6300	0.7000	0.7700	38.6890	(75)
Southwest	1.3200	36.7938	0.6300	0.7000	0.7700	14.8430	(79)
Northwest	10.5600	11.2829	0.6300	0.7000	0.7700	36.4131	(81)

Solar gains	89.9451	178.1555	310.0210	495.1941	656.0319	695.8785	652.3446	525.5352	373.0702	214.7655	112.2763	74.0346	(83)
Total gains	549.5456	636.1586	754.2401	913.0282	1047.5448	1060.4035	1002.8104	878.7444	739.9389	608.8076	535.1456	521.8735	(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	58.5749	58.6854	58.7941	59.3101	59.4077	59.8661	59.8661	59.9517	59.6887	59.4077	59.2107	59.0061	
alpha	4.9050	4.9124	4.9196	4.9540	4.9605	4.9911	4.9911	4.9968	4.9792	4.9605	4.9474	4.9337	
util living area													
	0.9708	0.9432	0.8669	0.6945	0.4929	0.3371	0.2456	0.2924	0.5137	0.8167	0.9473	0.9763	(86)
MIT	20.0679	20.2940	20.6178	20.8894	20.9809	20.9977	20.9996	20.9991	20.9833	20.8013	20.3803	20.0164	(87)
Th 2	20.1148	20.1163	20.1178	20.1248	20.1262	20.1323	20.1323	20.1334	20.1299	20.1262	20.1235	20.1207	(88)
util rest of house													
	0.9642	0.9314	0.8430	0.6556	0.4491	0.2918	0.1973	0.2375	0.4527	0.7767	0.9341	0.9709	(89)
MIT 2	19.0519	19.3320	19.7188	20.0225	20.1113	20.1309	20.1321	20.1331	20.1191	19.9420	19.4492	18.9921	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)

MIT	19.5387	19.7929	20.1495	20.4378	20.5279	20.5462	20.5477	20.5480	20.5331	20.3537	19.8952	19.4828	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.3887	19.6429	19.9995	20.2878	20.3779	20.3962	20.3977	20.3980	20.3831	20.2037	19.7452	19.3328	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9575	0.9239	0.8395	0.6631	0.4618	0.3056	0.2121	0.2543	0.4707	0.7806	0.9274	0.9647	(94)
Useful gains	526.1807	587.7614	633.2098	605.4312	483.7803	324.0656	212.6615	223.4526	348.3153	475.2094	496.2780	503.4743	(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	863.8402	842.4547	769.9770	643.8799	489.8546	324.6788	212.7345	223.6314	353.0039	542.1127	716.1795	860.0382	(97)
Space heating kWh	251.2186	171.1539	101.7548	27.6831	4.5193	0.0000	0.0000	0.0000	0.0000	49.7760	158.3291	265.2835	(98a)
Space heating requirement - total per year (kWh/year)												1029.7184	
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	251.2186	171.1539	101.7548	27.6831	4.5193	0.0000	0.0000	0.0000	0.0000	49.7760	158.3291	265.2835	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1029.7184	
Space heating per m2											(98c) / (4) =	17.3091	(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 %)												89.5000	(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	251.2186	171.1539	101.7548	27.6831	4.5193	0.0000	0.0000	0.0000	0.0000	49.7760	158.3291	265.2835	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	280.6912	191.2334	113.6925	30.9308	5.0495	0.0000	0.0000	0.0000	0.0000	55.6157	176.9041	296.4061	(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	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	1150.5234	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2455.2529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3833.9988	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1150.5234	3.6400	41.8791	(240)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	2455.2529	3.6400	89.3712	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	142.2226	16.4900	23.4525	(250)
Additional standing charges			92.0000	(251)
Total energy cost			260.8842	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8988	(257)
SAP value		85.4300	
SAP rating (Section 12)		85	(258)
SAP band		B	

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	1150.5234	0.2100	241.6099	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			757.2130	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Total CO2, kg/year			789.6694	(272)
CO2 emissions per m2			13.2700	(273)
EI value			89.8731	
EI rating			90	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3043	(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) =	0.2587	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.2845	0.2716	0.2716	0.2522	0.2522	0.2199	0.2263	0.2393	0.2328	0.2457	0.2457	0.2716	(22b)
Effective ac	0.5405	0.5369	0.5369	0.5318	0.5318	0.5242	0.5256	0.5286	0.5271	0.5302	0.5302	0.5369	(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	
Main dwelling								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								

Party Wall 1	24.7000	0.0000	0.0000	180.0000	4446.0000 (32)
Party Floor 1	59.4900			30.0000	1784.7000 (32d)
Party Ceiling 1	50.5600			20.0000	1011.2000 (32b)
Internal Wall 1	76.9600			9.0000	692.6400 (32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 202.9333 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100
E3 Sill	10.5000	0.0230	0.2415
E4 Jamb	30.8000	0.0240	0.7392
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	27.5873	27.4037	27.4037	27.1444	27.1444	26.7549	26.8285	26.9822	26.9043	27.0622	27.0622	27.4037	(38)

Heat transfer coeff

	56.5413	56.3577	56.3577	56.0984	56.0984	55.7089	55.7825	55.9362	55.8583	56.0162	56.0162	56.3577	(39)

Average = Sum(39)m / 12 = 56.0942

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9504	0.9473	0.9473	0.9430	0.9430	0.9364	0.9377	0.9403	0.9390	0.9416	0.9416	0.9473	(40)
HLP (average)												0.9429	
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 1.9672 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.3894	68.3589	66.9077	64.2319	62.2283	60.0067	58.8067	60.2477	61.8168	64.1940	66.9249	69.1548	(42b)

Hot water usage for other uses

36.6062	35.2750	33.9439	32.6128	31.2816	29.9505	29.9505	31.2816	32.6128	33.9439	35.2750	36.6062	(42c)

Average daily hot water use (litres/day) 97.6133 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.9956	103.6339	100.8516	96.8447	93.5100	89.9572	88.7572	91.5294	94.4295	98.1379	102.1999	105.7610	(44)
Energy conte	167.8711	147.5733	155.0051	132.5755	125.8824	110.6129	107.3441	113.3325	116.4411	133.1722	145.6025	165.5962	(45)

Energy content (annual) Total = Sum(45)m = 1621.0090
Distribution loss (46)m = 0.15 x (45)m

25.1807	22.1360	23.2508	19.8863	18.8824	16.5919	16.1016	16.9999	17.4662	19.9758	21.8404	24.8394	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 50.9589	46.0274	50.9589	47.7590	47.6517	44.3625	45.2297	46.6424	46.5680	50.0100	49.3151	50.9589	(61)

Total heat required for water heating calculated for each month

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(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

218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)

Total per year (kWh/year) = Sum(64)m = 2197.4514 (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

68.5569	60.5750	64.2789	56.0211	53.7688	47.8694	46.9993	49.3436	50.3587	56.7823	60.7416	67.8005	(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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)

-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)

Water heating gains (Table 5)

92.1463	90.1413	86.3964	77.8071	72.2699	66.4853	63.1712	66.3221	69.9426	76.3203	84.3633	91.1296	(72)

Total internal gains

459.6005	458.0031	444.2191	417.8341	391.5129	364.5250	350.4659	353.2092	366.8687	394.0421	422.8692	447.8388	(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	
Northeast	11.2200	12.4928	0.6300	0.7000	0.7700	42.8374	(75)
Southwest	1.3200	39.1209	0.6300	0.7000	0.7700	15.7817	(79)

Northwest			10.5600		12.4928		0.6300		0.7000		0.7700		40.3176 (81)
Solar gains	98.9368	176.8612	310.3275	515.0276	661.2993	750.5418	706.3167	583.4067	413.5229	233.3624	127.7452	83.2863 (83)	
Total gains	558.5373	634.8643	754.5466	932.8618	1052.8122	1115.0668	1056.7826	936.6159	780.3916	627.4045	550.6145	531.1252 (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	59.3101	59.5033	59.5033	59.7784	59.7784	60.1963	60.1169	59.9517	60.0353	59.8661	59.8661	59.5033	
alpha	4.9540	4.9669	4.9669	4.9852	4.9852	5.0131	5.0078	4.9968	5.0024	4.9911	4.9911	4.9669	
util living area	0.9592	0.9283	0.8265	0.6112	0.4023	0.2297	0.1320	0.1612	0.3775	0.7253	0.9177	0.9659	(86)
MIT	20.2342	20.4209	20.7337	20.9457	20.9938	20.9997	21.0000	21.0000	20.9968	20.9037	20.5558	20.1897	(87)
Th 2	20.1248	20.1274	20.1274	20.1311	20.1311	20.1366	20.1356	20.1334	20.1345	20.1323	20.1323	20.1274	(88)
util rest of house	0.9498	0.9131	0.7963	0.5677	0.3573	0.1866	0.0863	0.1095	0.3167	0.6725	0.8974	0.9579	(89)
MIT 2	19.2677	19.4967	19.8607	20.0847	20.1270	20.1365	20.1356	20.1334	20.1330	20.0526	19.6686	19.2152	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.7307	19.9395	20.2790	20.4972	20.5422	20.5501	20.5497	20.5486	20.5468	20.4603	20.0936	19.6820	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5807	19.7895	20.1290	20.3472	20.3922	20.4001	20.3997	20.3986	20.3968	20.3103	19.9436	19.5320	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9427	0.9064	0.7963	0.5787	0.3709	0.1998	0.1003	0.1253	0.3352	0.6838	0.8923	0.9511	(94)
Useful gains	526.5585	575.4440	600.8681	539.8810	390.4549	222.7834	105.9691	117.3819	261.6085	429.0502	491.3291	505.1605	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	801.7938	782.7789	694.8323	558.0226	392.2526	222.8390	105.9701	117.3851	262.3556	459.9105	646.6302	796.4496	(97)
Space heating kWh	204.7751	139.3290	69.9093	13.0619	1.3375	0.0000	0.0000	0.0000	0.0000	22.9601	111.8168	216.7191	(98a)
Space heating requirement - total per year (kWh/year)												779.9089	
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	204.7751	139.3290	69.9093	13.0619	1.3375	0.0000	0.0000	0.0000	0.0000	22.9601	111.8168	216.7191	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												779.9089	
Space heating per m2											(98c) / (4) =	13.1099	(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 %)												89.5000	(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	204.7751	139.3290	69.9093	13.0619	1.3375	0.0000	0.0000	0.0000	0.0000	22.9601	111.8168	216.7191	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	228.7990	155.6749	78.1110	14.5944	1.4944	0.0000	0.0000	0.0000	0.0000	25.6537	124.9350	242.1442	(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	218.8300	193.6007	205.9640	180.3346	173.5341	154.9753	152.5738	159.9748	163.0091	183.1822	194.9176	216.5551	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	244.5028	216.3137	230.1274	201.4911	193.8928	173.1568	170.4735	178.7428	182.1330	204.6729	217.7850	241.9610	(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	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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												871.4065	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2455.2529	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3554.8820	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	871.4065	6.3400	55.2472	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	6.3400	155.6630	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	142.2226	26.0000	36.9779	(250)
Additional standing charges			113.0000	(251)
Total energy cost			383.2481	(255)

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	871.4065	0.2100	182.9954	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2455.2529	0.2100	515.6031	(264)
Space and water heating			698.5985	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Total CO2, kg/year			731.0549	(272)

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	871.4065	1.1300	984.6894	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2455.2529	1.1300	2774.4358	(278)
Space and water heating			3759.1252	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Total Primary energy kWh/year			4107.3717	(286)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8 - Be Lean	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	86 B	**DER**	12.52	**TER**	13.68
Environmental	91 B	**% DER < TER**			8.48
CO_2 Emissions (t/year)	0.68	**DFEE**	23.83	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			22.69
% DPER < TPER	3.79	**DPER**	70.28	**TPER**	73.05

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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		60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3027	(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) =	0.2573	(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	0.3280	0.3216	0.3152	0.2830	0.2766	0.2444	0.2444	0.2380	0.2573	0.2766	0.2895	0.3023	(22b)
Effective ac	0.5538	0.5517	0.5497	0.5400	0.5383	0.5299	0.5299	0.5283	0.5331	0.5383	0.5419	0.5457	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0370	0.2886

E17 Corner (inverted - internal area greater than external area)									2.6000	-0.0700	-0.1820		
E18 Party wall between dwellings									15.6000	0.0160	0.2496		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												2.3398	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		32.0880	(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	28.6240	28.5160	28.4102	27.9130	27.8200	27.3869	27.3869	27.3067	27.5537	27.8200	28.0081	28.2049	(38)
Heat transfer coeff	60.7120	60.6040	60.4981	60.0009	59.9079	59.4749	59.4749	59.3947	59.6417	59.9079	60.0961	60.2928	(39)
Average = Sum(39)m / 12 =												60.0005	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0078	1.0060	1.0043	0.9960	0.9945	0.9873	0.9873	0.9860	0.9901	0.9945	0.9976	1.0009	(40)
HLP (average)												0.9960	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(64)
12Total per year (kWh/year)												2210	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	409.5304	418.6928	401.0072	385.7277	365.0422	347.6769	333.7666	335.1363	346.2356	362.3967	385.4967	400.8498	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	611.5254	772.3402	910.3165	1059.4169	1158.5411	1152.5533	1102.6306	1012.0002	912.0589	760.1100	629.1839	572.5871	(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	81.2823	81.4272	81.5697	82.2456	82.3733	82.9730	82.9730	83.0851	82.7410	82.3733	82.1153	81.8474	

alpha	6.4188	6.4285	6.4380	6.4830	6.4916	6.5315	6.5315	6.5390	6.5161	6.4916	6.4744	6.4565	
util living area	0.9842	0.9437	0.8490	0.6655	0.4787	0.3301	0.2373	0.2699	0.4498	0.7672	0.9552	0.9889	(86)
MIT	20.3430	20.6063	20.8335	20.9665	20.9960	20.9997	21.0000	20.9999	20.9980	20.9363	20.6258	20.2870	(87)
Th 2	20.0768	20.0783	20.0798	20.0866	20.0879	20.0939	20.0939	20.0950	20.0916	20.0879	20.0853	20.0826	(88)
util rest of house	0.9790	0.9283	0.8173	0.6211	0.4327	0.2834	0.1885	0.2169	0.3913	0.7155	0.9399	0.9851	(89)
MIT 2	19.3420	19.6631	19.9211	20.0596	20.0853	20.0938	20.0939	20.0950	20.0906	20.0377	19.6981	19.2766	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.7325	20.0310	20.2770	20.4134	20.4406	20.4472	20.4474	20.4480	20.4446	20.3882	20.0600	19.6708	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5825	19.8810	20.1270	20.2634	20.2906	20.2972	20.2974	20.2980	20.2946	20.2382	19.9100	19.5208	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9245	0.8191	0.6299	0.4429	0.2939	0.1994	0.2288	0.4044	0.7245	0.9364	0.9822	(94)
Useful gains	596.4918	714.0192	745.6143	667.3222	513.1664	338.7598	219.8965	231.5112	368.8457	550.7044	589.1972	562.3732	(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	927.8302	907.9093	824.4088	681.8143	514.6447	338.8404	219.9012	231.5228	369.4555	577.4056	769.8290	923.7321	(97)
Space heating kWh	246.5157	130.2941	58.6232	10.4343	1.0998	0.0000	0.0000	0.0000	0.0000	19.8657	130.0549	268.8510	(98a)
Space heating requirement - total per year (kWh/year)												865.7388	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	246.5157	130.2941	58.6232	10.4343	1.0998	0.0000	0.0000	0.0000	0.0000	19.8657	130.0549	268.8510	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												865.7388	
Space heating per m2											(98c) / (4) =	14.3715	(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 %)	89.5000	(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	246.5157	130.2941	58.6232	10.4343	1.0998	0.0000	0.0000	0.0000	0.0000	19.8657	130.0549	268.8510	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	275.4366	145.5800	65.5007	11.6585	1.2289	0.0000	0.0000	0.0000	0.0000	22.1963	145.3127	300.3922	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	967.3060	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3665.9684	(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	967.3060	0.2100	203.1343	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			721.5973	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Total CO2, kg/year			754.2800	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.5200	(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	967.3060	1.1300	1093.0557	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	1.1300	2789.8248	(278)
Space and water heating			3882.8806	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.7909	1.5338	220.5513	(282)
Total Primary energy kWh/year			4233.5326	(286)
Dwelling Primary energy Rate (DPER)			70.2800	(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	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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								
TER Opening Type			15.0600	1.1450	17.2443			(27)
External Wall	73.0600	15.0600	58.0000	0.1800	10.4400			(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6843			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							294.9090	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400

E3 Sill	10.8000	0.0500	0.5400	
E4 Jamb	35.2000	0.0500	1.7600	
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0900	0.7020	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	
E18 Party wall between dwellings	15.6000	0.0600	0.9360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1780 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)
Average = Sum(39)m / 12 =												64.9274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
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 1.9884 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)

Hot water usage for other uses

34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 93.3125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.5984	49.1285	45.6548	45.5522	42.4079	43.2369	44.5873	44.5162	47.8066	48.1794	50.9589	(61)
Total heat required for water heating calculated for each month	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(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	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(64)
										Total per year (kWh/year) = Sum(64)m =		2108.1738	(64)
12Total per year (kWh/year)												2108	(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	66.0976	58.3058	61.5505	53.5529	51.3998	45.7603	44.9286	47.1696	48.1399	54.2805	58.3246	65.3745	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	88.8408	86.7646	82.7292	74.3790	69.0857	63.5560	60.3879	63.4000	66.8609	72.9576	81.0064	87.8690	(72)
Total internal gains	405.7558	414.8594	396.9068	381.8130	361.4061	344.3318	330.5883	331.7994	342.7166	358.5568	381.7193	397.1263	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)
Northwest	5.3000	11.2829	0.6300	0.7000	0.7700	18.2755	(81)

Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	533.7793	639.0013	719.7115	808.8101	864.3468	854.4863	817.9160	760.8110	701.3427	610.6287	536.1675	505.9725	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area	0.9932	0.9804	0.9472	0.8457	0.6715	0.4774	0.3445	0.3862	0.6185	0.8973	0.9824	0.9950	(86)
MIT	20.1000	20.3176	20.5738	20.8398	20.9652	20.9962	20.9996	20.9992	20.9836	20.8015	20.4046	20.0632	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house	0.9908	0.9737	0.9303	0.8054	0.6099	0.4064	0.2688	0.3053	0.5379	0.8585	0.9752	0.9931	(89)
MIT 2	18.9791	19.2539	19.5684	19.8764	19.9968	20.0285	20.0301	20.0316	20.0180	19.8467	19.3745	18.9392	(90)
Living area fraction									fLA = Living area / (4) =			0.3901	(91)
MIT	19.4164	19.6689	19.9606	20.2522	20.3746	20.4060	20.4083	20.4091	20.3947	20.2192	19.7764	19.3777	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4164	19.6689	19.9606	20.2522	20.3746	20.4060	20.4083	20.4091	20.3947	20.2192	19.7764	19.3777	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9708	0.9293	0.8157	0.6327	0.4341	0.2984	0.3369	0.5690	0.8673	0.9729	0.9915	(94)
Useful gains	527.8321	620.3620	668.8360	659.7531	546.8954	370.9267	244.0412	256.3033	399.0707	529.5960	521.6583	501.6698	(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	998.2122	972.7815	884.3906	737.0788	561.9688	372.2166	244.1445	256.5175	405.1798	623.1647	824.9316	992.3560	(97)
Space heating kWh	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98a)
Space heating requirement - total per year (kWh/year)												1467.0928	
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	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1467.0928	
Space heating per m2											(98c) / (4) =	24.3541	(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 %)	92.4000	(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	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	378.7476	256.3051	173.5634	60.2537	12.1370	0.0000	0.0000	0.0000	0.0000	75.3411	236.3169	395.0979	(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	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.4532	84.8925	83.9409	82.2422	80.7949	80.3000	80.3000	80.3000	80.3000	82.5722	84.7103	85.5613	(217)
Fuel for water heating, kWh/month	247.4263	219.8895	235.0513	209.6115	205.3201	184.4921	181.6332	190.4439	194.0560	212.0704	221.1852	244.5721	(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	18.1885	14.5915	13.1380	9.6254	7.4350	6.0744	6.7824	8.8161	11.4512	15.0246	16.9702	18.6940	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4164	-20.1575	-30.8587	-37.0329	-42.0207	-40.0022	-39.5246	-36.2719	-30.9119	-24.0590	-15.1872	-11.4595	(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	-4.2243	-9.1318	-18.6151	-28.6532	-38.5725	-39.0005	-38.5331	-32.3027	-23.2630	-13.2739	-5.7083	-3.3219	(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	1587.7627	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2545.7517	(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)	146.7912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-595.5026	(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	3770.8030	(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	1587.7627	0.2100	333.4302	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2545.7517	0.2100	534.6079	(264)
Space and water heating			868.0380	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	146.7912	0.1443	21.1865	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	0.1333	-45.4303	
PV Unit electricity exported	-254.6002	0.1252	-31.8735	
Total			-77.3038	(269)
Total CO2, kg/year			823.8500	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6800	(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	1587.7627	1.1300	1794.1719	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2545.7517	1.1300	2876.6994	(278)
Space and water heating			4670.8713	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	146.7912	1.5338	225.1533	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	1.4924	-508.7792	
PV Unit electricity exported	-254.6002	0.4595	-116.9892	
Total			-625.7684	(283)
Total Primary energy kWh/year			4400.3569	(286)
Target Primary Energy Rate (TPER)			73.0500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8 - Be Lean	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	86 B	**DER**	12.52	**TER**	13.68
Environmental	91 B	**% DER < TER**			8.48
CO_2 Emissions (t/year)	0.68	**DFEE**	23.83	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			22.69
% DPER < TPER	3.79	**DPER**	70.28	**TPER**	73.05

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3027	(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) =	0.2573	(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	0.3280	0.3216	0.3152	0.2830	0.2766	0.2444	0.2444	0.2380	0.2573	0.2766	0.2895	0.3023	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5538	0.5517	0.5497	0.5400	0.5383	0.5299	0.5299	0.5283	0.5331	0.5383	0.5419	0.5457	(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	
Main dwelling								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)									30.6000	0.0000	0.0000		
E16 Corner (normal)									7.8000	0.0370	0.2886		
E17 Corner (inverted - internal area greater than external area)									2.6000	-0.0700	-0.1820		
E18 Party wall between dwellings									15.6000	0.0160	0.2496		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												2.3398	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		32.0880	(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	28.6240	28.5160	28.4102	27.9130	27.8200	27.3869	27.3869	27.3067	27.5537	27.8200	28.0081	28.2049	(38)
Heat transfer coeff	60.7120	60.6040	60.4981	60.0009	59.9079	59.4749	59.4749	59.3947	59.6417	59.9079	60.0961	60.2928	(39)
Average = Sum(39)m / 12 =												60.0005	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0078	1.0060	1.0043	0.9960	0.9945	0.9873	0.9873	0.9860	0.9901	0.9945	0.9976	1.0009	(40)
HLP (average)												0.9960	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.8754	24.5059	23.9857	23.0265	22.3082	21.5118	21.0816	21.5982	22.1606	23.0129	23.9918	24.7913	(42b)
Hot water usage for other uses	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)
Average daily hot water use (litres/day)												54.8755	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.8687	58.2268	56.4340	54.2023	52.2116	50.1427	49.7125	51.5015	53.3365	55.4612	57.7127	59.7846	(44)
Energy conte	94.8174	82.9141	86.7370	74.2003	70.2868	61.6562	60.1229	63.7697	65.7693	75.2603	82.2223	93.6082	(45)
Energy content (annual)										Total = Sum(45)m =		911.3646	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(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	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(64)
										Total per year (kWh/year) = Sum(64)m =		774.6599	(64)
12Total per year (kWh/year)												775	(64)
Electric shower(s)	46.0949	41.0710	44.8479	42.7978	43.6009	41.5910	42.9774	43.6009	42.7978	44.8479	44.0046	46.0949	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		524.3271	(64a)
Heat gains from water heating, kWh/month	31.6724	27.8870	29.6436	26.4670	25.8362	23.4997	23.5205	24.4513	24.6754	27.2048	28.4734	31.4155	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	42.5705	41.4985	39.8435	36.7597	34.7260	32.6385	31.6135	32.8646	34.2714	36.5656	39.5464	42.2251	(72)
Total internal gains	356.4854	366.5933	351.0211	341.1938	324.0464	313.4143	301.8139	301.2641	310.1271	319.1648	337.2593	348.4825	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	558.4804	720.2408	860.3304	1014.8830	1117.5453	1118.2908	1070.6780	978.1280	875.9503	716.8781	580.9465	520.2198	(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	81.2823	81.4272	81.5697	82.2456	82.3733	82.9730	82.9730	83.0851	82.7410	82.3733	82.1153	81.8474	
alpha	6.4188	6.4285	6.4380	6.4830	6.4916	6.5315	6.5315	6.5390	6.5161	6.4916	6.4744	6.4565	
util living area	0.9901	0.9585	0.8738	0.6901	0.4958	0.3402	0.2444	0.2793	0.4680	0.7988	0.9689	0.9934	(86)
MIT	20.2651	20.5448	20.7999	20.9590	20.9951	20.9996	21.0000	20.9999	20.9975	20.9194	20.5649	20.2081	(87)
Th 2	20.0768	20.0783	20.0798	20.0866	20.0879	20.0939	20.0939	20.0950	20.0916	20.0879	20.0853	20.0826	(88)
util rest of house	0.9867	0.9462	0.8448	0.6453	0.4483	0.2921	0.1941	0.2244	0.4073	0.7487	0.9575	0.9910	(89)
MIT 2	19.4282	19.6982	19.9286	20.0606	20.0855	20.0938	20.0939	20.0950	20.0906	20.0373	19.7274	19.3770	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.7547	20.0285	20.2685	20.4111	20.4403	20.4472	20.4474	20.4480	20.4444	20.3814	20.0541	19.7012	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7547	20.0285	20.2685	20.4111	20.4403	20.4472	20.4474	20.4480	20.4444	20.3814	20.0541	19.7012	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9852	0.9455	0.8512	0.6615	0.4667	0.3109	0.2137	0.2458	0.4309	0.7657	0.9570	0.9898	(94)
Useful gains	550.2153	680.9729	732.2834	671.3914	521.5790	347.6440	228.8148	240.4129	377.4828	548.8892	555.9885	514.9026	(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	938.2851	916.8447	832.9677	690.6748	523.6141	347.7605	228.8223	240.4317	378.3900	585.9857	778.4924	934.6111	(97)
Space heating kWh	288.7239	158.5058	74.9091	13.8840	1.5142	0.0000	0.0000	0.0000	0.0000	27.5998	160.2028	312.2631	(98a)
Space heating requirement - total per year (kWh/year)												1037.6027	
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	288.7239	158.5058	74.9091	13.8840	1.5142	0.0000	0.0000	0.0000	0.0000	27.5998	160.2028	312.2631	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1037.6027	
Space heating per m2											(98c) / (4) =	17.2245	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	559.0638	440.1141	451.3996	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9974	0.9992	0.9984	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	557.6212	439.7551	450.6706	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1274.9656	1221.0358	1114.5478	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	516.4880	581.2729	493.9246	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	129.1220	145.3182	123.4812	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												397.9214	(107)
Energy for space heating												17.2245	(99)
Energy for space cooling												6.6056	(108)
Total												23.8301	(109)
Fabric Energy Efficiency (DFEE)												23.8	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) = 0.3210 (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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			15.0600	1.1450	17.2443			(27)
External Wall	73.0600	15.0600	58.0000	0.1800	10.4400			(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6843			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 294.9090 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	15.6000	0.0600	0.9360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1780 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)

Average = Sum(39)m / 12 = 64.9274

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9884 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.8754	24.5059	23.9857	23.0265	22.3082	21.5118	21.0816	21.5982	22.1606	23.0129	23.9918	24.7913	(42b)
Hot water usage for other uses	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 54.8755 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.8687	58.2268	56.4340	54.2023	52.2116	50.1427	49.7125	51.5015	53.3365	55.4612	57.7127	59.7846	(44)
Energy conte	94.8174	82.9141	86.7370	74.2003	70.2868	61.6562	60.1229	63.7697	65.7693	75.2603	82.2223	93.6082	(45)

Energy content (annual) Total = Sum(45)m = 911.3646

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(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	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(64)

Total per year (kWh/year) = Sum(64)m = 774.6599 (64)

12Total per year (kWh/year) 775 (64)

Electric shower(s)	46.0949	41.0710	44.8479	42.7978	43.6009	41.5910	42.9774	43.6009	42.7978	44.8479	44.0046	46.0949	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 524.3271 (64a)

Heat gains from water heating, kWh/month	31.6724	27.8870	29.6436	26.4670	25.8362	23.4997	23.5205	24.4513	24.6754	27.2048	28.4734	31.4155	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)													
	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)													
	42.5705	41.4985	39.8435	36.7597	34.7260	32.6385	31.6135	32.8646	34.2714	36.5656	39.5464	42.2251	(72)
Total internal gains													
	356.4854	366.5933	351.0211	341.1938	324.0464	313.4143	301.8139	301.2641	310.1271	319.1648	337.2593	348.4825	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)
Northwest	5.3000	11.2829	0.6300	0.7000	0.7700	18.2755	(81)

Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	484.5090	590.7352	673.8259	768.1909	826.9871	823.5689	789.1417	730.2756	668.7532	571.2367	491.7075	457.3286	(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	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area													
	0.9959	0.9865	0.9599	0.8679	0.6963	0.4947	0.3570	0.4021	0.6448	0.9190	0.9885	0.9970	(86)
MIT	20.0251	20.2489	20.5188	20.8126	20.9579	20.9954	20.9995	20.9990	20.9796	20.7654	20.3405	19.9885	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house													
	0.9944	0.9817	0.9462	0.8305	0.6341	0.4215	0.2786	0.3180	0.5624	0.8855	0.9835	0.9959	(89)
MIT 2	19.1313	19.3535	19.6152	19.8866	19.9979	20.0285	20.0301	20.0316	20.0181	19.8562	19.4544	19.1021	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.4800	19.7028	19.9677	20.2479	20.3724	20.4057	20.4082	20.4090	20.3932	20.2109	19.8001	19.4479	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4800	19.7028	19.9677	20.2479	20.3724	20.4057	20.4082	20.4090	20.3932	20.2109	19.8001	19.4479	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9798	0.9455	0.8400	0.6571	0.4500	0.3092	0.3509	0.5942	0.8929	0.9821	0.9951	(94)
Useful gains	481.2548	578.8306	637.1084	645.2576	543.4532	370.6289	244.0156	256.2427	397.4041	510.0548	482.8997	455.0689	(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													
	1002.4116	975.0167	884.8590	736.7956	561.8265	372.1998	244.1423	256.5124	405.0832	622.6239	826.4749	996.9467	(97)
Space heating kWh													
	387.7407	266.2371	184.3264	65.9074	13.6697	0.0000	0.0000	0.0000	0.0000	83.7515	247.3741	403.1571	(98a)
Space heating requirement - total per year (kWh/year)												1652.1639	
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													
	387.7407	266.2371	184.3264	65.9074	13.6697	0.0000	0.0000	0.0000	0.0000	83.7515	247.3741	403.1571	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1652.1639	
Space heating per m2											(98c) / (4) =	27.4264	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	602.6254	474.4073	486.2802	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9743	0.9901	0.9836	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	587.1277	469.7292	478.3222	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	930.4854	891.9675	824.8502	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	247.2176	314.1453	257.8168	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	61.8044	78.5363	64.4542	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												204.7949	(107)
Energy for space heating												27.4264	(99)
Energy for space cooling												3.3996	(108)
Total												30.8260	(109)
Fabric Energy Efficiency (TFEE)												30.8	(109)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8 - Be Lean	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	86 B	**DER**	12.52	**TER**	13.68
Environmental	91 B	**% DER < TER**			8.48
CO_2 Emissions (t/year)	0.68	**DFEE**	23.83	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			22.69
% DPER < TPER	3.79	**DPER**	70.28	**TPER**	73.05

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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		60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3027	(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) =	0.2573	(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	0.3280	0.3216	0.3152	0.2830	0.2766	0.2444	0.2444	0.2380	0.2573	0.2766	0.2895	0.3023	(22b)
Effective ac	0.5538	0.5517	0.5497	0.5400	0.5383	0.5299	0.5299	0.5283	0.5331	0.5383	0.5419	0.5457	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0370	0.2886

E17 Corner (inverted - internal area greater than external area)									2.6000	-0.0700	-0.1820		
E18 Party wall between dwellings									15.6000	0.0160	0.2496		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												2.3398	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		32.0880	(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	28.6240	28.5160	28.4102	27.9130	27.8200	27.3869	27.3869	27.3067	27.5537	27.8200	28.0081	28.2049	(38)
Heat transfer coeff	60.7120	60.6040	60.4981	60.0009	59.9079	59.4749	59.4749	59.3947	59.6417	59.9079	60.0961	60.2928	(39)
Average = Sum(39)m / 12 =												60.0005	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0078	1.0060	1.0043	0.9960	0.9945	0.9873	0.9873	0.9860	0.9901	0.9945	0.9976	1.0009	(40)
HLP (average)												0.9960	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(64)
12Total per year (kWh/year)												2210	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	409.5304	418.6928	401.0072	385.7277	365.0422	347.6769	333.7666	335.1363	346.2356	362.3967	385.4967	400.8498	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	611.5254	772.3402	910.3165	1059.4169	1158.5411	1152.5533	1102.6306	1012.0002	912.0589	760.1100	629.1839	572.5871	(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	81.2823	81.4272	81.5697	82.2456	82.3733	82.9730	82.9730	83.0851	82.7410	82.3733	82.1153	81.8474	

alpha	6.4188	6.4285	6.4380	6.4830	6.4916	6.5315	6.5315	6.5390	6.5161	6.4916	6.4744	6.4565	
util living area	0.9842	0.9437	0.8490	0.6655	0.4787	0.3301	0.2373	0.2699	0.4498	0.7672	0.9552	0.9889	(86)
MIT	20.3430	20.6063	20.8335	20.9665	20.9960	20.9997	21.0000	20.9999	20.9980	20.9363	20.6258	20.2870	(87)
Th 2	20.0768	20.0783	20.0798	20.0866	20.0879	20.0939	20.0939	20.0950	20.0916	20.0879	20.0853	20.0826	(88)
util rest of house	0.9790	0.9283	0.8173	0.6211	0.4327	0.2834	0.1885	0.2169	0.3913	0.7155	0.9399	0.9851	(89)
MIT 2	19.3420	19.6631	19.9211	20.0596	20.0853	20.0938	20.0939	20.0950	20.0906	20.0377	19.6981	19.2766	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.7325	20.0310	20.2770	20.4134	20.4406	20.4472	20.4474	20.4480	20.4446	20.3882	20.0600	19.6708	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.5825	19.8810	20.1270	20.2634	20.2906	20.2972	20.2974	20.2980	20.2946	20.2382	19.9100	19.5208	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9754	0.9245	0.8191	0.6299	0.4429	0.2939	0.1994	0.2288	0.4044	0.7245	0.9364	0.9822	(94)
Useful gains	596.4918	714.0192	745.6143	667.3222	513.1664	338.7598	219.8965	231.5112	368.8457	550.7044	589.1972	562.3732	(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	927.8302	907.9093	824.4088	681.8143	514.6447	338.8404	219.9012	231.5228	369.4555	577.4056	769.8290	923.7321	(97)
Space heating kWh	246.5157	130.2941	58.6232	10.4343	1.0998	0.0000	0.0000	0.0000	0.0000	19.8657	130.0549	268.8510	(98a)
Space heating requirement - total per year (kWh/year)												865.7388	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	246.5157	130.2941	58.6232	10.4343	1.0998	0.0000	0.0000	0.0000	0.0000	19.8657	130.0549	268.8510	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												865.7388	
Space heating per m2											(98c) / (4) =	14.3715	(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 %)	89.5000	(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	246.5157	130.2941	58.6232	10.4343	1.0998	0.0000	0.0000	0.0000	0.0000	19.8657	130.0549	268.8510	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	275.4366	145.5800	65.5007	11.6585	1.2289	0.0000	0.0000	0.0000	0.0000	22.1963	145.3127	300.3922	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	967.3060	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3665.9684	(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	967.3060	0.2100	203.1343	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			721.5973	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Total CO2, kg/year			754.2800	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			12.5200	(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	967.3060	1.1300	1093.0557	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	1.1300	2789.8248	(278)
Space and water heating			3882.8806	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.7909	1.5338	220.5513	(282)
Total Primary energy kWh/year			4233.5326	(286)
Dwelling Primary energy Rate (DPER)			70.2800	(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	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(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								
TER Opening Type			15.0600	1.1450	17.2443			(27)
External Wall	73.0600	15.0600	58.0000	0.1800	10.4400			(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.6843			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							294.9090	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400

E3 Sill	10.8000	0.0500	0.5400	
E4 Jamb	35.2000	0.0500	1.7600	
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0900	0.7020	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	
E18 Party wall between dwellings	15.6000	0.0600	0.9360	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1780 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)
Average = Sum(39)m / 12 =												64.9274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
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 1.9884 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)

Hot water usage for other uses

34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 93.3125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	45.5984	49.1285	45.6548	45.5522	42.4079	43.2369	44.5873	44.5162	47.8066	48.1794	50.9589	(61)
Total heat required for water heating calculated for each month	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(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	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(64)
										Total per year (kWh/year) = Sum(64)m =		2108.1738	(64)
12Total per year (kWh/year)												2108	(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	66.0976	58.3058	61.5505	53.5529	51.3998	45.7603	44.9286	47.1696	48.1399	54.2805	58.3246	65.3745	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	88.8408	86.7646	82.7292	74.3790	69.0857	63.5560	60.3879	63.4000	66.8609	72.9576	81.0064	87.8690	(72)
Total internal gains	405.7558	414.8594	396.9068	381.8130	361.4061	344.3318	330.5883	331.7994	342.7166	358.5568	381.7193	397.1263	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)
Northwest	5.3000	11.2829	0.6300	0.7000	0.7700	18.2755	(81)

Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	533.7793	639.0013	719.7115	808.8101	864.3468	854.4863	817.9160	760.8110	701.3427	610.6287	536.1675	505.9725	(84)

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7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)													
tau	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area	0.9932	0.9804	0.9472	0.8457	0.6715	0.4774	0.3445	0.3862	0.6185	0.8973	0.9824	0.9950	(86)
MIT	20.1000	20.3176	20.5738	20.8398	20.9652	20.9962	20.9996	20.9992	20.9836	20.8015	20.4046	20.0632	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house	0.9908	0.9737	0.9303	0.8054	0.6099	0.4064	0.2688	0.3053	0.5379	0.8585	0.9752	0.9931	(89)
MIT 2	18.9791	19.2539	19.5684	19.8764	19.9968	20.0285	20.0301	20.0316	20.0180	19.8467	19.3745	18.9392	(90)
Living area fraction									fLA = Living area / (4) =			0.3901	(91)
MIT	19.4164	19.6689	19.9606	20.2522	20.3746	20.4060	20.4083	20.4091	20.3947	20.2192	19.7764	19.3777	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4164	19.6689	19.9606	20.2522	20.3746	20.4060	20.4083	20.4091	20.3947	20.2192	19.7764	19.3777	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9889	0.9708	0.9293	0.8157	0.6327	0.4341	0.2984	0.3369	0.5690	0.8673	0.9729	0.9915	(94)
Useful gains	527.8321	620.3620	668.8360	659.7531	546.8954	370.9267	244.0412	256.3033	399.0707	529.5960	521.6583	501.6698	(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	998.2122	972.7815	884.3906	737.0788	561.9688	372.2166	244.1445	256.5175	405.1798	623.1647	824.9316	992.3560	(97)
Space heating kWh	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98a)
Space heating requirement - total per year (kWh/year)												1467.0928	
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	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1467.0928	
Space heating per m2											(98c) / (4) =	24.3541	(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 %)	92.4000	(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	349.9627	236.8259	160.3726	55.6745	11.2146	0.0000	0.0000	0.0000	0.0000	69.6152	218.3568	365.0705	(98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000	(210)
Space heating fuel (main heating system)	378.7476	256.3051	173.5634	60.2537	12.1370	0.0000	0.0000	0.0000	0.0000	75.3411	236.3169	395.0979	(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	211.4337	186.6697	197.3042	172.3891	165.8882	148.1472	145.8515	152.9264	155.8270	175.1113	187.3667	209.2590	(64)
Efficiency of water heater												80.3000	(216)
(217)m	85.4532	84.8925	83.9409	82.2422	80.7949	80.3000	80.3000	80.3000	80.3000	82.5722	84.7103	85.5613	(217)
Fuel for water heating, kWh/month	247.4263	219.8895	235.0513	209.6115	205.3201	184.4921	181.6332	190.4439	194.0560	212.0704	221.1852	244.5721	(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	18.1885	14.5915	13.1380	9.6254	7.4350	6.0744	6.7824	8.8161	11.4512	15.0246	16.9702	18.6940	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4164	-20.1575	-30.8587	-37.0329	-42.0207	-40.0022	-39.5246	-36.2719	-30.9119	-24.0590	-15.1872	-11.4595	(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	-4.2243	-9.1318	-18.6151	-28.6532	-38.5725	-39.0005	-38.5331	-32.3027	-23.2630	-13.2739	-5.7083	-3.3219	(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	1587.7627	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	80.3000	
Water heating fuel used	2545.7517	(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)	146.7912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-595.5026	(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	3770.8030	(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	1587.7627	0.2100	333.4302	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2545.7517	0.2100	534.6079	(264)
Space and water heating			868.0380	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	146.7912	0.1443	21.1865	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	0.1333	-45.4303	
PV Unit electricity exported	-254.6002	0.1252	-31.8735	
Total			-77.3038	(269)
Total CO2, kg/year			823.8500	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6800	(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	1587.7627	1.1300	1794.1719	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2545.7517	1.1300	2876.6994	(278)
Space and water heating			4670.8713	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	146.7912	1.5338	225.1533	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	1.4924	-508.7792	
PV Unit electricity exported	-254.6002	0.4595	-116.9892	
Total			-625.7684	(283)
Total Primary energy kWh/year			4400.3569	(286)
Target Primary Energy Rate (TPER)			73.0500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8 - Be Lean	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	86 B	**DER**	12.52	**TER**	13.68
Environmental	91 B	**% DER < TER**			8.48
CO_2 Emissions (t/year)	0.68	**DFEE**	23.83	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			22.69
% DPER < TPER	3.79	**DPER**	70.28	**TPER**	73.05

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1277 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		3.5000 (17)
Infiltration rate		0.3027 (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) =	0.2573 (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	0.3280	0.3216	0.3152	0.2830	0.2766	0.2444	0.2444	0.2380	0.2573	0.2766	0.2895	0.3023	(22b)
Effective ac	0.5538	0.5517	0.5497	0.5400	0.5383	0.5299	0.5299	0.5283	0.5331	0.5383	0.5419	0.5457	(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	
Main dwelling								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0370	0.2886

E17 Corner (inverted - internal area greater than external area)									2.6000	-0.0700	-0.1820		
E18 Party wall between dwellings									15.6000	0.0160	0.2496		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												2.3398	(36)
Point Thermal bridges											(36a) =	0.0000	
Total fabric heat loss										(33) + (36) + (36a) =		32.0880	(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	28.6240	28.5160	28.4102	27.9130	27.8200	27.3869	27.3869	27.3067	27.5537	27.8200	28.0081	28.2049	(38)
Heat transfer coeff	60.7120	60.6040	60.4981	60.0009	59.9079	59.4749	59.4749	59.3947	59.6417	59.9079	60.0961	60.2928	(39)
Average = Sum(39)m / 12 =												60.0005	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0078	1.0060	1.0043	0.9960	0.9945	0.9873	0.9873	0.9860	0.9901	0.9945	0.9976	1.0009	(40)
HLP (average)												0.9960	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3551	18.0792	14.7030	11.1311	8.3206	7.0246	7.5904	9.8662	13.2425	16.8143	19.6248	20.9208	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	463.6902	462.0848	448.1667	421.6388	395.0537	367.8289	353.6306	356.3892	370.1820	397.5915	426.5911	451.8037	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	665.6853	815.7322	957.4760	1095.3280	1188.5527	1172.7053	1122.4946	1033.2531	936.0053	795.3048	670.2783	623.5410	(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	81.2823	81.4272	81.5697	82.2456	82.3733	82.9730	82.9730	83.0851	82.7410	82.3733	82.1153	81.8474	
alpha	6.4188	6.4285	6.4380	6.4830	6.4916	6.5315	6.5315	6.5390	6.5161	6.4916	6.4744	6.4565	

util living area												
	0.9759	0.9295	0.8248	0.6465	0.4669	0.3244	0.2331	0.2644	0.4385	0.7420	0.9411	0.9828 (86)
MIT	20.4192	20.6531	20.8605	20.9715	20.9965	20.9997	21.0000	20.9999	20.9983	20.9473	20.6734	20.3613 (87)
Th 2	20.0768	20.0783	20.0798	20.0866	20.0879	20.0939	20.0939	20.0950	20.0916	20.0879	20.0853	20.0826 (88)
util rest of house												
	0.9684	0.9114	0.7912	0.6026	0.4219	0.2786	0.1851	0.2124	0.3813	0.6896	0.9224	0.9772 (89)
MIT 2	19.4360	19.7173	19.9487	20.0638	20.0857	20.0938	20.0939	20.0950	20.0908	20.0471	19.7531	19.3693 (90)
Living area fraction										fLA = Living area / (4) =		0.3901 (91)
MIT	19.8196	20.0824	20.3044	20.4179	20.4410	20.4472	20.4474	20.4480	20.4448	20.3983	20.1121	19.7563 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.6696	19.9324	20.1544	20.2679	20.2910	20.2972	20.2974	20.2980	20.2948	20.2483	19.9621	19.6063 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9643	0.9082	0.7941	0.6115	0.4319	0.2889	0.1959	0.2241	0.3942	0.6992	0.9195	0.9736	(94)
Useful gains	641.9112	740.8250	760.3040	669.7920	513.3928	338.7690	219.8971	231.5129	368.9431	556.1083	616.2890	607.0627	(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	933.1165	911.0226	826.0653	682.0842	514.6702	338.8415	219.9013	231.5230	369.4671	578.0073	772.9630	928.8881	(97)
Space heating kWh	216.6568	114.3728	48.9264	8.8504	0.9503	0.0000	0.0000	0.0000	0.0000	16.2928	112.8053	239.4381	(98a)
Space heating requirement - total per year (kWh/year)												758.2929	
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	216.6568	114.3728	48.9264	8.8504	0.9503	0.0000	0.0000	0.0000	0.0000	16.2928	112.8053	239.4381	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												758.2929	
Space heating per m2											(98c) / (4) =	12.5879	(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 %)												89.5000	(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	216.6568	114.3728	48.9264	8.8504	0.9503	0.0000	0.0000	0.0000	0.0000	16.2928	112.8053	239.4381	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	242.0746	127.7908	54.6664	9.8887	1.0618	0.0000	0.0000	0.0000	0.0000	18.2043	126.0394	267.5286	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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												847.2546	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.5000	
Water heating fuel used												2468.8715	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(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												3545.9170	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	847.2546	3.6400	30.8401	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	3.6400	89.8669	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	143.7909	16.4900	23.7111	(250)
Additional standing charges			92.0000	(251)
Total energy cost			250.5995	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8572	(257)
SAP value		86.1042	
SAP rating (Section 12)		86	(258)
SAP band		B	

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	847.2546	0.2100	177.9235	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			696.3865	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Total CO2, kg/year			729.0692	(272)
CO2 emissions per m2			12.1000	(273)
EI value			90.7169	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b) x	2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3027	(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) =	0.2573	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.2830	0.2702	0.2702	0.2509	0.2509	0.2187	0.2251	0.2380	0.2316	0.2444	0.2444	0.2702	(22b)
Effective ac	0.5400	0.5365	0.5365	0.5315	0.5315	0.5239	0.5253	0.5283	0.5268	0.5299	0.5299	0.5365	(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	
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0370	0.2886
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820
E18 Party wall between dwellings	15.6000	0.0160	0.2496

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		2.3398 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.0880 (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	27.9130	27.7291	27.7291	27.4692	27.4692	27.0790	27.1528	27.3067	27.2287	27.3869	27.3869	27.7291	(38)
Heat transfer coeff	60.0009	59.8170	59.8170	59.5572	59.5572	59.1669	59.2407	59.3947	59.3166	59.4749	59.4749	59.8170	(39)
Average = Sum(39)m / 12 =												59.5529	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9960	0.9930	0.9930	0.9887	0.9887	0.9822	0.9834	0.9860	0.9847	0.9873	0.9873	0.9930	(40)
HLP (average)												0.9886	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.9884 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)

Hot water usage for other uses

36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)

Average daily hot water use (litres/day)		98.2236 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(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	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3551	18.0792	14.7030	11.1311	8.3206	7.0246	7.5904	9.8662	13.2425	16.8143	19.6248	20.9208	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	463.6902	462.0848	448.1667	421.6388	395.0537	367.8289	353.6306	356.3892	370.1820	397.5915	426.5911	451.8037	(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	
Southeast	4.8400	39.1209	0.6300	0.7000	0.7700	57.8664	(77)
Southwest	10.5600	39.1209	0.6300	0.7000	0.7700	126.2539	(79)
Northwest	8.3600	12.4928	0.6300	0.7000	0.7700	31.9181	(81)

Solar gains	216.0384	340.0656	493.4265	681.7560	783.4824	853.1628	816.9496	733.1311	607.9192	418.1804	269.2325	188.1218	(83)
Total gains	679.7286	802.1503	941.5932	1103.3948	1178.5362	1220.9917	1170.5802	1089.5203	978.1013	815.7720	695.8235	639.9255	(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	82.2456	82.4984	82.4984	82.8583	82.8583	83.4049	83.3010	83.0851	83.1944	82.9730	82.9730	82.4984	
alpha	6.4830	6.4999	6.4999	6.5239	6.5239	6.5603	6.5534	6.5390	6.5463	6.5315	6.5315	6.4999	
util living area	0.9621	0.9122	0.7798	0.5656	0.3836	0.2229	0.1265	0.1472	0.3213	0.6348	0.8971	0.9712	(86)
MIT	20.5495	20.7259	20.9115	20.9885	20.9991	21.0000	21.0000	21.0000	20.9998	20.9817	20.7998	20.5019	(87)
Th 2	20.0866	20.0892	20.0892	20.0928	20.0928	20.0982	20.0972	20.0950	20.0961	20.0939	20.0939	20.0892	(88)
util rest of house	0.9504	0.8898	0.7401	0.5195	0.3380	0.1792	0.0808	0.0979	0.2666	0.5755	0.8670	0.9619	(89)
MIT 2	19.6045	19.8124	20.0108	20.0845	20.0923	20.0982	20.0972	20.0950	20.0961	20.0817	19.9047	19.5495	(90)
Living area fraction									fLA = Living area / (4) =			0.3901	(91)
MIT	19.9732	20.1687	20.3622	20.4371	20.4461	20.4500	20.4494	20.4481	20.4486	20.4328	20.2539	19.9211	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8232	20.0187	20.2122	20.2871	20.2961	20.3000	20.2994	20.2981	20.2986	20.2828	20.1039	19.7711	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9464	0.8879	0.7457	0.5295	0.3483	0.1890	0.0911	0.1089	0.2788	0.5882	0.8674	0.9579	(94)
Useful gains	643.2730	712.2281	702.1635	584.2447	410.4352	230.7471	106.5963	118.6748	272.7281	479.8052	603.5489	612.9637	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	865.4035	844.5413	742.4592	588.8509	410.7112	230.7505	106.5963	118.6749	272.7742	486.6715	696.0852	859.6344	(97)
Space heating kWh	165.2651	88.9145	29.9800	3.3164	0.2054	0.0000	0.0000	0.0000	0.0000	5.1086	66.6261	183.5230	(98a)
Space heating requirement - total per year (kWh/year)												542.9389	
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	165.2651	88.9145	29.9800	3.3164	0.2054	0.0000	0.0000	0.0000	0.0000	5.1086	66.6261	183.5230	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												542.9389	
Space heating per m2											(98c) / (4) =	9.0129	(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 %)	89.5000	(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	165.2651	88.9145	29.9800	3.3164	0.2054	0.0000	0.0000	0.0000	0.0000	5.1086	66.6261	183.5230	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	184.6538	99.3458	33.4972	3.7055	0.2294	0.0000	0.0000	0.0000	0.0000	5.7079	74.4426	205.0536	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	606.6357	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3305.2981	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	606.6357	6.3400	38.4607	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	6.3400	156.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	143.7909	26.0000	37.3856	(250)
Additional standing charges			113.0000	(251)
Total energy cost			367.7328	(255)

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	606.6357	0.2100	127.3935	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			645.8565	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Total CO2, kg/year			678.5392	(272)

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	606.6357	1.1300	685.4983	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	1.1300	2789.8248	(278)
Space and water heating			3475.3232	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.7909	1.5338	220.5513	(282)
Total Primary energy kWh/year			3825.9752	(286)

SAP 10 EPC IMPROVEMENTS

Flat 8 - Be Lean

Current energy efficiency rating: B 86
Current environmental impact rating: B 91

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 86
Potential environmental impact rating: B 91

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£60	£60	£0
Mains gas	£308	£308	£0
Space heating	£174	£174	£0
Water heating	£157	£157	£0
Lighting	£37	£37	£0

Total cost of fuels	£368	£368	£0
Total cost of uses	£368	£368	£0
Delivered energy	55 kWh/m²	55 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	11 kg/m²	11 kg/m²	0 kg/m²
Primary energy	64 kWh/m²	64 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3027	(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) =	0.2573	(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	0.3280	0.3216	0.3152	0.2830	0.2766	0.2444	0.2444	0.2380	0.2573	0.2766	0.2895	0.3023	(22b)
Effective ac	0.5538	0.5517	0.5497	0.5400	0.5383	0.5299	0.5299	0.5283	0.5331	0.5383	0.5419	0.5457	(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								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17765.3200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							294.9090	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0370	0.2886
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820
E18 Party wall between dwellings	15.6000	0.0160	0.2496

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		2.3398	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	32.0880	(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	28.6240	28.5160	28.4102	27.9130	27.8200	27.3869	27.3869	27.3067	27.5537	27.8200	28.0081	28.2049	(38)
Heat transfer coeff	60.7120	60.6040	60.4981	60.0009	59.9079	59.4749	59.4749	59.3947	59.6417	59.9079	60.0961	60.2928	(39)
Average = Sum(39)m / 12 =												60.0005	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0078	1.0060	1.0043	0.9960	0.9945	0.9873	0.9873	0.9860	0.9901	0.9945	0.9976	1.0009	(40)

HLP (average)												0.9960	
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												1.9884	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses													
	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m													
	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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													
	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(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													
	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.3551	18.0792	14.7030	11.1311	8.3206	7.0246	7.5904	9.8662	13.2425	16.8143	19.6248	20.9208	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)													
	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains													
	463.6902	462.0848	448.1667	421.6388	395.0537	367.8289	353.6306	356.3892	370.1820	397.5915	426.5911	451.8037	(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	
Southeast	4.8400	36.7938	0.6300	0.7000	0.7700	54.4242	(77)
Southwest	10.5600	36.7938	0.6300	0.7000	0.7700	118.7438	(79)
Northwest	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271	(81)

Solar gains	201.9950	353.6475	509.3093	673.6892	793.4990	804.8764	768.8640	676.8639	565.8233	397.7133	243.6872	171.7373	(83)
Total gains	665.6853	815.7322	957.4760	1095.3280	1188.5527	1172.7053	1122.4946	1033.2531	936.0053	795.3048	670.2783	623.5410	(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	81.2823	81.4272	81.5697	82.2456	82.3733	82.9730	82.9730	83.0851	82.7410	82.3733	82.1153	81.8474	
alpha	6.4188	6.4285	6.4380	6.4830	6.4916	6.5315	6.5315	6.5390	6.5161	6.4916	6.4744	6.4565	
util living area													
	0.9759	0.9295	0.8248	0.6465	0.4669	0.3244	0.2331	0.2644	0.4385	0.7420	0.9411	0.9828	(86)
MIT	20.4192	20.6531	20.8605	20.9715	20.9965	20.9997	21.0000	20.9999	20.9983	20.9473	20.6734	20.3613	(87)
Th 2	20.0768	20.0783	20.0798	20.0866	20.0879	20.0939	20.0939	20.0950	20.0916	20.0879	20.0853	20.0826	(88)
util rest of house													
	0.9684	0.9114	0.7912	0.6026	0.4219	0.2786	0.1851	0.2124	0.3813	0.6896	0.9224	0.9772	(89)
MIT 2	19.4360	19.7173	19.9487	20.0638	20.0857	20.0938	20.0939	20.0950	20.0908	20.0471	19.7531	19.3693	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.8196	20.0824	20.3044	20.4179	20.4410	20.4472	20.4474	20.4480	20.4448	20.3983	20.1121	19.7563	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.6696	19.9324	20.1544	20.2679	20.2910	20.2972	20.2974	20.2980	20.2948	20.2483	19.9621	19.6063	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9643	0.9082	0.7941	0.6115	0.4319	0.2889	0.1959	0.2241	0.3942	0.6992	0.9195	0.9736	(94)
Useful gains	641.9112	740.8250	760.3040	669.7920	513.3928	338.7690	219.8971	231.5129	368.9431	556.1083	616.2890	607.0627	(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	933.1165	911.0226	826.0653	682.0842	514.6702	338.8415	219.9013	231.5230	369.4671	578.0073	772.9630	928.8881	(97)
Space heating kWh	216.6568	114.3728	48.9264	8.8504	0.9503	0.0000	0.0000	0.0000	0.0000	16.2928	112.8053	239.4381	(98a)
Space heating requirement - total per year (kWh/year)												758.2929	
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	216.6568	114.3728	48.9264	8.8504	0.9503	0.0000	0.0000	0.0000	0.0000	16.2928	112.8053	239.4381	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												758.2929	
Space heating per m2											(98c) / (4) =	12.5879	(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 %)	89.5000	(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	216.6568	114.3728	48.9264	8.8504	0.9503	0.0000	0.0000	0.0000	0.0000	16.2928	112.8053	239.4381	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	242.0746	127.7908	54.6664	9.8887	1.0618	0.0000	0.0000	0.0000	0.0000	18.2043	126.0394	267.5286	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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	847.2546	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	89.5000	
Water heating fuel used	2468.8715	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	143.7909	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(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	3545.9170	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	847.2546	3.6400	30.8401	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	3.6400	89.8669	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)
Energy for lighting	143.7909	16.4900	23.7111	(250)
Additional standing charges			92.0000	(251)
Total energy cost			250.5995	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.8572	(257)
SAP value		86.1042	
SAP rating (Section 12)		86	(258)
SAP band		B	

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	847.2546	0.2100	177.9235	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			696.3865	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Total CO2, kg/year			729.0692	(272)
CO2 emissions per m2			12.1000	(273)
EI value			90.7169	
EI rating			91	(274)
EI band			B	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3027	(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) =	0.2573	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.2830	0.2702	0.2702	0.2509	0.2509	0.2187	0.2251	0.2380	0.2316	0.2444	0.2444	0.2702	(22b)
Effective ac	0.5400	0.5365	0.5365	0.5315	0.5315	0.5239	0.5253	0.5283	0.5268	0.5299	0.5299	0.5365	(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								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17765.3200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							294.9090	(35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160	
E3 Sill	10.8000	0.0230	0.2484	
E4 Jamb	35.2000	0.0240	0.8448	
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0370	0.2886	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820	
E18 Party wall between dwellings	15.6000	0.0160	0.2496	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			2.3398	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	32.0880	(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	27.9130	27.7291	27.7291	27.4692	27.4692	27.0790	27.1528	27.3067	27.2287	27.3869	27.3869	27.7291	(38)
Heat transfer coeff	60.0009	59.8170	59.8170	59.5572	59.5572	59.1669	59.2407	59.3947	59.3166	59.4749	59.4749	59.8170	(39)
Average = Sum(39)m / 12 =												59.5529	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9960	0.9930	0.9930	0.9887	0.9887	0.9822	0.9834	0.9860	0.9847	0.9873	0.9873	0.9930	(40)
HLP (average)												0.9886	
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												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	69.8233	68.7863	67.3260	64.6336	62.6175	60.3819	59.1744	60.6245	62.2033	64.5954	67.3433	69.5873	(42b)
Hot water usage for other uses	36.8351	35.4956	34.1562	32.8167	31.4773	30.1378	30.1378	31.4773	32.8167	34.1562	35.4956	36.8351	(42c)
Average daily hot water use (litres/day)												98.2236	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	106.6584	104.2820	101.4822	97.4503	94.0947	90.5197	89.3122	92.1017	95.0200	98.7516	102.8390	106.4223	(44)
Energy conte	168.9208	148.4961	155.9744	133.4046	126.6696	111.3045	108.0154	114.0412	117.1692	134.0050	146.5130	166.6317	(45)
Energy content (annual)										Total = Sum(45)m =		1631.1452	
Distribution loss (46)m = 0.15 x (45)m	25.3381	22.2744	23.3962	20.0107	19.0004	16.6957	16.2023	17.1062	17.5754	20.1007	21.9769	24.9947	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	48.0577	47.9496	44.6399	45.5125	46.9340	46.8592	50.3227	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
										Total per year (kWh/year) = Sum(64)m =		2209.6400	(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	68.9059	60.8818	64.6012	56.3714	54.1050	48.1687	47.2932	49.6522	50.6736	57.1373	61.0443	68.1448	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.3551	18.0792	14.7030	11.1311	8.3206	7.0246	7.5904	9.8662	13.2425	16.8143	19.6248	20.9208	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	92.6154	90.5979	86.8296	78.2937	72.7218	66.9010	63.5662	66.7368	70.3799	76.7975	84.7838	91.5924	(72)
Total internal gains	463.6902	462.0848	448.1667	421.6388	395.0537	367.8289	353.6306	356.3892	370.1820	397.5915	426.5911	451.8037	(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	
Southeast	4.8400	39.1209	0.6300	0.7000	0.7700	57.8664	(77)
Southwest	10.5600	39.1209	0.6300	0.7000	0.7700	126.2539	(79)
Northwest	8.3600	12.4928	0.6300	0.7000	0.7700	31.9181	(81)

Solar gains	216.0384	340.0656	493.4265	681.7560	783.4824	853.1628	816.9496	733.1311	607.9192	418.1804	269.2325	188.1218	(83)
Total gains	679.7286	802.1503	941.5932	1103.3948	1178.5362	1220.9917	1170.5802	1089.5203	978.1013	815.7720	695.8235	639.9255	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	82.2456	82.4984	82.4984	82.8583	82.8583	83.4049	83.3010	83.0851	83.1944	82.9730	82.9730	82.4984	
alpha	6.4830	6.4999	6.4999	6.5239	6.5239	6.5603	6.5534	6.5390	6.5463	6.5315	6.5315	6.4999	
util living area	0.9621	0.9122	0.7798	0.5656	0.3836	0.2229	0.1265	0.1472	0.3213	0.6348	0.8971	0.9712	(86)
MIT	20.5495	20.7259	20.9115	20.9885	20.9991	21.0000	21.0000	21.0000	20.9998	20.9817	20.7998	20.5019	(87)
Th 2	20.0866	20.0892	20.0892	20.0928	20.0928	20.0982	20.0972	20.0950	20.0961	20.0939	20.0939	20.0892	(88)
util rest of house	0.9504	0.8898	0.7401	0.5195	0.3380	0.1792	0.0808	0.0979	0.2666	0.5755	0.8670	0.9619	(89)
MIT 2	19.6045	19.8124	20.0108	20.0845	20.0923	20.0982	20.0972	20.0950	20.0961	20.0817	19.9047	19.5495	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.9732	20.1687	20.3622	20.4371	20.4461	20.4500	20.4494	20.4481	20.4486	20.4328	20.2539	19.9211	(92)
Temperature adjustment												-0.1500	
adjusted MIT	19.8232	20.0187	20.2122	20.2871	20.2961	20.3000	20.2994	20.2981	20.2986	20.2828	20.1039	19.7711	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9464	0.8879	0.7457	0.5295	0.3483	0.1890	0.0911	0.1089	0.2788	0.5882	0.8674	0.9579	(94)
Useful gains	643.2730	712.2281	702.1635	584.2447	410.4352	230.7471	106.5963	118.6748	272.7281	479.8052	603.5489	612.9637	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	865.4035	844.5413	742.4592	588.8509	410.7112	230.7505	106.5963	118.6749	272.7742	486.6715	696.0852	859.6344	(97)
Space heating kWh	165.2651	88.9145	29.9800	3.3164	0.2054	0.0000	0.0000	0.0000	0.0000	5.1086	66.6261	183.5230	(98a)
Space heating requirement - total per year (kWh/year)												542.9389	
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	165.2651	88.9145	29.9800	3.3164	0.2054	0.0000	0.0000	0.0000	0.0000	5.1086	66.6261	183.5230	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												542.9389	
Space heating per m2											(98c) / (4) =	9.0129	(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 %) 89.5000 (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	165.2651	88.9145	29.9800	3.3164	0.2054	0.0000	0.0000	0.0000	0.0000	5.1086	66.6261	183.5230	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	184.6538	99.3458	33.4972	3.7055	0.2294	0.0000	0.0000	0.0000	0.0000	5.7079	74.4426	205.0536	(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	219.8797	194.5235	206.9333	181.4622	174.6192	155.9444	153.5279	160.9752	164.0284	184.3277	195.8280	217.5906	(64)
Efficiency of water heater												89.5000	(216)
(217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(217)
Fuel for water heating, kWh/month	245.6757	217.3447	231.2104	202.7511	195.1053	174.2396	171.5395	179.8605	183.2719	205.9527	218.8023	243.1179	(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	17.8167	14.2932	12.8694	9.4287	7.2830	5.9503	6.6438	8.6359	11.2171	14.7175	16.6234	18.3119	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(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 1 606.6357 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 89.5000

Water heating fuel used 2468.8715 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

central heating pump 41.0000 (230c)

main heating flue fan 45.0000 (230e)

Total electricity for the above, kWh/year 86.0000 (231)

Electricity for lighting (calculated in Appendix L) 143.7909 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation 0.0000 (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	3305.2981	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	606.6357	6.3400	38.4607	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	6.3400	156.5265	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0000	22.3600	(249)
Energy for lighting	143.7909	26.0000	37.3856	(250)
Additional standing charges			113.0000	(251)
Total energy cost			367.7328	(255)

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	606.6357	0.2100	127.3935	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2468.8715	0.2100	518.4630	(264)
Space and water heating			645.8565	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	143.7909	0.1443	20.7535	(268)
Total CO2, kg/year			678.5392	(272)

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	606.6357	1.1300	685.4983	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2468.8715	1.1300	2789.8248	(278)
Space and water heating			3475.3232	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	143.7909	1.5338	220.5513	(282)
Total Primary energy kWh/year			3825.9752	(286)

Appendix 3

SAP Calculations – Be Clean

Appendix 4

SAP Calculations – Be Green

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11 - Be Green	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	91 B	**DER**	2.56	**TER**	15.86
Environmental	98 A	**% DER < TER**			83.86
CO_2 Emissions (t/year)	0.11	**DFEE**	39.37	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			1.07
% DPER < TPER	66.38	**DPER**	28.55	**TPER**	84.91

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.9000 (1b)	x	2.6300 (2b)	=	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.7570	(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	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)

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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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12418.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							230.4059	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000	
E16 Corner (normal)	2.6300	0.0370	0.0973	
E18 Party wall between dwellings	18.4100	0.0250	0.4603	
E14 Flat roof	16.5000	0.0800	1.3200	
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312	
E3 Sill	9.8000	0.0460	0.4508	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8552 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.9666 (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	13.5267	13.3527	13.1787	12.3089	12.1350	11.2652	11.2652	11.0912	11.6131	12.1350	12.4829	12.8308	(38)
Heat transfer coeff	50.4933	50.3193	50.1453	49.2755	49.1016	48.2318	48.2318	48.0578	48.5797	49.1016	49.4495	49.7974	(39)
Average = Sum(39)m / 12 =												49.2320	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9368	0.9336	0.9303	0.9142	0.9110	0.8948	0.8948	0.8916	0.9013	0.9110	0.9174	0.9239	(40)
HLP (average)												0.9134	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 88.3055 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)

Water storage loss (or HIU loss):
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.0044 (55)
Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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

206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(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	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
										Total per year (kWh/year) = Sum(64)m =		2106.9416	(64)
12Total per year (kWh/year)												2107	(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

94.0138	83.6968	90.1438	81.9932	81.3838	75.3870	75.8076	77.6089	77.1401	83.5766	85.9117	93.3295	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	126.3626	124.5488	121.1610	113.8795	109.3869	104.7041	101.8919	104.3130	107.1390	112.3341	119.3218	125.4429	(72)
Total internal gains	413.1482	421.4703	405.4648	392.0694	373.8743	361.4449	349.0448	349.8330	359.4190	370.7280	391.4181	405.2859	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	11.2829	0.4000	0.7000	0.7700	18.7846	(75)
Northwest	12.9800	11.2829	0.4000	0.7000	0.7700	28.4177	(81)
Southeast	1.0800	26.0000	0.4000	0.7000	1.0000	7.0762	(82)

Solar gains	54.2784	110.7781	199.2356	325.1175	434.4009	461.8403	432.5603	346.5641	242.2335	135.3817	68.3739	44.2631	(83)
Total gains	467.4265	532.2484	604.7004	717.1869	808.2752	823.2852	781.6051	696.3971	601.6525	506.1097	459.7920	449.5490	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.3198	68.5560	68.7938	70.0082	70.2562	71.5232	71.5232	71.7821	71.0109	70.2562	69.7619	69.2745	
alpha	5.5547	5.5704	5.5863	5.6672	5.6837	5.7682	5.7682	5.7855	5.7341	5.6837	5.6508	5.6183	
util living area	0.9828	0.9647	0.9145	0.7618	0.5552	0.3741	0.2714	0.3172	0.5483	0.8542	0.9633	0.9856	(86)
Living	20.1510	20.3434	20.6144	20.8892	20.9824	20.9985	20.9998	20.9996	20.9882	20.8258	20.4573	20.1274	
Non living	19.1647	19.4064	19.7362	20.0536	20.1449	20.1711	20.1718	20.1745	20.1592	19.9982	19.5618	19.1435	
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	20.5657	20.3434	20.6144	20.8892	20.9824	20.9985	20.9998	20.9996	20.9882	20.8258	20.4573	20.2495	(87)
Th 2	20.1363	20.1391	20.1418	20.1554	20.1582	20.1719	20.1719	20.1746	20.1664	20.1582	20.1527	20.1472	(88)
util rest of house	0.9783	0.9560	0.8952	0.7235	0.5081	0.3261	0.2204	0.2604	0.4856	0.8165	0.9527	0.9818	(89)
MIT 2	19.7490	19.4064	19.7362	20.0536	20.1449	20.1711	20.1718	20.1745	20.1592	19.9982	19.5618	19.3244	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	20.1051	19.8149	20.1191	20.4179	20.5101	20.5318	20.5328	20.5342	20.5206	20.3590	19.9522	19.7277	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1051	19.8149	20.1191	20.4179	20.5101	20.5318	20.5328	20.5342	20.5206	20.3590	19.9522	19.7277	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9781	0.9521	0.8947	0.7359	0.5280	0.3470	0.2426	0.2852	0.5126	0.8262	0.9498	0.9796	(94)
Useful gains	457.1981	506.7584	541.0170	527.7505	426.7403	285.6820	189.6462	198.5806	308.3969	418.1383	436.6956	440.3564	(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	798.0499	750.5083	682.9345	567.5516	432.5882	286.1024	189.6870	198.6808	311.9119	479.1826	635.5361	773.2394	(97)
Space heating kWh	253.5938	163.8000	105.5866	28.6568	4.3508	0.0000	0.0000	0.0000	0.0000	45.4170	143.1652	247.6650	(98a)
Space heating requirement - total per year (kWh/year)												992.2351	
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	253.5938	163.8000	105.5866	28.6568	4.3508	0.0000	0.0000	0.0000	0.0000	45.4170	143.1652	247.6650	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												992.2351	
Space heating per m2										(98c) / (4) =		18.4088	(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 %) 212.6387 (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	253.5938	163.8000	105.5866	28.6568	4.3508	0.0000	0.0000	0.0000	0.0000	45.4170	143.1652	247.6650	(98)
Space heating efficiency (main heating system 1)	212.6387	212.6387	212.6387	212.6387	212.6387	0.0000	0.0000	0.0000	0.0000	212.6387	212.6387	212.6387	(210)
Space heating fuel (main heating system)	119.2604	77.0321	49.6554	13.4767	2.0461	0.0000	0.0000	0.0000	0.0000	21.3588	67.3279	116.4722	(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	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
Efficiency of water heater												177.7243	(216)
(217)m	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	(217)
Fuel for water heating, kWh/month	116.0577	102.7637	109.5087	97.1043	94.6848	85.9250	85.2485	88.2966	88.8916	98.3954	103.7353	114.8997	(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	13.0873	11.8208	13.0873	12.6652	13.0873	12.6652	13.0873	13.0873	12.6652	13.0873	12.6652	13.0873	(231)
Lighting	14.5802	11.6967	10.5316	7.7159	5.9600	4.8694	5.4369	7.0671	9.1795	12.0440	13.6036	14.9854	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.1384	-46.6849	-78.3668	-100.4153	-118.3804	-114.2307	-112.6599	-101.1132	-81.6748	-58.2658	-33.1296	-23.4704	(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	-0.9553	-3.1906	-9.5260	-20.7228	-33.4881	-35.8149	-35.1050	-26.6479	-16.1512	-6.3511	-1.6550	-0.6829	(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												466.6296	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.7243	
Water heating fuel used												1185.5113	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	154.0927	(230a)
Total electricity for the above, kWh/year	154.0927	(231)
Electricity for lighting (calculated in Appendix L)	117.6702	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1086.8212	(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	837.0826	(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	466.6296	0.1578	73.6154	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1185.5113	0.1407	166.7808	(264)
Space and water heating			240.3962	(265)
Pumps, fans and electric keep-hot	154.0927	0.1387	21.3746	(267)
Energy for lighting	117.6702	0.1443	16.9834	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.5304	0.1319	-118.2862	
PV Unit electricity exported	-190.2908	0.1184	-22.5227	
Total			-140.8089	(269)
Total CO2, kg/year			137.9453	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5600	(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	466.6296	1.5840	739.1307	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1185.5113	1.5202	1802.1932	(278)
Space and water heating			2541.3240	(279)
Pumps, fans and electric keep-hot	154.0927	1.5128	233.1114	(281)
Energy for lighting	117.6702	1.5338	180.4865	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.5304	1.4875	-1333.5641	
PV Unit electricity exported	-190.2908	0.4341	-82.5994	
Total			-1416.1634	(283)
Total Primary energy kWh/year			1538.7585	(286)
Dwelling Primary energy Rate (DPER)			28.5500	(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		53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(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													
	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.4563 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	35.8147 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff													
	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
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		1.8051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day)		88.3055 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte 151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	

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

22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)

Water storage loss (or HIU loss):		
Store volume		150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.3938 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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

198.4589	175.5874	186.8197	165.0258	160.4740	145.1574	143.7034	149.1207	150.4298	167.0686	176.8106	196.4008	(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												
198.4589	175.5874	186.8197	165.0258	160.4740	145.1574	143.7034	149.1207	150.4298	167.0686	176.8106	196.4008	(64)
									Total per year (kWh/year) = Sum(64)m =		2015.0570	(64)
12Total per year (kWh/year)											2015	(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

87.7707	78.0579	83.9007	75.9515	75.1407	69.3453	69.5645	71.3657	71.0983	77.3334	79.8700	87.0864	(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 90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)													
	117.9714	116.1575	112.7697	105.4882	100.9956	96.3129	93.5006	95.9217	98.7477	103.9428	110.9305	117.0516	(72)
Total internal gains													
	407.7569	416.0790	400.0735	386.6781	368.4830	353.0537	340.6535	341.4418	351.0277	365.3367	386.0269	399.8946	(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	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	458.6364	519.9191	586.8323	691.4441	775.7022	786.0005	746.1501	666.3155	578.0939	492.2394	450.1189	441.3862	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area													
	0.9881	0.9778	0.9504	0.8580	0.6868	0.4914	0.3610	0.4198	0.6818	0.9160	0.9772	0.9899	(86)
MIT	19.7223	19.9239	20.2461	20.6592	20.9034	20.9839	20.9970	20.9941	20.9316	20.5850	20.0930	19.6942	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house													
	0.9846	0.9715	0.9364	0.8228	0.6264	0.4162	0.2772	0.3278	0.5990	0.8858	0.9696	0.9870	(89)
MIT 2	18.4773	18.7330	19.1346	19.6286	19.8820	19.9583	19.9660	19.9667	19.9196	19.5604	18.9574	18.4484	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	19.0201	19.2523	19.6192	20.0779	20.3273	20.4054	20.4155	20.4146	20.3609	20.0071	19.4525	18.9915	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0201	19.2523	19.6192	20.0779	20.3273	20.4054	20.4155	20.4146	20.3609	20.0071	19.4525	18.9915	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9663	0.9312	0.8274	0.6487	0.4485	0.3138	0.3679	0.6323	0.8875	0.9650	0.9834	(94)
Useful gains	449.7628	502.3899	546.4705	572.0813	503.1857	352.5498	234.1215	245.1686	365.5074	436.8521	434.3442	434.0589	(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													
	933.3482	907.6834	827.6031	696.7435	536.5453	357.2512	234.7951	246.5624	386.8539	585.0449	771.7339	928.5102	(97)
Space heating kWh													
	359.7876	272.3573	209.1626	89.7567	24.8196	0.0000	0.0000	0.0000	0.0000	110.2554	242.9206	367.8718	(98a)
Space heating requirement - total per year (kWh/year)												1676.9316	
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													
	359.7876	272.3573	209.1626	89.7567	24.8196	0.0000	0.0000	0.0000	0.0000	110.2554	242.9206	367.8718	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1676.9316	
Space heating per m2											(98c) / (4) =	31.1119	(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													
	359.7876	272.3573	209.1626	89.7567	24.8196	0.0000	0.0000	0.0000	0.0000	110.2554	242.9206	367.8718	(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)													
	389.8023	295.0783	226.6117	97.2446	26.8901	0.0000	0.0000	0.0000	0.0000	119.4533	263.1859	398.5610	(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													
	198.4589	175.5874	186.8197	165.0258	160.4740	145.1574	143.7034	149.1207	150.4298	167.0686	176.8106	196.4008	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3769	85.0405	84.3137	82.7547	80.8983	79.8000	79.8000	79.8000	79.8000	83.1505	84.7725	85.4458	(217)
Fuel for water heating, kWh/month													
	232.4504	206.4751	221.5768	199.4155	198.3652	181.9015	180.0794	186.8680	188.5085	200.9233	208.5706	229.8542	(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	16.4901	13.2290	11.9112	8.7267	6.7407	5.5072	6.1491	7.9929	10.3819	13.6217	15.3856	16.9484	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-12.0404	-18.1098	-27.7558	-33.3520	-37.8870	-36.0888	-35.6638	-32.7112	-27.8473	-21.6382	-13.6382	-10.2824	(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	-3.7437	-8.0968	-16.5111	-25.4209	-34.2241	-34.5992	-34.1786	-28.6462	-20.6258	-11.7655	-5.0582	-2.9433	(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	1816.8273	(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	2434.9885	(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)	133.0846	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-532.8285	(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	3938.0718	(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	1816.8273	0.2100	381.5337	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2434.9885	0.2100	511.3476	(264)
Space and water heating			892.8813	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.0846	0.1443	19.2082	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	0.1332	-40.9058	
PV Unit electricity exported	-225.8135	0.1252	-28.2691	
Total			-69.1749	(269)
Total CO2, kg/year			854.8439	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8600	(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	1816.8273	1.1300	2053.0148	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2434.9885	1.1300	2751.5370	(278)
Space and water heating			4804.5518	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.0846	1.5338	204.1296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	1.4923	-458.1722	
PV Unit electricity exported	-225.8135	0.4595	-103.7595	
Total			-561.9317	(283)
Total Primary energy kWh/year			4576.8505	(286)
Target Primary Energy Rate (TPER)			84.9100	(287)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11 - Be Green	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	91 B	**DER**	2.56	**TER**	15.86
Environmental	98 A	**% DER < TER**			83.86
CO_2 Emissions (t/year)	0.11	**DFEE**	39.37	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			1.07
% DPER < TPER	66.38	**DPER**	28.55	**TPER**	84.91

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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			2 * 10 =	20.0000 (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) =			20.0000 / (5) =	0.1411 (8)
Pressure test				Yes
Pressure Test Method				Blower Door
Measured/design AP50				3.5000 (17)
Infiltration rate				0.3161 (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) =		0.2687 (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	0.3426	0.3358	0.3291	0.2955	0.2888	0.2552	0.2552	0.2485	0.2687	0.2888	0.3023	0.3157	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5587	0.5564	0.5542	0.5437	0.5417	0.5326	0.5326	0.5309	0.5361	0.5417	0.5457	0.5498	(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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973

E18 Party wall between dwellings	18.4100	0.0250	0.4603	
E14 Flat roof	16.5000	0.0800	1.3200	
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312	
E3 Sill	9.8000	0.0460	0.4508	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8552 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.9666 (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	26.1346	26.0280	25.9236	25.4329	25.3411	24.9137	24.9137	24.8346	25.0783	25.3411	25.5268	25.7210	(38)
Heat transfer coeff	63.1012	62.9946	62.8902	62.3995	62.3077	61.8803	61.8803	61.8011	62.0449	62.3077	62.4934	62.6876	(39)
Average = Sum(39)m / 12 =												62.3990	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1707	1.1687	1.1668	1.1577	1.1560	1.1481	1.1481	1.1466	1.1511	1.1560	1.1594	1.1630	(40)
HLP (average)												1.1577	
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 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.5533	23.2035	22.7109	21.8027	21.1226	20.3685	19.9612	20.4503	20.9829	21.7898	22.7168	23.4737	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 51.9428 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.6690	55.1150	53.4182	51.3057	49.4214	47.4631	47.0558	48.7491	50.4859	52.4971	54.6282	56.5894	(44)
Energy conte	89.7498	78.4830	82.1018	70.2350	66.5307	58.3614	56.9099	60.3616	62.2542	71.2380	77.8279	88.6053	(45)
Energy content (annual)										Total = Sum(45)m =		862.6586	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(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	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(64)
										Total per year (kWh/year) = Sum(64)m =		733.2598	(64)
12Total per year (kWh/year)												733	(64)
Electric shower(s)	43.6330	38.8774	42.4526	40.5120	41.2722	39.3696	40.6820	41.2722	40.5120	42.4526	41.6543	43.6330	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		496.3227	(64a)
Heat gains from water heating, kWh/month	29.9801	26.3970	28.0598	25.0529	24.4558	22.2442	22.2638	23.1449	23.3570	25.7512	26.9520	29.7369	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	40.2958	39.2812	37.7147	34.7957	32.8707	30.8947	29.9245	31.1087	32.4403	34.6119	37.4333	39.9689	(72)
Total internal gains	327.0813	336.2027	322.0185	312.9856	297.3582	287.6355	277.0773	276.6288	284.7203	293.0057	309.5297	319.8119	(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	
Northeast	8.5800	11.2829	0.4000	0.7000	0.7700	18.7846	(75)
Northwest	12.9800	11.2829	0.4000	0.7000	0.7700	28.4177	(81)
Southeast	1.0800	26.0000	0.4000	0.7000	1.0000	7.0762	(82)

Solar gains	54.2784	110.7781	199.2356	325.1175	434.4009	461.8403	432.5603	346.5641	242.2335	135.3817	68.3739	44.2631	(83)
Total gains	381.3597	446.9808	521.2541	638.1031	731.7591	749.4758	709.6377	623.1929	526.9538	428.3875	377.9036	364.0750	(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	54.6691	54.7616	54.8526	55.2839	55.3654	55.7478	55.7478	55.8192	55.5999	55.3654	55.2009	55.0299	
alpha	4.6446	4.6508	4.6568	4.6856	4.6910	4.7165	4.7165	4.7213	4.7067	4.6910	4.6801	4.6687	
util living area	0.9943	0.9875	0.9669	0.8857	0.7168	0.5158	0.3811	0.4500	0.7299	0.9463	0.9884	0.9954	(86)
MIT	19.5754	19.7899	20.1380	20.5980	20.8837	20.9799	20.9961	20.9918	20.9078	20.4862	19.9521	19.5392	(87)
Th 2	19.9435	19.9451	19.9467	19.9540	19.9554	19.9618	19.9618	19.9630	19.9593	19.9554	19.9526	19.9497	(88)
util rest of house	0.9926	0.9837	0.9569	0.8546	0.6568	0.4374	0.2925	0.3516	0.6475	0.9244	0.9842	0.9940	(89)
MIT 2	18.6583	18.8718	19.2136	19.6482	19.8838	19.9533	19.9608	19.9607	19.9120	19.5595	19.0399	18.6270	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.0582	19.2721	19.6166	20.0623	20.3198	20.4009	20.4122	20.4103	20.3461	19.9636	19.4376	19.0247	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0582	19.2721	19.6166	20.0623	20.3198	20.4009	20.4122	20.4103	20.3461	19.9636	19.4376	19.0247	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9906	0.9806	0.9531	0.8582	0.6787	0.4711	0.3312	0.3946	0.6800	0.9246	0.9816	0.9923	(94)
Useful gains	377.7747	438.3274	496.8037	547.6042	496.6377	353.0658	235.0246	245.9106	358.3473	396.0885	370.9354	361.2736	(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	931.2594	905.3665	824.9083	696.5230	537.0777	358.9613	235.8998	247.8407	387.5414	583.4211	771.0215	929.3253	(97)
Space heating kWh	411.7926	313.8503	244.1098	107.2215	30.0873	0.0000	0.0000	0.0000	0.0000	139.3754	288.0620	422.6305	(98a)
Space heating requirement - total per year (kWh/year)												1957.1295	
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	411.7926	313.8503	244.1098	107.2215	30.0873	0.0000	0.0000	0.0000	0.0000	139.3754	288.0620	422.6305	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1957.1295	
Space heating per m2											(98c) / (4) =	36.3104	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	581.6747	457.9141	469.6887	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9377	0.9670	0.9432	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	545.4130	442.7940	442.9908	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	838.2530	793.7621	695.7144	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	210.8448	261.1203	188.0263	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	52.7112	65.2801	47.0066	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												164.9978	(107)
Energy for space heating												36.3104	(99)
Energy for space cooling												3.0612	(108)
Total												39.3716	(109)
Fabric Energy Efficiency (DFEE)												39.4	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000 (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) =	20.0000 / (5) =	0.1411 (8)
Pressure test		Yes

Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.3911	(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) =	0.3324	(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	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(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								
TER Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.4563	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	35.8147	(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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8051	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.5533	23.2035	22.7109	21.8027	21.1226	20.3685	19.9612	20.4503	20.9829	21.7898	22.7168	23.4737	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day)	51.9428	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.6690	55.1150	53.4182	51.3057	49.4214	47.4631	47.0558	48.7491	50.4859	52.4971	54.6282	56.5894	(44)
Energy conte	89.7498	78.4830	82.1018	70.2350	66.5307	58.3614	56.9099	60.3616	62.2542	71.2380	77.8279	88.6053	(45)
Energy content (annual)										Total = Sum(45)m =		862.6586	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(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	76.2873	66.7105	69.7865	59.6997	56.5511	49.6072	48.3734	51.3074	52.9161	60.5523	66.1537	75.3145	(64)
										Total per year (kWh/year) = Sum(64)m =		733.2598	(64)
12Total per year (kWh/year)												733	(64)
Electric shower(s)	43.6330	38.8774	42.4526	40.5120	41.2722	39.3696	40.6820	41.2722	40.5120	42.4526	41.6543	43.6330	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		496.3227	(64a)
Heat gains from water heating, kWh/month	29.9801	26.3970	28.0598	25.0529	24.4558	22.2442	22.2638	23.1449	23.3570	25.7512	26.9520	29.7369	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)													
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)													
	40.2958	39.2812	37.7147	34.7957	32.8707	30.8947	29.9245	31.1087	32.4403	34.6119	37.4333	39.9689	(72)
Total internal gains													
	327.0813	336.2027	322.0185	312.9856	297.3582	287.6355	277.0773	276.6288	284.7203	293.0057	309.5297	319.8119	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	377.9608	440.0427	508.7773	617.7516	704.5774	720.5824	682.5739	601.5025	511.7865	419.9084	373.6217	361.3035	(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	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area													
	0.9945	0.9883	0.9698	0.8955	0.7347	0.5319	0.3937	0.4627	0.7425	0.9496	0.9889	0.9955	(86)
MIT	19.5593	19.7688	20.1103	20.5743	20.8714	20.9776	20.9956	20.9911	20.9017	20.4745	19.9440	19.5309	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house													
	0.9928	0.9847	0.9605	0.8661	0.6753	0.4521	0.3028	0.3625	0.6609	0.9288	0.9849	0.9942	(89)
MIT 2	18.6388	18.8482	19.1848	19.6288	19.8772	19.9574	19.9658	19.9663	19.9121	19.5505	19.0322	18.6178	(90)
Living area fraction									fLA = Living area / (4) =			0.4360	(91)
MIT	19.0401	19.2496	19.5883	20.0410	20.3106	20.4022	20.4148	20.4131	20.3436	19.9534	19.4298	19.0159	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0401	19.2496	19.5883	20.0410	20.3106	20.4022	20.4148	20.4131	20.3436	19.9534	19.4298	19.0159	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9909	0.9817	0.9567	0.8688	0.6965	0.4864	0.3425	0.4062	0.6928	0.9287	0.9823	0.9925	(94)
Useful gains	374.5271	432.0019	486.7499	536.6887	490.7232	350.4639	233.7710	244.3447	354.5892	389.9739	367.0081	358.6038	(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													
	934.6190	907.5144	825.6551	694.4420	535.5095	357.0519	234.7542	246.4677	385.7865	581.6999	770.3121	930.0395	(97)
Space heating kWh													
	416.7084	319.5444	252.1455	113.5823	33.3210	0.0000	0.0000	0.0000	0.0000	142.6442	290.3789	425.1481	(98a)
Space heating requirement - total per year (kWh/year)												1993.4728	
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													
	416.7084	319.5444	252.1455	113.5823	33.3210	0.0000	0.0000	0.0000	0.0000	142.6442	290.3789	425.1481	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1993.4728	
Space heating per m2											(98c) / (4) =	36.9847	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	578.4508	455.3761	466.7628	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9308	0.9631	0.9378	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	538.4380	438.5622	437.7483	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	805.0941	762.7081	670.8430	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	191.9924	241.1646	173.4225	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	47.9981	60.2911	43.3556	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												151.6449	(107)
Energy for space heating												36.9847	(99)
Energy for space cooling												2.8134	(108)
Total												39.7981	(109)
Fabric Energy Efficiency (TFEE)												39.8	(109)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11 - Be Green	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	91 B	**DER**	2.56	**TER**	15.86
Environmental	98 A	**% DER < TER**			83.86
CO_2 Emissions (t/year)	0.11	**DFEE**	39.37	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			1.07
% DPER < TPER	66.38	**DPER**	28.55	**TPER**	84.91

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	53.9000 (1b)	x	2.6300 (2b)	=	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.7570	(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	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)

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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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		12418.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							230.4059	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000	
E16 Corner (normal)	2.6300	0.0370	0.0973	
E18 Party wall between dwellings	18.4100	0.0250	0.4603	
E14 Flat roof	16.5000	0.0800	1.3200	
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560	
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312	
E3 Sill	9.8000	0.0460	0.4508	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8552 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.9666 (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	13.5267	13.3527	13.1787	12.3089	12.1350	11.2652	11.2652	11.0912	11.6131	12.1350	12.4829	12.8308	(38)
Heat transfer coeff	50.4933	50.3193	50.1453	49.2755	49.1016	48.2318	48.2318	48.0578	48.5797	49.1016	49.4495	49.7974	(39)
Average = Sum(39)m / 12 =												49.2320	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9368	0.9336	0.9303	0.9142	0.9110	0.8948	0.8948	0.8916	0.9013	0.9110	0.9174	0.9239	(40)
HLP (average)												0.9134	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 88.3055 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)

Water storage loss (or HIU loss):
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.0044 (55)
Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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

206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(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	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
										Total per year (kWh/year) = Sum(64)m =		2106.9416	(64)
12Total per year (kWh/year)												2107	(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

94.0138	83.6968	90.1438	81.9932	81.3838	75.3870	75.8076	77.6089	77.1401	83.5766	85.9117	93.3295	(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	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	126.3626	124.5488	121.1610	113.8795	109.3869	104.7041	101.8919	104.3130	107.1390	112.3341	119.3218	125.4429	(72)
Total internal gains	413.1482	421.4703	405.4648	392.0694	373.8743	361.4449	349.0448	349.8330	359.4190	370.7280	391.4181	405.2859	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	11.2829	0.4000	0.7000	0.7700	18.7846	(75)
Northwest	12.9800	11.2829	0.4000	0.7000	0.7700	28.4177	(81)
Southeast	1.0800	26.0000	0.4000	0.7000	1.0000	7.0762	(82)

Solar gains	54.2784	110.7781	199.2356	325.1175	434.4009	461.8403	432.5603	346.5641	242.2335	135.3817	68.3739	44.2631	(83)
Total gains	467.4265	532.2484	604.7004	717.1869	808.2752	823.2852	781.6051	696.3971	601.6525	506.1097	459.7920	449.5490	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.3198	68.5560	68.7938	70.0082	70.2562	71.5232	71.5232	71.7821	71.0109	70.2562	69.7619	69.2745	
alpha	5.5547	5.5704	5.5863	5.6672	5.6837	5.7682	5.7682	5.7855	5.7341	5.6837	5.6508	5.6183	
util living area	0.9828	0.9647	0.9145	0.7618	0.5552	0.3741	0.2714	0.3172	0.5483	0.8542	0.9633	0.9856	(86)
Living	20.1510	20.3434	20.6144	20.8892	20.9824	20.9985	20.9998	20.9996	20.9882	20.8258	20.4573	20.1274	
Non living	19.1647	19.4064	19.7362	20.0536	20.1449	20.1711	20.1718	20.1745	20.1592	19.9982	19.5618	19.1435	
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	20.5657	20.3434	20.6144	20.8892	20.9824	20.9985	20.9998	20.9996	20.9882	20.8258	20.4573	20.2495	(87)
Th 2	20.1363	20.1391	20.1418	20.1554	20.1582	20.1719	20.1719	20.1746	20.1664	20.1582	20.1527	20.1472	(88)
util rest of house	0.9783	0.9560	0.8952	0.7235	0.5081	0.3261	0.2204	0.2604	0.4856	0.8165	0.9527	0.9818	(89)
MIT 2	19.7490	19.4064	19.7362	20.0536	20.1449	20.1711	20.1718	20.1745	20.1592	19.9982	19.5618	19.3244	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	20.1051	19.8149	20.1191	20.4179	20.5101	20.5318	20.5328	20.5342	20.5206	20.3590	19.9522	19.7277	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1051	19.8149	20.1191	20.4179	20.5101	20.5318	20.5328	20.5342	20.5206	20.3590	19.9522	19.7277	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9781	0.9521	0.8947	0.7359	0.5280	0.3470	0.2426	0.2852	0.5126	0.8262	0.9498	0.9796	(94)
Useful gains	457.1981	506.7584	541.0170	527.7505	426.7403	285.6820	189.6462	198.5806	308.3969	418.1383	436.6956	440.3564	(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	798.0499	750.5083	682.9345	567.5516	432.5882	286.1024	189.6870	198.6808	311.9119	479.1826	635.5361	773.2394	(97)
Space heating kWh	253.5938	163.8000	105.5866	28.6568	4.3508	0.0000	0.0000	0.0000	0.0000	45.4170	143.1652	247.6650	(98a)
Space heating requirement - total per year (kWh/year)												992.2351	
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	253.5938	163.8000	105.5866	28.6568	4.3508	0.0000	0.0000	0.0000	0.0000	45.4170	143.1652	247.6650	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												992.2351	
Space heating per m2										(98c) / (4) =		18.4088	(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 %) 212.6387 (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	253.5938	163.8000	105.5866	28.6568	4.3508	0.0000	0.0000	0.0000	0.0000	45.4170	143.1652	247.6650	(98)
Space heating efficiency (main heating system 1)	212.6387	212.6387	212.6387	212.6387	212.6387	0.0000	0.0000	0.0000	0.0000	212.6387	212.6387	212.6387	(210)
Space heating fuel (main heating system)	119.2604	77.0321	49.6554	13.4767	2.0461	0.0000	0.0000	0.0000	0.0000	21.3588	67.3279	116.4722	(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	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
Efficiency of water heater												177.7243	(216)
(217)m	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	(217)
Fuel for water heating, kWh/month	116.0577	102.7637	109.5087	97.1043	94.6848	85.9250	85.2485	88.2966	88.8916	98.3954	103.7353	114.8997	(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	13.0873	11.8208	13.0873	12.6652	13.0873	12.6652	13.0873	13.0873	12.6652	13.0873	12.6652	13.0873	(231)
Lighting	14.5802	11.6967	10.5316	7.7159	5.9600	4.8694	5.4369	7.0671	9.1795	12.0440	13.6036	14.9854	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.1384	-46.6849	-78.3668	-100.4153	-118.3804	-114.2307	-112.6599	-101.1132	-81.6748	-58.2658	-33.1296	-23.4704	(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	-0.9553	-3.1906	-9.5260	-20.7228	-33.4881	-35.8149	-35.1050	-26.6479	-16.1512	-6.3511	-1.6550	-0.6829	(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												466.6296	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.7243	
Water heating fuel used												1185.5113	(219)

Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	154.0927	(230a)
Total electricity for the above, kWh/year	154.0927	(231)
Electricity for lighting (calculated in Appendix L)	117.6702	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1086.8212	(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	837.0826	(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	466.6296	0.1578	73.6154	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1185.5113	0.1407	166.7808	(264)
Space and water heating			240.3962	(265)
Pumps, fans and electric keep-hot	154.0927	0.1387	21.3746	(267)
Energy for lighting	117.6702	0.1443	16.9834	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.5304	0.1319	-118.2862	
PV Unit electricity exported	-190.2908	0.1184	-22.5227	
Total			-140.8089	(269)
Total CO2, kg/year			137.9453	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.5600	(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	466.6296	1.5840	739.1307	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1185.5113	1.5202	1802.1932	(278)
Space and water heating			2541.3240	(279)
Pumps, fans and electric keep-hot	154.0927	1.5128	233.1114	(281)
Energy for lighting	117.6702	1.5338	180.4865	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.5304	1.4875	-1333.5641	
PV Unit electricity exported	-190.2908	0.4341	-82.5994	
Total			-1416.1634	(283)
Total Primary energy kWh/year			1538.7585	(286)
Dwelling Primary energy Rate (DPER)			28.5500	(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		53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		141.7570	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1411	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3911	(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) =	0.3324	(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													
	0.4238	0.4155	0.4072	0.3657	0.3574	0.3158	0.3158	0.3075	0.3324	0.3574	0.3740	0.3906	(22b)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5639	0.5499	0.5499	0.5473	0.5553	0.5639	0.5699	0.5763	(25)

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3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			12.8400	1.1450	14.7023			(27)
TER Roof Light			0.6400	1.5918	1.2941			(27a)
External Wall	43.3900	12.8400	30.5500	0.1800	5.4990			(29a)
External Roof 1	53.9400	0.6400	53.3000	0.1100	5.8630			(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3584			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0700	1.1550
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0900	0.2367
E18 Party wall between dwellings	18.4100	0.0600	1.1046
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0500	0.4900
E3 Sill	9.8000	0.0500	0.4900
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		8.4563 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	35.8147 (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	27.5917	27.4285	27.2686	26.5174	26.3769	25.7226	25.7226	25.6014	25.9746	26.3769	26.6612	26.9584	(38)
Heat transfer coeff													
	63.4064	63.2432	63.0833	62.3321	62.1916	61.5373	61.5373	61.4162	61.7893	62.1916	62.4759	62.7731	(39)
Average = Sum(39)m / 12 =												62.3314	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1764	1.1733	1.1704	1.1564	1.1538	1.1417	1.1417	1.1394	1.1464	1.1538	1.1591	1.1646	(40)
HLP (average)												1.1564	
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		1.8051 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day)		88.3055 (43)

Daily hot water use

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte 151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	

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

22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)

Water storage loss (or HIU loss):		
Store volume		150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.3938 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.7527 (55)

Total storage loss

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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

198.4589	175.5874	186.8197	165.0258	160.4740	145.1574	143.7034	149.1207	150.4298	167.0686	176.8106	196.4008	(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												
198.4589	175.5874	186.8197	165.0258	160.4740	145.1574	143.7034	149.1207	150.4298	167.0686	176.8106	196.4008	(64)
									Total per year (kWh/year) = Sum(64)m =		2015.0570	(64)
12Total per year (kWh/year)											2015	(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

87.7707	78.0579	83.9007	75.9515	75.1407	69.3453	69.5645	71.3657	71.0983	77.3334	79.8700	87.0864	(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 90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	90.2531	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	79.3632	87.8664	79.3632	82.0086	79.3632	82.0086	79.3632	79.3632	82.0086	79.3632	82.0086	79.3632	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	157.3464	158.9792	154.8647	146.1054	135.0483	124.6562	117.7137	116.0809	120.1954	128.9547	140.0118	150.4039	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	32.0253	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)													
	117.9714	116.1575	112.7697	105.4882	100.9956	96.3129	93.5006	95.9217	98.7477	103.9428	110.9305	117.0516	(72)
Total internal gains													
	407.7569	416.0790	400.0735	386.6781	368.4830	353.0537	340.6535	341.4418	351.0277	365.3367	386.0269	399.8946	(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	
Northeast	5.1100	11.2829	0.6300	0.7000	0.7700	17.6204	(75)
Northwest	7.7300	11.2829	0.6300	0.7000	0.7700	26.6547	(81)
Southeast	0.6400	26.0000	0.6300	0.7000	1.0000	6.6044	(82)

Solar gains	50.8795	103.8400	186.7588	304.7660	407.2192	432.9469	405.4966	324.8738	227.0662	126.9027	64.0920	41.4916	(83)
Total gains	458.6364	519.9191	586.8323	691.4441	775.7022	786.0005	746.1501	666.3155	578.0939	492.2394	450.1189	441.3862	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.4060	54.5464	54.6847	55.3437	55.4688	56.0585	56.0585	56.1691	55.8299	55.4688	55.2163	54.9549	
alpha	4.6271	4.6364	4.6456	4.6896	4.6979	4.7372	4.7372	4.7446	4.7220	4.6979	4.6811	4.6637	
util living area													
	0.9881	0.9778	0.9504	0.8580	0.6868	0.4914	0.3610	0.4198	0.6818	0.9160	0.9772	0.9899	(86)
MIT	19.7223	19.9239	20.2461	20.6592	20.9034	20.9839	20.9970	20.9941	20.9316	20.5850	20.0930	19.6942	(87)
Th 2	19.9389	19.9414	19.9438	19.9550	19.9571	19.9669	19.9669	19.9687	19.9631	19.9571	19.9529	19.9484	(88)
util rest of house													
	0.9846	0.9715	0.9364	0.8228	0.6264	0.4162	0.2772	0.3278	0.5990	0.8858	0.9696	0.9870	(89)
MIT 2	18.4773	18.7330	19.1346	19.6286	19.8820	19.9583	19.9660	19.9667	19.9196	19.5604	18.9574	18.4484	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	19.0201	19.2523	19.6192	20.0779	20.3273	20.4054	20.4155	20.4146	20.3609	20.0071	19.4525	18.9915	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0201	19.2523	19.6192	20.0779	20.3273	20.4054	20.4155	20.4146	20.3609	20.0071	19.4525	18.9915	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9807	0.9663	0.9312	0.8274	0.6487	0.4485	0.3138	0.3679	0.6323	0.8875	0.9650	0.9834	(94)
Useful gains	449.7628	502.3899	546.4705	572.0813	503.1857	352.5498	234.1215	245.1686	365.5074	436.8521	434.3442	434.0589	(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													
	933.3482	907.6834	827.6031	696.7435	536.5453	357.2512	234.7951	246.5624	386.8539	585.0449	771.7339	928.5102	(97)
Space heating kWh													
	359.7876	272.3573	209.1626	89.7567	24.8196	0.0000	0.0000	0.0000	0.0000	110.2554	242.9206	367.8718	(98a)
Space heating requirement - total per year (kWh/year)												1676.9316	
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													
	359.7876	272.3573	209.1626	89.7567	24.8196	0.0000	0.0000	0.0000	0.0000	110.2554	242.9206	367.8718	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1676.9316	
Space heating per m2											(98c) / (4) =	31.1119	(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													
	359.7876	272.3573	209.1626	89.7567	24.8196	0.0000	0.0000	0.0000	0.0000	110.2554	242.9206	367.8718	(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)													
	389.8023	295.0783	226.6117	97.2446	26.8901	0.0000	0.0000	0.0000	0.0000	119.4533	263.1859	398.5610	(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													
	198.4589	175.5874	186.8197	165.0258	160.4740	145.1574	143.7034	149.1207	150.4298	167.0686	176.8106	196.4008	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.3769	85.0405	84.3137	82.7547	80.8983	79.8000	79.8000	79.8000	79.8000	83.1505	84.7725	85.4458	(217)
Fuel for water heating, kWh/month													
	232.4504	206.4751	221.5768	199.4155	198.3652	181.9015	180.0794	186.8680	188.5085	200.9233	208.5706	229.8542	(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	16.4901	13.2290	11.9112	8.7267	6.7407	5.5072	6.1491	7.9929	10.3819	13.6217	15.3856	16.9484	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-12.0404	-18.1098	-27.7558	-33.3520	-37.8870	-36.0888	-35.6638	-32.7112	-27.8473	-21.6382	-13.6382	-10.2824	(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	-3.7437	-8.0968	-16.5111	-25.4209	-34.2241	-34.5992	-34.1786	-28.6462	-20.6258	-11.7655	-5.0582	-2.9433	(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	1816.8273	(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	2434.9885	(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)	133.0846	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-532.8285	(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	3938.0718	(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	1816.8273	0.2100	381.5337	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2434.9885	0.2100	511.3476	(264)
Space and water heating			892.8813	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	133.0846	0.1443	19.2082	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	0.1332	-40.9058	
PV Unit electricity exported	-225.8135	0.1252	-28.2691	
Total			-69.1749	(269)
Total CO2, kg/year			854.8439	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			15.8600	(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	1816.8273	1.1300	2053.0148	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2434.9885	1.1300	2751.5370	(278)
Space and water heating			4804.5518	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	133.0846	1.5338	204.1296	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-307.0150	1.4923	-458.1722	
PV Unit electricity exported	-225.8135	0.4595	-103.7595	
Total			-561.9317	(283)
Total Primary energy kWh/year			4576.8505	(286)
Target Primary Energy Rate (TPER)			84.9100	(287)

Full SAP Calculation Printout

Plot Reference	Flat 11	**Issued on Date**	24/09/2026
Assessment Reference	Flat 11 - Be Green	**Plot Type Ref**	Flat 11
Plot Address	Flat 11, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	91 B	**DER**	2.56	**TER**	15.86
Environmental	98 A	**% DER < TER**			83.86
CO_2 Emissions (t/year)	0.11	**DFEE**	39.37	**TFEE**	39.80
Compliance Check	See BREL	**% DFEE < TFEE**			1.07
% DPER < TPER	66.38	**DPER**	28.55	**TPER**	84.91

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000 (1b)	x	2.6300 (2b)	=	141.7570	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.7570	(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	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)

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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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312
E3 Sill	9.8000	0.0460	0.4508
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.8552 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 36.9666 (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	13.5267	13.3527	13.1787	12.3089	12.1350	11.2652	11.2652	11.0912	11.6131	12.1350	12.4829	12.8308	(38)
Heat transfer coeff	50.4933	50.3193	50.1453	49.2755	49.1016	48.2318	48.2318	48.0578	48.5797	49.1016	49.4495	49.7974	(39)
Average = Sum(39)m / 12 =												49.2320	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9368	0.9336	0.9303	0.9142	0.9110	0.8948	0.8948	0.8916	0.9013	0.9110	0.9174	0.9239	(40)
HLP (average)												0.9134	
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 1.8051 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day) 88.3055 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)

Water storage loss (or HIU loss):
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.0044 (55)
Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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

206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(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													
206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
									Total per year (kWh/year) = Sum(64)m =		2106.9416	(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

94.0138	83.6968	90.1438	81.9932	81.3838	75.3870	75.8076	77.6089	77.1401	83.5766	85.9117	93.3295	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6574	14.7950	12.0321	9.1091	6.8091	5.7486	6.2115	8.0740	10.8369	13.7599	16.0598	17.1204	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(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)	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)	126.3626	124.5488	121.1610	113.8795	109.3869	104.7041	101.8919	104.3130	107.1390	112.3341	119.3218	125.4429	(72)
Total internal gains	461.6021	460.3628	448.0711	424.7929	401.4973	380.2435	367.5322	369.3788	381.1087	402.3004	428.0911	450.7834	(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	
Northeast	8.5800	11.2829	0.4000	0.7000	0.7700	18.7846	(75)
Northwest	12.9800	11.2829	0.4000	0.7000	0.7700	28.4177	(81)
Southeast	1.0800	26.0000	0.4000	0.7000	1.0000	7.0762	(82)

Solar gains 54.2784	110.7781	199.2356	325.1175	434.4009	461.8403	432.5603	346.5641	242.2335	135.3817	68.3739	44.2631	(83)

Total gains	515.8805	571.1410	647.3067	749.9104	835.8982	842.0838	800.0926	715.9428	623.3422	537.6822	496.4650	495.0464	(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	68.3198	68.5560	68.7938	70.0082	70.2562	71.5232	71.5232	71.7821	71.0109	70.2562	69.7619	69.2745	
alpha	5.5547	5.5704	5.5863	5.6672	5.6837	5.7682	5.7682	5.7855	5.7341	5.6837	5.6508	5.6183	
util living area													
	0.9736	0.9532	0.8928	0.7384	0.5382	0.3659	0.2652	0.3085	0.5305	0.8276	0.9501	0.9779	(86)
Living	20.2459	20.4119	20.6697	20.9055	20.9849	20.9987	20.9998	20.9996	20.9900	20.8540	20.5211	20.2183	
Non living	19.2828	19.4896	19.7992	20.0694	20.1469	20.1712	20.1718	20.1745	20.1603	20.0265	19.6384	19.2572	
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	20.6142	20.4119	20.6697	20.9055	20.9849	20.9987	20.9998	20.9996	20.9900	20.8540	20.5211	20.3277	(87)
Th 2	20.1363	20.1391	20.1418	20.1554	20.1582	20.1719	20.1719	20.1746	20.1664	20.1582	20.1527	20.1472	(88)
util rest of house													
	0.9670	0.9422	0.8706	0.6993	0.4921	0.3188	0.2153	0.2533	0.4694	0.7870	0.9365	0.9723	(89)
MIT 2	19.7961	19.4896	19.7992	20.0694	20.1469	20.1712	20.1718	20.1745	20.1603	20.0265	19.6384	19.4176	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	20.1528	19.8917	20.1787	20.4339	20.5123	20.5320	20.5328	20.5342	20.5220	20.3873	20.0233	19.8144	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1528	19.8917	20.1787	20.4339	20.5123	20.5320	20.5328	20.5342	20.5220	20.3873	20.0233	19.8144	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9672	0.9386	0.8716	0.7126	0.5117	0.3393	0.2370	0.2774	0.4957	0.7988	0.9341	0.9697	(94)
Useful gains	498.9471	536.0579	564.2055	534.3995	427.6893	285.7349	189.6517	198.5964	309.0084	429.4942	463.7684	480.0589	(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													
	800.4578	754.3733	685.9245	568.3414	432.6957	286.1084	189.6876	198.6827	311.9811	480.5717	639.0498	777.5556	(97)
Space heating kWh													
	224.3240	146.7080	90.5590	24.4382	3.7248	0.0000	0.0000	0.0000	0.0000	38.0017	126.2026	221.3376	(98a)
Space heating requirement - total per year (kWh/year)												875.2958	
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													
	224.3240	146.7080	90.5590	24.4382	3.7248	0.0000	0.0000	0.0000	0.0000	38.0017	126.2026	221.3376	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												875.2958	
Space heating per m2											(98c) / (4) =	16.2393	(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 %)												212.6387	(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													
	224.3240	146.7080	90.5590	24.4382	3.7248	0.0000	0.0000	0.0000	0.0000	38.0017	126.2026	221.3376	(98)
Space heating efficiency (main heating system 1)													
	212.6387	212.6387	212.6387	212.6387	212.6387	0.0000	0.0000	0.0000	0.0000	212.6387	212.6387	212.6387	(210)
Space heating fuel (main heating system)													
	105.4954	68.9940	42.5882	11.4928	1.7517	0.0000	0.0000	0.0000	0.0000	17.8715	59.3507	104.0909	(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													
	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
Efficiency of water heater												177.7243	(216)
(217)m	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	(217)
Fuel for water heating, kWh/month													
	116.0577	102.7637	109.5087	97.1043	94.6848	85.9250	85.2485	88.2966	88.8916	98.3954	103.7353	114.8997	(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	13.0873	11.8208	13.0873	12.6652	13.0873	12.6652	13.0873	13.0873	12.6652	13.0873	12.6652	13.0873	(231)
Lighting	14.5802	11.6967	10.5316	7.7159	5.9600	4.8694	5.4369	7.0671	9.1795	12.0440	13.6036	14.9854	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.1107	-46.6216	-78.2021	-100.2984	-118.3513	-114.2307	-112.6599	-101.1132	-81.6748	-58.1999	-33.0954	-23.4521	(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	-0.9830	-3.2539	-9.6907	-20.8398	-33.5172	-35.8149	-35.1050	-26.6479	-16.1512	-6.4170	-1.6892	-0.7011	(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												411.6352	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.7243	
Water heating fuel used												1185.5113	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	154.0927	(230a)
Total electricity for the above, kWh/year	154.0927	(231)
Electricity for lighting (calculated in Appendix L)	117.6702	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1086.8212	(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	782.0882	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	411.6352	16.4900	67.8786	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1185.5113	16.4900	195.4908	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	154.0927	16.4900	25.4099	(249)
Energy for lighting	117.6702	16.4900	19.4038	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.0102	16.4900	-147.7521	
PV Unit electricity exported	-190.8110	5.5900	-10.6663	
Total			-158.4184	(252)
Total energy cost			149.7647	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.5451	(257)
SAP value		91.1631	
SAP rating (Section 12)		91	(258)
SAP band		B	

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	411.6352	0.1579	64.9848	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1185.5113	0.1407	166.7808	(264)
Space and water heating			231.7655	(265)
Pumps, fans and electric keep-hot	154.0927	0.1387	21.3746	(267)
Energy for lighting	117.6702	0.1443	16.9834	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.0102	0.1319	-118.2087	
PV Unit electricity exported	-190.8110	0.1185	-22.6091	
Total			-140.8178	(269)
Total CO2, kg/year			129.3058	(272)
CO2 emissions per m2			2.4000	(273)
EI value			98.2480	
EI rating			98	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.1636	0.1562	0.1562	0.1450	0.1450	0.1264	0.1302	0.1376	0.1339	0.1413	0.1413	0.1562	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2557	0.2557	0.2445	0.2445	0.2259	0.2297	0.2371	0.2334	0.2408	0.2408	0.2557	(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								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	230.4059 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312
E3 Sill	9.8000	0.0460	0.4508
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.8552 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 36.9666 (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	12.3089	11.9610	11.9610	11.4391	11.4391	10.5693	10.7433	11.0912	10.9172	11.2652	11.2652	11.9610	(38)
Heat transfer coeff	49.2755	48.9276	48.9276	48.4057	48.4057	47.5359	47.7099	48.0578	47.8838	48.2318	48.2318	48.9276	(39)
Average = Sum(39)m / 12 =												48.3767	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9142	0.9077	0.9077	0.8981	0.8981	0.8819	0.8852	0.8916	0.8884	0.8948	0.8948	0.9077	(40)
HLP (average)												0.8975	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8051 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)
Hot water usage for other uses	33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)
Average daily hot water use (litres/day)												88.3055	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)

Water storage loss (or HIU loss):	
Store volume	150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.8600 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	1.0044 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(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													
	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
									Total per year (kWh/year) = Sum(64)m =			2106.9416	(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													
	94.0138	83.6968	90.1438	81.9932	81.3838	75.3870	75.8076	77.6089	77.1401	83.5766	85.9117	93.3295	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.6574	14.7950	12.0321	9.1091	6.8091	5.7486	6.2115	8.0740	10.8369	13.7599	16.0598	17.1204	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(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)													
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)													
	126.3626	124.5488	121.1610	113.8795	109.3869	104.7041	101.8919	104.3130	107.1390	112.3341	119.3218	125.4429	(72)
Total internal gains													
	461.6021	460.3628	448.0711	424.7929	401.4973	380.2435	367.5322	369.3788	381.1087	402.3004	428.0911	450.7834	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	12.4928	0.4000	0.7000	0.7700	20.7988	(75)
Northwest	12.9800	12.4928	0.4000	0.7000	0.7700	31.4648	(81)
Southeast	1.0800	29.0000	0.4000	0.7000	1.0000	7.8926	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	60.1562	110.6935	200.3195	338.9185	438.3821	498.4858	468.7679	385.3943	269.4443	147.9605	78.3648	50.1794	(83)
Total gains	521.7583	571.0564	648.3906	763.7114	839.8794	878.7293	836.3001	754.7731	650.5530	550.2610	506.4559	500.9628	(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	70.0082	70.5060	70.5060	71.2661	71.2661	72.5702	72.3056	71.7821	72.0429	71.5232	71.5232	70.5060	
alpha	5.6672	5.7004	5.7004	5.7511	5.7511	5.8380	5.8204	5.7855	5.8029	5.7682	5.7682	5.7004	
util living area													
	0.9613	0.9364	0.8491	0.6478	0.4359	0.2488	0.1426	0.1719	0.3891	0.7298	0.9178	0.9669	(86)
Living	20.4065	20.5459	20.7879	20.9591	20.9960	20.9999	21.0000	21.0000	20.9985	20.9382	20.6813	20.3795	
Non living	19.4981	19.6714	19.9515	20.1351	20.1666	20.1828	20.1801	20.1746	20.1767	20.1229	19.8460	19.4697	
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	20.6964	20.5459	20.7879	20.9591	20.9960	20.9999	21.0000	21.0000	20.9985	20.9382	20.6813	20.4663	(87)
Th 2	20.1554	20.1609	20.1609	20.1691	20.1691	20.1829	20.1801	20.1746	20.1774	20.1719	20.1719	20.1609	(88)
util rest of house													
	0.9516	0.9216	0.8196	0.6036	0.3891	0.2046	0.0958	0.1194	0.3292	0.6764	0.8963	0.9583	(89)
MIT 2	19.8934	19.6714	19.9515	20.1351	20.1666	20.1828	20.1801	20.1746	20.1767	20.1229	19.8460	19.5942	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	20.2435	20.0527	20.3162	20.4944	20.5282	20.5391	20.5376	20.5345	20.5350	20.4784	20.2102	19.9744	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.2435	20.0527	20.3162	20.4944	20.5282	20.5391	20.5376	20.5345	20.5350	20.4784	20.2102	19.9744	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9194	0.8254	0.6212	0.4094	0.2239	0.1162	0.1423	0.3553	0.6969	0.8974	0.9561	(94)
Useful gains	497.1139	525.0440	535.1860	474.4368	343.8231	196.7301	97.2128	107.3832	231.1479	383.4619	454.4927	478.9856	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	731.4208	692.4563	612.3861	488.6245	345.0458	196.7546	97.2131	107.3844	231.5197	404.1032	569.6262	713.0924	(97)
Space heating kWh													
	174.3244	112.5010	57.4369	10.2151	0.9097	0.0000	0.0000	0.0000	0.0000	15.3571	82.8961	174.1755	(98a)
Space heating requirement - total per year (kWh/year)												627.8157	
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													
	174.3244	112.5010	57.4369	10.2151	0.9097	0.0000	0.0000	0.0000	0.0000	15.3571	82.8961	174.1755	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												627.8157	
Space heating per m2											(98c) / (4) =	11.6478	(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 %)	212.2174	(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	174.3244	112.5010	57.4369	10.2151	0.9097	0.0000	0.0000	0.0000	0.0000	15.3571	82.8961	174.1755	(98)
Space heating efficiency (main heating system 1)	212.2174	212.2174	212.2174	212.2174	212.2174	0.0000	0.0000	0.0000	0.0000	212.2174	212.2174	212.2174	(210)
Space heating fuel (main heating system)	82.1442	53.0121	27.0651	4.8135	0.4287	0.0000	0.0000	0.0000	0.0000	7.2365	39.0619	82.0741	(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	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
Efficiency of water heater												177.8224	(216)
(217)m	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	(217)
Fuel for water heating, kWh/month	115.9937	102.7070	109.4483	97.0508	94.6325	85.8776	85.2015	88.2479	88.8426	98.3411	103.6780	114.8364	(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	13.0873	11.8208	13.0873	12.6652	13.0873	12.6652	13.0873	13.0873	12.6652	13.0873	12.6652	13.0873	(231)
Lighting	14.5802	11.6967	10.5316	7.7159	5.9600	4.8694	5.4369	7.0671	9.1795	12.0440	13.6036	14.9854	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.5119	-45.6064	-76.6564	-101.5476	-117.3764	-119.3621	-118.0016	-108.0201	-87.5161	-61.6107	-36.9478	-26.0717	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.2226	-3.2584	-9.7576	-22.0562	-33.0852	-39.9366	-39.3712	-31.1975	-18.8827	-7.5347	-2.2416	-0.9118	(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	295.8361	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	177.8224	
Water heating fuel used	1184.8574	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	154.0927	(230a)
Total electricity for the above, kWh/year	154.0927	(231)
Electricity for lighting (calculated in Appendix L)	117.6702	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1138.6850	(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	613.7715	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	295.8361	26.0000	76.9174	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1184.8574	26.0000	308.0629	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	154.0927	26.0000	40.0641	(249)
Energy for lighting	117.6702	26.0000	30.5943	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.2287	26.0000	-241.5995	
PV Unit electricity exported	-209.4562	5.8100	-12.1694	
Total			-253.7689	(252)
Total energy cost			201.8698	(255)

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	295.8361	0.1589	47.0179	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1184.8574	0.1407	166.6888	(264)
Space and water heating			213.7067	(265)
Pumps, fans and electric keep-hot	154.0927	0.1387	21.3746	(267)
Energy for lighting	117.6702	0.1443	16.9834	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.2287	0.1317	-122.4186	
PV Unit electricity exported	-209.4562	0.1176	-24.6410	
Total			-147.0596	(269)
Total CO2, kg/year			105.0051	(272)

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	295.8361	1.5883	469.8725	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1184.8574	1.5202	1801.1992	(278)
Space and water heating			2271.0718	(279)
Pumps, fans and electric keep-hot	154.0927	1.5128	233.1114	(281)
Energy for lighting	117.6702	1.5338	180.4865	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.2287	1.4867	-1381.5072	
PV Unit electricity exported	-209.4562	0.4313	-90.3337	
Total			-1471.8409	(283)
Total Primary energy kWh/year			1212.8288	(286)

SAP 10 EPC IMPROVEMENTS

Flat 11 - Be Green

Current energy efficiency rating: B 91
Current environmental impact rating: A 98

N	Solar water heating	Not applicable	
U	Solar photovoltaic panels	Not applicable	
V2	Wind turbine	Not applicable	

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: B 91
Potential environmental impact rating: A 98

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£456	£456	£0
Space heating	£117	£117	£0
Water heating	£308	£308	£0
Lighting	£31	£31	£0
Generated (PV)	-£254	-£254	£0
Total cost of fuels	£202	£202	£0
Total cost of uses	£202	£202	£0
Delivered energy	11 kWh/m²	11 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	2 kg/m²	2 kg/m²	0 kg/m²
Primary energy	23 kWh/m²	23 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000 (1b)	x	2.6300 (2b)	=	141.7570 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	141.7570	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) =	12418.8800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	230.4059	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312
E3 Sill	9.8000	0.0460	0.4508
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.8552	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	36.9666	(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	13.5267	13.3527	13.1787	12.3089	12.1350	11.2652	11.2652	11.0912	11.6131	12.1350	12.4829	12.8308	(38)
Heat transfer coeff	50.4933	50.3193	50.1453	49.2755	49.1016	48.2318	48.2318	48.0578	48.5797	49.1016	49.4495	49.7974	(39)
Average = Sum(39)m / 12 =												49.2320	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9368	0.9336	0.9303	0.9142	0.9110	0.8948	0.8948	0.8916	0.9013	0.9110	0.9174	0.9239	(40)
HLP (average)												0.9134	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.8051	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606	(42b)

Hot water usage for other uses

33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156	(42c)

Average daily hot water use (litres/day)	88.3055	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.8600	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	1.0044	(55)

Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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

206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(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

206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
									Total per year (kWh/year) = Sum(64)m =		2106.9416	(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

94.0138	83.6968	90.1438	81.9932	81.3838	75.3870	75.8076	77.6089	77.1401	83.5766	85.9117	93.3295	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

16.6574	14.7950	12.0321	9.1091	6.8091	5.7486	6.2115	8.0740	10.8369	13.7599	16.0598	17.1204	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(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)

-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)

Water heating gains (Table 5)

126.3626	124.5488	121.1610	113.8795	109.3869	104.7041	101.8919	104.3130	107.1390	112.3341	119.3218	125.4429	(72)

Total internal gains

461.6021	460.3628	448.0711	424.7929	401.4973	380.2435	367.5322	369.3788	381.1087	402.3004	428.0911	450.7834	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	8.5800	11.2829	0.4000	0.7000	0.7700	18.7846	(75)
Northwest	12.9800	11.2829	0.4000	0.7000	0.7700	28.4177	(81)
Southeast	1.0800	26.0000	0.4000	0.7000	1.0000	7.0762	(82)

Solar gains	54.2784	110.7781	199.2356	325.1175	434.4009	461.8403	432.5603	346.5641	242.2335	135.3817	68.3739	44.2631	(83)
Total gains	515.8805	571.1410	647.3067	749.9104	835.8982	842.0838	800.0926	715.9428	623.3422	537.6822	496.4650	495.0464	(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	68.3198	68.5560	68.7938	70.0082	70.2562	71.5232	71.5232	71.7821	71.0109	70.2562	69.7619	69.2745	
alpha	5.5547	5.5704	5.5863	5.6672	5.6837	5.7682	5.7682	5.7855	5.7341	5.6837	5.6508	5.6183	
util living area													
	0.9736	0.9532	0.8928	0.7384	0.5382	0.3659	0.2652	0.3085	0.5305	0.8276	0.9501	0.9779	(86)
Living	20.2459	20.4119	20.6697	20.9055	20.9849	20.9987	20.9998	20.9996	20.9900	20.8540	20.5211	20.2183	
Non living	19.2828	19.4896	19.7992	20.0694	20.1469	20.1712	20.1718	20.1745	20.1603	20.0265	19.6384	19.2572	
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	20.6142	20.4119	20.6697	20.9055	20.9849	20.9987	20.9998	20.9996	20.9900	20.8540	20.5211	20.3277	(87)
Th 2	20.1363	20.1391	20.1418	20.1554	20.1582	20.1719	20.1719	20.1746	20.1664	20.1582	20.1527	20.1472	(88)
util rest of house													
	0.9670	0.9422	0.8706	0.6993	0.4921	0.3188	0.2153	0.2533	0.4694	0.7870	0.9365	0.9723	(89)
MIT 2	19.7961	19.4896	19.7992	20.0694	20.1469	20.1712	20.1718	20.1745	20.1603	20.0265	19.6384	19.4176	(90)
Living area fraction										fLA = Living area / (4) =		0.4360	(91)
MIT	20.1528	19.8917	20.1787	20.4339	20.5123	20.5320	20.5328	20.5342	20.5220	20.3873	20.0233	19.8144	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1528	19.8917	20.1787	20.4339	20.5123	20.5320	20.5328	20.5342	20.5220	20.3873	20.0233	19.8144	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9672	0.9386	0.8716	0.7126	0.5117	0.3393	0.2370	0.2774	0.4957	0.7988	0.9341	0.9697	(94)
Useful gains	498.9471	536.0579	564.2055	534.3995	427.6893	285.7349	189.6517	198.5964	309.0084	429.4942	463.7684	480.0589	(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													
	800.4578	754.3733	685.9245	568.3414	432.6957	286.1084	189.6876	198.6827	311.9811	480.5717	639.0498	777.5556	(97)
Space heating kWh													
	224.3240	146.7080	90.5590	24.4382	3.7248	0.0000	0.0000	0.0000	0.0000	38.0017	126.2026	221.3376	(98a)

Space heating requirement - total per year (kWh/year) 875.2958

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

224.3240	146.7080	90.5590	24.4382	3.7248	0.0000	0.0000	0.0000	0.0000	38.0017	126.2026	221.3376	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 875.2958

Space heating per m2 (98c) / (4) = 16.2393 (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 %)	212.6387 (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													
	224.3240	146.7080	90.5590	24.4382	3.7248	0.0000	0.0000	0.0000	0.0000	38.0017	126.2026	221.3376	(98)

Space heating efficiency (main heating system 1)

	212.6387	212.6387	212.6387	212.6387	212.6387	0.0000	0.0000	0.0000	0.0000	212.6387	212.6387	212.6387	(210)
Space heating fuel (main heating system)													
	105.4954	68.9940	42.5882	11.4928	1.7517	0.0000	0.0000	0.0000	0.0000	17.8715	59.3507	104.0909	(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													
	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
Efficiency of water heater												177.7243	(216)
(217)m	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	177.7243	(217)
Fuel for water heating, kWh/month													
	116.0577	102.7637	109.5087	97.1043	94.6848	85.9250	85.2485	88.2966	88.8916	98.3954	103.7353	114.8997	(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	13.0873	11.8208	13.0873	12.6652	13.0873	12.6652	13.0873	13.0873	12.6652	13.0873	12.6652	13.0873	(231)
Lighting	14.5802	11.6967	10.5316	7.7159	5.9600	4.8694	5.4369	7.0671	9.1795	12.0440	13.6036	14.9854	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.1107	-46.6216	-78.2021	-100.2984	-118.3513	-114.2307	-112.6599	-101.1132	-81.6748	-58.1999	-33.0954	-23.4521	(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	-0.9830	-3.2539	-9.6907	-20.8398	-33.5172	-35.8149	-35.1050	-26.6479	-16.1512	-6.4170	-1.6892	-0.7011	(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	411.6352	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	177.7243	
Water heating fuel used	1185.5113	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	154.0927	(230a)
Total electricity for the above, kWh/year	154.0927	(231)
Electricity for lighting (calculated in Appendix L)	117.6702	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1086.8212	(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	782.0882	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	411.6352	16.4900	67.8786	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1185.5113	16.4900	195.4908	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	154.0927	16.4900	25.4099	(249)
Energy for lighting	117.6702	16.4900	19.4038	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.0102	16.4900	-147.7521	
PV Unit electricity exported	-190.8110	5.5900	-10.6663	
Total			-158.4184	(252)
Total energy cost			149.7647	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.5451	(257)
SAP value	91.1631	
SAP rating (Section 12)	91	(258)
SAP band	B	

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	411.6352	0.1579	64.9848	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1185.5113	0.1407	166.7808	(264)
Space and water heating			231.7655	(265)
Pumps, fans and electric keep-hot	154.0927	0.1387	21.3746	(267)
Energy for lighting	117.6702	0.1443	16.9834	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-896.0102	0.1319	-118.2087	
PV Unit electricity exported	-190.8110	0.1185	-22.6091	
Total			-140.8178	(269)

Total CO2, kg/year	129.3058	(272)
CO2 emissions per m2	2.4000	(273)
EI value	98.2480	
EI rating	98	(274)
EI band	A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.9000	(1b)	x 2.6300	(2b) =	141.7570	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.9000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	141.7570	(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	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	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.1636	0.1562	0.1562	0.1450	0.1450	0.1264	0.1302	0.1376	0.1339	0.1413	0.1413	0.1562	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2557	0.2557	0.2445	0.2445	0.2259	0.2297	0.2371	0.2334	0.2408	0.2408	0.2557	(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	
Main dwelling								
Windows			21.5600	0.9615	20.7308			(27)
Rooflights			1.0800	0.9615	1.0385			(27a)
External Wall	43.3900	21.5600	21.8300	0.1400	3.0562	190.0000	4147.7000	(29a)
External Roof 1	53.9400	1.0800	52.8600	0.1000	5.2860	9.0000	475.7400	(30)
Total net area of external elements Aum(A, m2)			97.3300					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.1114			(33)
Main dwelling								
Party Wall 1			31.8200	0.0000	0.0000	180.0000	5727.6000	(32)
Party Floor 1			53.9400			30.0000	1618.2000	(32d)
Internal Wall 1			49.9600			9.0000	449.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12418.8800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	230.4059 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	16.5000	0.0120	0.1980
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.3000	0.0000	0.0000
E16 Corner (normal)	2.6300	0.0370	0.0973
E18 Party wall between dwellings	18.4100	0.0250	0.4603
E14 Flat roof	16.5000	0.0800	1.3200
P4 Party wall - Roof (insulation at ceiling level)	16.3000	0.1200	1.9560
E2 Other lintels (including other steel lintels)	9.8000	0.0440	0.4312
E3 Sill	9.8000	0.0460	0.4508
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	4.8000	0.0800	0.3840

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		6.8552 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	36.9666 (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	12.3089	11.9610	11.9610	11.4391	11.4391	10.5693	10.7433	11.0912	10.9172	11.2652	11.2652	11.9610	(38)

Heat transfer coeff

	49.2755	48.9276	48.9276	48.4057	48.4057	47.5359	47.7099	48.0578	47.8838	48.2318	48.2318	48.9276 (39)
Average = Sum(39)m / 12 =												48.3767

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9142	0.9077	0.9077	0.8981	0.8981	0.8819	0.8852	0.8916	0.8884	0.8948	0.8948	0.9077	(40)
HLP (average)												0.8975	
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												1.8051 (42)
Hot water usage for mixer showers												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths												
	62.7729	61.8406	60.5278	58.1072	56.2946	54.2848	53.1992	54.5029	55.9223	58.0729	60.5433	62.5606 (42b)
Hot water usage for other uses												
	33.1156	31.9114	30.7072	29.5030	28.2988	27.0946	27.0946	28.2988	29.5030	30.7072	31.9114	33.1156 (42c)
Average daily hot water use (litres/day)												88.3055 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	95.8885	93.7520	91.2350	87.6102	84.5935	81.3794	80.2938	82.8017	85.4253	88.7801	92.4548	95.6763	(44)
Energy conte	151.8639	133.5016	140.2248	119.9340	113.8790	100.0655	97.1085	102.5258	105.3380	120.4737	131.7188	149.8059	(45)
Energy content (annual)										Total = Sum(45)m =		1466.4396	
Distribution loss (46)m = 0.15 x (45)m													
	22.7796	20.0252	21.0337	17.9901	17.0819	15.0098	14.5663	15.3789	15.8007	18.0711	19.7578	22.4709	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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													
	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(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													
	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
									Total per year (kWh/year) = Sum(64)m =			2106.9416	(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													
	94.0138	83.6968	90.1438	81.9932	81.3838	75.3870	75.8076	77.6089	77.1401	83.5766	85.9117	93.3295	(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	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	108.3037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.6574	14.7950	12.0321	9.1091	6.8091	5.7486	6.2115	8.0740	10.8369	13.7599	16.0598	17.1204	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	234.8454	237.2823	231.1413	218.0677	201.5646	186.0541	175.6921	173.2551	179.3962	192.4698	208.9728	224.4834	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	47.6354	(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)													
	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	-72.2025	(71)
Water heating gains (Table 5)													
	126.3626	124.5488	121.1610	113.8795	109.3869	104.7041	101.8919	104.3130	107.1390	112.3341	119.3218	125.4429	(72)
Total internal gains													
	461.6021	460.3628	448.0711	424.7929	401.4973	380.2435	367.5322	369.3788	381.1087	402.3004	428.0911	450.7834	(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	
Northeast	8.5800	12.4928	0.4000	0.7000	0.7700	20.7988	(75)
Northwest	12.9800	12.4928	0.4000	0.7000	0.7700	31.4648	(81)
Southeast	1.0800	29.0000	0.4000	0.7000	1.0000	7.8926	(82)

Solar gains	60.1562	110.6935	200.3195	338.9185	438.3821	498.4858	468.7679	385.3943	269.4443	147.9605	78.3648	50.1794	(83)
Total gains	521.7583	571.0564	648.3906	763.7114	839.8794	878.7293	836.3001	754.7731	650.5530	550.2610	506.4559	500.9628	(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	70.0082	70.5060	70.5060	71.2661	71.2661	72.5702	72.3056	71.7821	72.0429	71.5232	71.5232	70.5060	
alpha	5.6672	5.7004	5.7004	5.7511	5.7511	5.8380	5.8204	5.7855	5.8029	5.7682	5.7682	5.7004	
util living area													
	0.9613	0.9364	0.8491	0.6478	0.4359	0.2488	0.1426	0.1719	0.3891	0.7298	0.9178	0.9669	(86)
Living	20.4065	20.5459	20.7879	20.9591	20.9960	20.9999	21.0000	21.0000	20.9985	20.9382	20.6813	20.3795	
Non living	19.4981	19.6714	19.9515	20.1351	20.1666	20.1828	20.1801	20.1746	20.1767	20.1229	19.8460	19.4697	
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	
16 / 9	28	0	0	0	0	0	0	0	0	0	10	
MIT	20.6964	20.5459	20.7879	20.9591	20.9960	20.9999	21.0000	21.0000	20.9985	20.9382	20.6813	20.4663 (87)
Th 2	20.1554	20.1609	20.1609	20.1691	20.1691	20.1829	20.1801	20.1746	20.1774	20.1719	20.1719	20.1609 (88)
util rest of house												
	0.9516	0.9216	0.8196	0.6036	0.3891	0.2046	0.0958	0.1194	0.3292	0.6764	0.8963	0.9583 (89)
MIT 2	19.8934	19.6714	19.9515	20.1351	20.1666	20.1828	20.1801	20.1746	20.1767	20.1229	19.8460	19.5942 (90)
Living area fraction										fLA = Living area / (4) =		0.4360 (91)
MIT	20.2435	20.0527	20.3162	20.4944	20.5282	20.5391	20.5376	20.5345	20.5350	20.4784	20.2102	19.9744 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2435	20.0527	20.3162	20.4944	20.5282	20.5391	20.5376	20.5345	20.5350	20.4784	20.2102	19.9744 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9528	0.9194	0.8254	0.6212	0.4094	0.2239	0.1162	0.1423	0.3553	0.6969	0.8974	0.9561	(94)
Useful gains	497.1139	525.0440	535.1860	474.4368	343.8231	196.7301	97.2128	107.3832	231.1479	383.4619	454.4927	478.9856	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	731.4208	692.4563	612.3861	488.6245	345.0458	196.7546	97.2131	107.3844	231.5197	404.1032	569.6262	713.0924	(97)
Space heating kWh													
	174.3244	112.5010	57.4369	10.2151	0.9097	0.0000	0.0000	0.0000	0.0000	15.3571	82.8961	174.1755	(98a)
Space heating requirement - total per year (kWh/year)												627.8157	
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													
	174.3244	112.5010	57.4369	10.2151	0.9097	0.0000	0.0000	0.0000	0.0000	15.3571	82.8961	174.1755	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												627.8157	
Space heating per m2											(98c) / (4) =	11.6478	(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 %)												212.2174	(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													
	174.3244	112.5010	57.4369	10.2151	0.9097	0.0000	0.0000	0.0000	0.0000	15.3571	82.8961	174.1755	(98)
Space heating efficiency (main heating system 1)													
	212.2174	212.2174	212.2174	212.2174	212.2174	0.0000	0.0000	0.0000	0.0000	212.2174	212.2174	212.2174	(210)
Space heating fuel (main heating system)													
	82.1442	53.0121	27.0651	4.8135	0.4287	0.0000	0.0000	0.0000	0.0000	7.2365	39.0619	82.0741	(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													
	206.2627	182.6360	194.6236	172.5780	168.2778	152.7095	151.5073	156.9246	157.9820	174.8725	184.3628	204.2047	(64)
Efficiency of water heater												177.8224	(216)
(217)m	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	177.8224	(217)
Fuel for water heating, kWh/month													
	115.9937	102.7070	109.4483	97.0508	94.6325	85.8776	85.2015	88.2479	88.8426	98.3411	103.6780	114.8364	(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	13.0873	11.8208	13.0873	12.6652	13.0873	12.6652	13.0873	13.0873	12.6652	13.0873	12.6652	13.0873	(231)
Lighting	14.5802	11.6967	10.5316	7.7159	5.9600	4.8694	5.4369	7.0671	9.1795	12.0440	13.6036	14.9854	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-30.5119	-45.6064	-76.6564	-101.5476	-117.3764	-119.3621	-118.0016	-108.0201	-87.5161	-61.6107	-36.9478	-26.0717	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.2226	-3.2584	-9.7576	-22.0562	-33.0852	-39.9366	-39.3712	-31.1975	-18.8827	-7.5347	-2.2416	-0.9118	(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												295.8361	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.8224	
Water heating fuel used												1184.8574	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)													
mechanical ventilation fans (SFP = 0.8910)												154.0927	(230a)
Total electricity for the above, kWh/year												154.0927	(231)
Electricity for lighting (calculated in Appendix L)												117.6702	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1138.6850	(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												613.7715	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	295.8361	26.0000	76.9174	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1184.8574	26.0000	308.0629	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	154.0927	26.0000	40.0641	(249)
Energy for lighting	117.6702	26.0000	30.5943	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.2287	26.0000	-241.5995	
PV Unit electricity exported	-209.4562	5.8100	-12.1694	
Total			-253.7689	(252)
Total energy cost			201.8698	(255)

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	295.8361	0.1589	47.0179	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1184.8574	0.1407	166.6888	(264)
Space and water heating			213.7067	(265)
Pumps, fans and electric keep-hot	154.0927	0.1387	21.3746	(267)
Energy for lighting	117.6702	0.1443	16.9834	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.2287	0.1317	-122.4186	
PV Unit electricity exported	-209.4562	0.1176	-24.6410	
Total			-147.0596	(269)
Total CO2, kg/year			105.0051	(272)

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	295.8361	1.5883	469.8725	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1184.8574	1.5202	1801.1992	(278)
Space and water heating			2271.0718	(279)
Pumps, fans and electric keep-hot	154.0927	1.5128	233.1114	(281)
Energy for lighting	117.6702	1.5338	180.4865	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-929.2287	1.4867	-1381.5072	
PV Unit electricity exported	-209.4562	0.4313	-90.3337	
Total			-1471.8409	(283)
Total Primary energy kWh/year			1212.8288	(286)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10 - Be Green	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	94 A	**DER**	1.61	**TER**	16.11
Environmental	99 A	**% DER < TER**			90.01
CO_2 Emissions (t/year)	0.05	**DFEE**	36.98	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			9.76
% DPER < TPER	76.47	**DPER**	20.30	**TPER**	86.25

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			17917.1800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							334.5254	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696
E3 Sill	8.4000	0.0460	0.3864
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4676 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0951 (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	13.4413	13.2685	13.0956	12.2313	12.0584	11.1941	11.1941	11.0212	11.5398	12.0584	12.4042	12.7499	(38)
Heat transfer coeff	52.5365	52.3636	52.1908	51.3264	51.1536	50.2892	50.2892	50.1164	50.6350	51.1536	51.4993	51.8450	(39)

Average = Sum(39)m / 12 = 51.2832

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9809	0.9777	0.9744	0.9583	0.9551	0.9389	0.9389	0.9357	0.9454	0.9551	0.9615	0.9680	(40)
HLP (average)												0.9575	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day) 92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.3465	(64)
12Total per year (kWh/year)												2179	(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	96.5070	85.8885	92.4459	83.9622	83.2534	77.0298	77.4018	79.2920	78.8694	85.5544	88.0741	95.7889	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	129.7137	127.8103	124.2552	116.6142	111.8997	106.9858	104.0347	106.5753	109.5409	114.9925	122.3252	128.7485	(72)
Total internal gains	415.0265	423.2025	407.1002	393.3794	375.0390	362.4218	349.9363	350.8533	360.5410	372.0723	393.0309	407.1576	(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	
Southeast	3.5200	36.7938	0.4000	0.7000	0.7700	25.1310	(77)
Southwest	9.2400	36.7938	0.4000	0.7000	0.7700	65.9688	(79)
Northwest	5.7200	11.2829	0.4000	0.7000	0.7700	12.5230	(81)
Southeast	1.7600	26.0000	0.4000	0.7000	1.0000	11.5315	(82)

Solar gains	115.1543	204.6176	300.8239	405.0266	481.2062	489.3257	466.9731	408.7076	336.8640	231.9274	139.5098	97.5032	(83)
Total gains	530.1808	627.8201	707.9240	798.4061	856.2452	851.7475	816.9094	759.5608	697.4050	603.9997	532.5407	504.6608	(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	94.7341	95.0468	95.3616	96.9675	97.2952	98.9674	98.9674	99.3087	98.2916	97.2952	96.6420	95.9975	
alpha	7.3156	7.3365	7.3574	7.4645	7.4863	7.5978	7.5978	7.6206	7.5528	7.4863	7.4428	7.3998	
util living area	0.9899	0.9679	0.9076	0.7478	0.5525	0.3777	0.2709	0.3035	0.4996	0.8192	0.9691	0.9925	(86)
Living	20.5295	20.6717	20.8189	20.9291	20.9553	20.9589	20.9590	20.9591	20.9577	20.9131	20.7150	20.5078	
Non living	19.5661	19.7434	19.9165	20.0414	20.0657	20.0819	20.0820	20.0849	20.0757	20.0325	19.8107	19.5482	
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	20.7593	20.6717	20.8189	20.9291	20.9553	20.9589	20.9590	20.9591	20.9577	20.9131	20.7150	20.5766	(87)
Th 2	20.0993	20.1020	20.1047	20.1182	20.1209	20.1345	20.1345	20.1373	20.1291	20.1209	20.1155	20.1101	(88)
util rest of house	0.9861	0.9570	0.8817	0.7025	0.5016	0.3267	0.2176	0.2466	0.4373	0.7692	0.9567	0.9896	(89)
MIT 2	19.8867	19.7434	19.9165	20.0414	20.0657	20.0819	20.0820	20.0849	20.0757	20.0325	19.8107	19.6495	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	20.3510	20.2373	20.3967	20.5137	20.5390	20.5486	20.5487	20.5501	20.5450	20.5011	20.2919	20.1428	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3510	20.2373	20.3967	20.5137	20.5390	20.5486	20.5487	20.5501	20.5450	20.5011	20.2919	20.1428	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9589	0.8907	0.7233	0.5260	0.3511	0.2431	0.2738	0.4671	0.7918	0.9595	0.9897	(94)
Useful gains	523.4357	602.0030	630.5683	577.4697	450.3487	299.0807	198.5726	207.9790	325.7810	478.2641	510.9921	499.4752	(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	843.2655	803.1190	725.2773	596.0920	452.1476	299.1492	198.5758	207.9868	326.3424	506.4771	679.3730	826.5563	(97)
Space heating kWh	237.9534	135.1500	70.4635	13.4080	1.3384	0.0000	0.0000	0.0000	0.0000	20.9904	121.2343	243.3483	(98a)
Space heating requirement - total per year (kWh/year)												843.8863	
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	237.9534	135.1500	70.4635	13.4080	1.3384	0.0000	0.0000	0.0000	0.0000	20.9904	121.2343	243.3483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												843.8863	
Space heating per m2											(98c) / (4) =	15.7559	(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 %)												213.5980	(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	237.9534	135.1500	70.4635	13.4080	1.3384	0.0000	0.0000	0.0000	0.0000	20.9904	121.2343	243.3483	(98)
Space heating efficiency (main heating system 1)	213.5980	213.5980	213.5980	213.5980	0.0000	0.0000	0.0000	0.0000	213.5980	213.5980	213.5980	213.5980	(210)
Space heating fuel (main heating system)	111.4024	63.2730	32.9888	6.2772	0.6266	0.0000	0.0000	0.0000	0.0000	9.8271	56.7582	113.9282	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
Efficiency of water heater												177.5028	(216)
(217)m	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	(217)
Fuel for water heating, kWh/month	120.4268	106.6054	113.5459	100.5616	97.9706	88.8156	88.0560	91.2587	91.9326	101.8693	107.5286	119.2101	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.0048	11.7462	13.0048	12.5853	13.0048	12.5853	13.0048	13.0048	12.5853	13.0048	12.5853	13.0048	(231)
Lighting	14.4987	11.6314	10.4728	7.6728	5.9267	4.8422	5.4065	7.0276	9.1282	11.9767	13.5276	14.9017	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.1132	-60.8265	-100.2652	-125.8071	-146.1782	-140.2566	-138.3798	-125.6262	-103.1314	-74.9257	-43.4485	-31.0166	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.6785	-5.6742	-16.9252	-35.7104	-56.3132	-59.8042	-58.6401	-44.7220	-27.3033	-11.2302	-2.9311	-1.1877	(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												395.0815	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	177.5028	
Water heating fuel used	1227.7813	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	153.1207	(230a)
Total electricity for the above, kWh/year	153.1207	(231)
Electricity for lighting (calculated in Appendix L)	117.0127	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	443.9014	(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	395.0815	0.1589	62.7872	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.7813	0.1407	172.7625	(264)
Space and water heating			235.5497	(265)
Pumps, fans and electric keep-hot	153.1207	0.1387	21.2397	(267)
Energy for lighting	117.0127	0.1443	16.8886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1126.9751	0.1323	-149.0577	
PV Unit electricity exported	-322.1198	0.1188	-38.2728	
Total			-187.3304	(269)
Total CO2, kg/year			86.3475	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6100	(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	395.0815	1.5882	627.4730	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.7813	1.5203	1866.5830	(278)
Space and water heating			2494.0559	(279)
Pumps, fans and electric keep-hot	153.1207	1.5128	231.6410	(281)
Energy for lighting	117.0127	1.5338	179.4780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1126.9751	1.4887	-1677.7239	
PV Unit electricity exported	-322.1198	0.4358	-140.3766	
Total			-1818.1005	(283)
Total Primary energy kWh/year			1087.0744	(286)
Dwelling Primary energy Rate (DPER)			20.3000	(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		53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) = 0.3332 (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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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 Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.2108			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)
Average = Sum(39)m / 12 =												68.5665	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)
Hot water usage for other uses	33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)
Average daily hot water use (litres/day)												88.0322	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	197.9890	175.1743	186.3858	164.6547	160.1216	144.8477	143.4029	148.8035	150.1039	166.6959	176.4030	195.9373	(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	197.9890	175.1743	186.3858	164.6547	160.1216	144.8477	143.4029	148.8035	150.1039	166.6959	176.4030	195.9373	(64)
										Total per year (kWh/year) = Sum(64)m =		2010.5197	(64)
12Total per year (kWh/year)												2011	(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	87.6144	77.9205	83.7564	75.8281	75.0235	69.2423	69.4646	71.2603	70.9900	77.2095	79.7344	86.9323	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	117.7614	115.9532	112.5758	105.3168	100.8381	96.1699	93.3664	95.7799	98.5972	103.7762	110.7423	116.8445	(72)
Total internal gains													
	406.0742	414.3453	398.4208	385.0821	366.9774	351.6059	339.2679	340.0579	349.5973	363.8560	384.4480	398.2536	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)
Northwest	3.7800	11.2829	0.6300	0.7000	0.7700	13.0342	(81)
Southeast	1.1600	26.0000	0.6300	0.7000	1.0000	11.9705	(82)

Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	525.9840	627.3971	711.6091	806.7092	867.8726	860.9402	825.3406	765.5032	700.2905	605.3334	529.7162	499.7854	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area													
	0.9943	0.9841	0.9562	0.8655	0.6971	0.4994	0.3607	0.4053	0.6478	0.9134	0.9854	0.9957	(86)
MIT	20.0106	20.2249	20.4977	20.7962	20.9513	20.9941	20.9993	20.9986	20.9756	20.7539	20.3288	19.9754	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house													
	0.9919	0.9777	0.9392	0.8217	0.6250	0.4133	0.2683	0.3065	0.5516	0.8727	0.9783	0.9938	(89)
MIT 2	18.7288	19.0000	19.3357	19.6806	19.8269	19.8657	19.8679	19.8695	19.8528	19.6490	19.1421	18.6910	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.4109	19.6518	19.9540	20.2742	20.4252	20.4661	20.4699	20.4703	20.4502	20.2369	19.7736	19.3744	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4109	19.6518	19.9540	20.2742	20.4252	20.4661	20.4699	20.4703	20.4502	20.2369	19.7736	19.3744	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9764	0.9410	0.8390	0.6618	0.4592	0.3175	0.3592	0.6025	0.8879	0.9776	0.9928	(94)
Useful gains	521.1090	612.5696	669.6572	676.8021	574.3954	395.3098	262.0713	274.9467	421.9398	537.4754	517.8730	496.2031	(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													
	1052.3129	1024.9063	932.5904	779.8972	597.0384	397.5698	262.2791	275.3683	431.9754	659.4228	870.8085	1047.1473	(97)
Space heating kWh													
	395.2157	277.0903	195.6223	74.2285	16.8464	0.0000	0.0000	0.0000	0.0000	90.7289	254.1136	409.9024	(98a)
Space heating requirement - total per year (kWh/year)												1713.7480	
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													
	395.2157	277.0903	195.6223	74.2285	16.8464	0.0000	0.0000	0.0000	0.0000	90.7289	254.1136	409.9024	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1713.7480	
Space heating per m2											(98c) / (4) =	31.9968	(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													
	395.2157	277.0903	195.6223	74.2285	16.8464	0.0000	0.0000	0.0000	0.0000	90.7289	254.1136	409.9024	(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)													
	428.1860	300.2061	211.9418	80.4209	18.2518	0.0000	0.0000	0.0000	0.0000	98.2978	275.3126	444.0980	(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													
	197.9890	175.1743	186.3858	164.6547	160.1216	144.8477	143.4029	148.8035	150.1039	166.6959	176.4030	195.9373	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5786	85.0833	84.1684	82.3949	80.5774	79.8000	79.8000	79.8000	79.8000	82.7561	84.8776	85.6750	(217)
Fuel for water heating, kWh/month													

	231.3533	205.8857	221.4439	199.8361	198.7177	181.5135	179.7029	186.4705	188.1001	201.4302	207.8322	228.6984 (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	16.3980	13.1551	11.8447	8.6779	6.7031	5.4765	6.1148	7.9482	10.3239	13.5456	15.2997	16.8537 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.9664	-17.9997	-27.5889	-33.1538	-37.6644	-35.8780	-35.4558	-32.5194	-27.6824	-21.5080	-13.5549	-10.2192 (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	-3.7180	-8.0416	-16.3987	-25.2483	-33.9919	-34.3642	-33.9460	-28.4509	-20.4850	-11.6850	-5.0235	-2.9231 (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	1856.7151 (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	2430.9846 (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)	132.3410 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-529.4674 (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	3976.5733 (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	1856.7151	0.2100	389.9102	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2430.9846	0.2100	510.5068	(264)
Space and water heating			900.4169	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.3410	0.1443	19.1009	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	0.1332	-40.6623	
PV Unit electricity exported	-224.2764	0.1252	-28.0767	
Total			-68.7389	(269)
Total CO2, kg/year			862.7082	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.1100	(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	1856.7151	1.1300	2098.0881	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2430.9846	1.1300	2747.0126	(278)
Space and water heating			4845.1007	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.3410	1.5338	202.9890	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	1.4923	-455.4483	
PV Unit electricity exported	-224.2764	0.4595	-103.0532	
Total			-558.5015	(283)
Total Primary energy kWh/year			4619.6890	(286)
Target Primary Energy Rate (TPER)			86.2500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10 - Be Green	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	94 A	**DER**	1.61	**TER**	16.11
Environmental	99 A	**% DER < TER**			90.01
CO_2 Emissions (t/year)	0.05	**DFEE**	36.98	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			9.76
% DPER < TPER	76.47	**DPER**	20.30	**TPER**	86.25

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3170	(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) =	0.2694	(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	0.3435	0.3368	0.3301	0.2964	0.2896	0.2560	0.2560	0.2492	0.2694	0.2896	0.3031	0.3166	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000	(23c)
Effective ac	0.5590	0.5567	0.5545	0.5439	0.5419	0.5328	0.5328	0.5311	0.5363	0.5419	0.5459	0.5501	(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	
Main dwelling								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184

E18 Party wall between dwellings	15.6000	0.0160	0.2496	
E14 Flat roof	26.0000	0.0800	2.0800	
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696	
E3 Sill	8.4000	0.0460	0.3864	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4676 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0951 (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	25.9852	25.8787	25.7743	25.2840	25.1922	24.7651	24.7651	24.6860	24.9296	25.1922	25.3778	25.5719	(38)

Heat transfer coeff

	65.0804	64.9739	64.8695	64.3791	64.2874	63.8603	63.8603	63.7812	64.0248	64.2874	64.4730	64.6670	(39)

Average = Sum(39)m / 12 = 64.3787

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2151	1.2131	1.2112	1.2020	1.2003	1.1923	1.1923	1.1908	1.1954	1.2003	1.2038	1.2074	(40)
HLP (average)												1.2020	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.4812	23.1325	22.6414	21.7359	21.0579	20.3061	19.9000	20.3877	20.9186	21.7231	22.6472	23.4018	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 51.7828 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	56.4944	54.9452	53.2536	51.1477	49.2692	47.3169	46.9108	48.5989	50.3304	52.3353	54.4599	56.4150	(44)
Energy conte	89.4733	78.2412	81.8488	70.0186	66.3258	58.1816	56.7346	60.1756	62.0624	71.0185	77.5881	88.3322	(45)

Energy content (annual) Total = Sum(45)m = 860.0008
Distribution loss (46)m = 0.15 x (45)m

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(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

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(64)

Total per year (kWh/year) = Sum(64)m = 731.0006 (64)
12Total per year (kWh/year) 731 (64)
Electric shower(s)

43.4986	38.7576	42.3219	40.3872	41.1451	39.2484	40.5567	41.1451	40.3872	42.3219	41.5261	43.4986	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 494.7945 (64a)
Heat gains from water heating, kWh/month

29.8877	26.3157	27.9733	24.9758	24.3805	22.1757	22.1953	23.0736	23.2851	25.6719	26.8690	29.6453	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)

-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)

Water heating gains (Table 5)

40.1717	39.1602	37.5986	34.6886	32.7695	30.7996	29.8324	31.0129	32.3404	34.5052	37.3180	39.8458	(72)

Total internal gains

325.4845	334.5524	320.4435	311.4538	295.9088	286.2356	275.7339	275.2908	283.3405	291.5851	308.0238	318.2549	(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	
Southeast	3.5200	36.7938	0.4000	0.7000	0.7700	25.1310	(77)
Southwest	9.2400	36.7938	0.4000	0.7000	0.7700	65.9688	(79)
Northwest	5.7200	11.2829	0.4000	0.7000	0.7700	12.5230	(81)
Southeast	1.7600	26.0000	0.4000	0.7000	1.0000	11.5315	(82)

Solar gains	115.1543	204.6176	300.8239	405.0266	481.2062	489.3257	466.9731	408.7076	336.8640	231.9274	139.5098	97.5032	(83)
Total gains	440.6388	539.1700	621.2674	716.4805	777.1150	775.5613	742.7070	683.9984	620.2045	523.5125	447.5336	415.7581	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.4746	76.5999	76.7232	77.3076	77.4179	77.9357	77.9357	78.0323	77.7354	77.4179	77.1951	76.9634	
alpha	6.0983	6.1067	6.1149	6.1538	6.1612	6.1957	6.1957	6.2022	6.1824	6.1612	6.1463	6.1309	
util living area	0.9976	0.9915	0.9716	0.8935	0.7277	0.5222	0.3778	0.4277	0.6847	0.9418	0.9929	0.9983	(86)
MIT	19.9872	20.1994	20.4725	20.7824	20.9493	20.9942	20.9993	20.9986	20.9732	20.7248	20.2919	19.9484	(87)
Th 2	19.9079	19.9095	19.9111	19.9184	19.9198	19.9262	19.9262	19.9273	19.9237	19.9198	19.9170	19.9141	(88)
util rest of house	0.9965	0.9878	0.9599	0.8559	0.6584	0.4371	0.2859	0.3287	0.5906	0.9113	0.9893	0.9975	(89)
MIT 2	19.0056	19.2168	19.4827	19.7677	19.8935	19.9243	19.9261	19.9271	19.9134	19.7284	19.3158	18.9720	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.5280	19.7397	20.0094	20.3076	20.4553	20.4936	20.4972	20.4973	20.4773	20.2586	19.8352	19.4915	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5280	19.7397	20.0094	20.3076	20.4553	20.4936	20.4972	20.4973	20.4773	20.2586	19.8352	19.4915	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9960	0.9871	0.9611	0.8706	0.6939	0.4824	0.3348	0.3815	0.6405	0.9223	0.9889	0.9971	(94)
Useful gains	438.8874	532.2283	597.1112	623.7813	539.2413	374.1602	248.6845	260.9147	397.2321	482.8244	442.5839	414.5673	(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	991.0416	964.1899	876.3456	734.4134	562.8534	376.3688	248.8737	261.3286	408.3060	620.9236	821.0771	988.8582	(97)
Space heating kWh	410.8027	290.2782	207.7504	79.6551	17.5674	0.0000	0.0000	0.0000	0.0000	102.7458	272.5151	427.2724	(98a)
Space heating requirement - total per year (kWh/year)												1808.5872	
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	410.8027	290.2782	207.7504	79.6551	17.5674	0.0000	0.0000	0.0000	0.0000	102.7458	272.5151	427.2724	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1808.5872	
Space heating per m2											(98c) / (4) =	33.7675	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	600.2866	472.5660	484.7370	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9654	0.9864	0.9772	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	579.4980	466.1371	473.6722	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	863.1489	827.1309	762.4189	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	204.2287	268.5794	214.8276	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	51.0572	67.1449	53.7069	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												171.9089	(107)
Energy for space heating												33.7675	(99)
Energy for space cooling												3.2097	(108)
Total												36.9771	(109)
Fabric Energy Efficiency (DFEE)												37.0	(109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 =	20.0000 (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) = 20.0000 / (5) = 0.1420 (8)
Pressure test Yes
Pressure Test Method Blower Door
Measured/design AP50 5.0000 (17)
Infiltration rate 0.3920 (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) = 0.3332 (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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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 Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.2108			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)
List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)

Average = Sum(39)m / 12 = 68.5665

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

23.4812	23.1325	22.6414	21.7359	21.0579	20.3061	19.9000	20.3877	20.9186	21.7231	22.6472	23.4018	(42b)

Hot water usage for other uses

33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)

Average daily hot water use (litres/day) 51.7828 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	56.4944	54.9452	53.2536	51.1477	49.2692	47.3169	46.9108	48.5989	50.3304	52.3353	54.4599	56.4150	(44)
Energy conte	89.4733	78.2412	81.8488	70.0186	66.3258	58.1816	56.7346	60.1756	62.0624	71.0185	77.5881	88.3322	(45)

Energy content (annual) Total = Sum(45)m = 860.0008

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

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):
Total storage loss

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)

If cylinder contains dedicated solar storage

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss 0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)

Total heat required for water heating calculated for each month

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(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

76.0523	66.5050	69.5715	59.5158	56.3769	49.4544	48.2244	51.1493	52.7530	60.3657	65.9499	75.0824	(64)

Total per year (kWh/year) = Sum(64)m = 731.0006 (64)
12Total per year (kWh/year) 731 (64)
Electric shower(s)

43.4986	38.7576	42.3219	40.3872	41.1451	39.2484	40.5567	41.1451	40.3872	42.3219	41.5261	43.4986	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 494.7945 (64a)

Heat gains from water heating, kWh/month

29.8877	26.3157	27.9733	24.9758	24.3805	22.1757	22.1953	23.0736	23.2851	25.6719	26.8690	29.6453	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	40.1717	39.1602	37.5986	34.6886	32.7695	30.7996	29.8324	31.0129	32.3404	34.5052	37.3180	39.8458	(72)
Total internal gains													
	325.4845	334.5524	320.4435	311.4538	295.9088	286.2356	275.7339	275.2908	283.3405	291.5851	308.0238	318.2549	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)
Northwest	3.7800	11.2829	0.6300	0.7000	0.7700	13.0342	(81)
Southeast	1.1600	26.0000	0.6300	0.7000	1.0000	11.9705	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	445.3943	547.6042	633.6319	733.0809	796.8040	795.5699	761.8066	700.7362	634.0337	533.0624	453.2919	419.7867	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area													
	0.9976	0.9917	0.9732	0.9010	0.7437	0.5382	0.3905	0.4421	0.7027	0.9463	0.9931	0.9983	(86)
MIT	19.8890	20.1099	20.3990	20.7378	20.9321	20.9913	20.9989	20.9978	20.9630	20.6786	20.2175	19.8537	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house													
	0.9965	0.9881	0.9618	0.8640	0.6719	0.4466	0.2906	0.3346	0.6039	0.9167	0.9895	0.9975	(89)
MIT 2	18.8537	19.0742	19.3570	19.6737	19.8230	19.8653	19.8679	19.8695	19.8500	19.6338	19.1913	18.8260	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	19.4046	19.6253	19.9115	20.2399	20.4132	20.4645	20.4697	20.4698	20.4423	20.1898	19.7374	19.3728	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4046	19.6253	19.9115	20.2399	20.4132	20.4645	20.4697	20.4698	20.4423	20.1898	19.7374	19.3728	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9959	0.9872	0.9626	0.8777	0.7082	0.4954	0.3438	0.3920	0.6561	0.9267	0.9891	0.9970	(94)
Useful gains	443.5769	540.6174	609.9222	643.4155	564.3148	394.1044	261.9440	274.6626	415.9954	493.9855	448.3328	418.5396	(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													
	1051.8760	1023.0659	929.6433	777.5452	596.2139	397.4569	262.2642	275.3362	431.4343	656.1968	868.3227	1047.0379	(97)
Space heating kWh													
	452.5746	324.2054	237.8725	96.5734	23.7330	0.0000	0.0000	0.0000	0.0000	120.6852	302.3927	467.6027	(98a)
Space heating requirement - total per year (kWh/year)												2025.6395	
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													
	452.5746	324.2054	237.8725	96.5734	23.7330	0.0000	0.0000	0.0000	0.0000	120.6852	302.3927	467.6027	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2025.6395	
Space heating per m2											(98c) / (4) =	37.8200	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	637.0731	501.5256	514.1612	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9552	0.9811	0.9694	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	608.5295	492.0559	498.4446	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	885.9655	848.9164	781.5350	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	199.7539	265.5042	210.6193	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	49.9385	66.3761	52.6548	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												168.9694	(107)
Energy for space heating												37.8200	(99)
Energy for space cooling												3.1548	(108)
Total												40.9748	(109)
Fabric Energy Efficiency (TFEE)												41.0	(109)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10 - Be Green	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	94 A	**DER**	1.61	**TER**	16.11
Environmental	99 A	**% DER < TER**			90.01
CO_2 Emissions (t/year)	0.05	**DFEE**	36.98	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			9.76
% DPER < TPER	76.47	**DPER**	20.30	**TPER**	86.25

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)
Heat capacity Cm = Sum(A x k)				(28)...(30) + (32) + (32a)...(32e) =			17917.1800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							334.5254	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696
E3 Sill	8.4000	0.0460	0.3864
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.4676 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0951 (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	13.4413	13.2685	13.0956	12.2313	12.0584	11.1941	11.1941	11.0212	11.5398	12.0584	12.4042	12.7499	(38)
Heat transfer coeff	52.5365	52.3636	52.1908	51.3264	51.1536	50.2892	50.2892	50.1164	50.6350	51.1536	51.4993	51.8450	(39)

Average = Sum(39)m / 12 = 51.2832

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9809	0.9777	0.9744	0.9583	0.9551	0.9389	0.9389	0.9357	0.9454	0.9551	0.9615	0.9680	(40)
HLP (average)												0.9575	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day) 92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.3465	(64)
12Total per year (kWh/year)												2179	(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	96.5070	85.8885	92.4459	83.9622	83.2534	77.0298	77.4018	79.2920	78.8694	85.5544	88.0741	95.7889	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	129.7137	127.8103	124.2552	116.6142	111.8997	106.9858	104.0347	106.5753	109.5409	114.9925	122.3252	128.7485	(72)
Total internal gains	415.0265	423.2025	407.1002	393.3794	375.0390	362.4218	349.9363	350.8533	360.5410	372.0723	393.0309	407.1576	(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	
Southeast	3.5200	36.7938	0.4000	0.7000	0.7700	25.1310	(77)
Southwest	9.2400	36.7938	0.4000	0.7000	0.7700	65.9688	(79)
Northwest	5.7200	11.2829	0.4000	0.7000	0.7700	12.5230	(81)
Southeast	1.7600	26.0000	0.4000	0.7000	1.0000	11.5315	(82)

Solar gains	115.1543	204.6176	300.8239	405.0266	481.2062	489.3257	466.9731	408.7076	336.8640	231.9274	139.5098	97.5032	(83)
Total gains	530.1808	627.8201	707.9240	798.4061	856.2452	851.7475	816.9094	759.5608	697.4050	603.9997	532.5407	504.6608	(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	94.7341	95.0468	95.3616	96.9675	97.2952	98.9674	98.9674	99.3087	98.2916	97.2952	96.6420	95.9975	
alpha	7.3156	7.3365	7.3574	7.4645	7.4863	7.5978	7.5978	7.6206	7.5528	7.4863	7.4428	7.3998	
util living area	0.9899	0.9679	0.9076	0.7478	0.5525	0.3777	0.2709	0.3035	0.4996	0.8192	0.9691	0.9925	(86)
Living	20.5295	20.6717	20.8189	20.9291	20.9553	20.9589	20.9590	20.9591	20.9577	20.9131	20.7150	20.5078	
Non living	19.5661	19.7434	19.9165	20.0414	20.0657	20.0819	20.0820	20.0849	20.0757	20.0325	19.8107	19.5482	
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	20.7593	20.6717	20.8189	20.9291	20.9553	20.9589	20.9590	20.9591	20.9577	20.9131	20.7150	20.5766	(87)
Th 2	20.0993	20.1020	20.1047	20.1182	20.1209	20.1345	20.1345	20.1373	20.1291	20.1209	20.1155	20.1101	(88)
util rest of house	0.9861	0.9570	0.8817	0.7025	0.5016	0.3267	0.2176	0.2466	0.4373	0.7692	0.9567	0.9896	(89)
MIT 2	19.8867	19.7434	19.9165	20.0414	20.0657	20.0819	20.0820	20.0849	20.0757	20.0325	19.8107	19.6495	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	20.3510	20.2373	20.3967	20.5137	20.5390	20.5486	20.5487	20.5501	20.5450	20.5011	20.2919	20.1428	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3510	20.2373	20.3967	20.5137	20.5390	20.5486	20.5487	20.5501	20.5450	20.5011	20.2919	20.1428	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9873	0.9589	0.8907	0.7233	0.5260	0.3511	0.2431	0.2738	0.4671	0.7918	0.9595	0.9897	(94)
Useful gains	523.4357	602.0030	630.5683	577.4697	450.3487	299.0807	198.5726	207.9790	325.7810	478.2641	510.9921	499.4752	(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	843.2655	803.1190	725.2773	596.0920	452.1476	299.1492	198.5758	207.9868	326.3424	506.4771	679.3730	826.5563	(97)
Space heating kWh	237.9534	135.1500	70.4635	13.4080	1.3384	0.0000	0.0000	0.0000	0.0000	20.9904	121.2343	243.3483	(98a)
Space heating requirement - total per year (kWh/year)												843.8863	
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	237.9534	135.1500	70.4635	13.4080	1.3384	0.0000	0.0000	0.0000	0.0000	20.9904	121.2343	243.3483	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												843.8863	
Space heating per m2											(98c) / (4) =	15.7559	(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 %)												213.5980	(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	237.9534	135.1500	70.4635	13.4080	1.3384	0.0000	0.0000	0.0000	0.0000	20.9904	121.2343	243.3483	(98)
Space heating efficiency (main heating system 1)	213.5980	213.5980	213.5980	213.5980	0.0000	0.0000	0.0000	0.0000	213.5980	213.5980	213.5980	213.5980	(210)
Space heating fuel (main heating system)	111.4024	63.2730	32.9888	6.2772	0.6266	0.0000	0.0000	0.0000	0.0000	9.8271	56.7582	113.9282	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
Efficiency of water heater												177.5028	(216)
(217)m	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	(217)
Fuel for water heating, kWh/month	120.4268	106.6054	113.5459	100.5616	97.9706	88.8156	88.0560	91.2587	91.9326	101.8693	107.5286	119.2101	(219)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	13.0048	11.7462	13.0048	12.5853	13.0048	12.5853	13.0048	13.0048	12.5853	13.0048	12.5853	13.0048	(231)
Lighting	14.4987	11.6314	10.4728	7.6728	5.9267	4.8422	5.4065	7.0276	9.1282	11.9767	13.5276	14.9017	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.1132	-60.8265	-100.2652	-125.8071	-146.1782	-140.2566	-138.3798	-125.6262	-103.1314	-74.9257	-43.4485	-31.0166	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.6785	-5.6742	-16.9252	-35.7104	-56.3132	-59.8042	-58.6401	-44.7220	-27.3033	-11.2302	-2.9311	-1.1877	(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												395.0815	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)

Efficiency of water heater	177.5028	
Water heating fuel used	1227.7813	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	153.1207	(230a)
Total electricity for the above, kWh/year	153.1207	(231)
Electricity for lighting (calculated in Appendix L)	117.0127	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	443.9014	(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	395.0815	0.1589	62.7872	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.7813	0.1407	172.7625	(264)
Space and water heating			235.5497	(265)
Pumps, fans and electric keep-hot	153.1207	0.1387	21.2397	(267)
Energy for lighting	117.0127	0.1443	16.8886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1126.9751	0.1323	-149.0577	
PV Unit electricity exported	-322.1198	0.1188	-38.2728	
Total			-187.3304	(269)
Total CO2, kg/year			86.3475	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.6100	(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	395.0815	1.5882	627.4730	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.7813	1.5203	1866.5830	(278)
Space and water heating			2494.0559	(279)
Pumps, fans and electric keep-hot	153.1207	1.5128	231.6410	(281)
Energy for lighting	117.0127	1.5338	179.4780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1126.9751	1.4887	-1677.7239	
PV Unit electricity exported	-322.1198	0.4358	-140.3766	
Total			-1818.1005	(283)
Total Primary energy kWh/year			1087.0744	(286)
Dwelling Primary energy Rate (DPER)			20.3000	(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		53.5600	(1b)	x 2.6300	(2b) =	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		140.8628	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1420	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3920	(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) = 0.3332 (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	0.4248	0.4165	0.4082	0.3665	0.3582	0.3165	0.3165	0.3082	0.3332	0.3582	0.3748	0.3915	(22b)
Effective ac	0.5902	0.5867	0.5833	0.5672	0.5641	0.5501	0.5501	0.5475	0.5555	0.5641	0.5702	0.5766	(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 Opening Type			12.2200	1.1450	13.9924			(27)
TER Roof Light			1.1600	1.5918	2.3456			(27a)
External Wall	68.3800	12.2200	56.1600	0.1800	10.1088			(29a)
External Roof 1	53.5600	1.1600	52.4000	0.1100	5.7640			(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.2108			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0700	1.8200
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E18 Party wall between dwellings	15.6000	0.0600	0.9360
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0500	0.4200
E3 Sill	8.4000	0.0500	0.4200
E4 Jamb	26.4000	0.0500	1.3200
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 9.9920 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 42.2028 (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	27.4368	27.2739	27.1143	26.3644	26.2241	25.5710	25.5710	25.4500	25.8225	26.2241	26.5079	26.8046	(38)
Heat transfer coeff	69.6395	69.4767	69.3170	68.5671	68.4268	67.7737	67.7737	67.6528	68.0253	68.4268	68.7107	69.0074	(39)
Average = Sum(39)m / 12 =												68.5665	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.3002	1.2972	1.2942	1.2802	1.2776	1.2654	1.2654	1.2631	1.2701	1.2776	1.2829	1.2884	(40)
HLP (average)												1.2802	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	62.5786	61.6493	60.3405	57.9274	56.1205	54.1169	53.0346	54.3342	55.7493	57.8932	60.3560	62.3671	(42b)
Hot water usage for other uses	33.0132	31.8127	30.6122	29.4117	28.2113	27.0108	27.0108	28.2113	29.4117	30.6122	31.8127	33.0132	(42c)
Average daily hot water use (litres/day)												88.0322	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	95.5918	93.4620	90.9527	87.3391	84.3317	81.1276	80.0454	82.5455	85.1610	88.5054	92.1687	95.3803	(44)
Energy conte	151.3941	133.0886	139.7909	119.5629	113.5267	99.7559	96.8080	102.2086	105.0120	120.1010	131.3112	149.3424	(45)
Energy content (annual)										Total = Sum(45)m =		1461.9023	
Distribution loss (46)m = 0.15 x (45)m	22.7091	19.9633	20.9686	17.9344	17.0290	14.9634	14.5212	15.3313	15.7518	18.0151	19.6967	22.4014	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	197.9890	175.1743	186.3858	164.6547	160.1216	144.8477	143.4029	148.8035	150.1039	166.6959	176.4030	195.9373	(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	197.9890	175.1743	186.3858	164.6547	160.1216	144.8477	143.4029	148.8035	150.1039	166.6959	176.4030	195.9373	(64)
										Total per year (kWh/year) = Sum(64)m =		2010.5197	(64)
12Total per year (kWh/year)												2011	(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	87.6144	77.9205	83.7564	75.8281	75.0235	69.2423	69.4646	71.2603	70.9900	77.2095	79.7344	86.9323	(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	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	89.7529	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	78.9198	87.3754	78.9198	81.5504	78.9198	81.5504	78.9198	78.9198	81.5504	78.9198	81.5504	78.9198	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	156.4672	158.0909	153.9994	145.2890	134.2937	123.9597	117.0560	115.4323	119.5238	128.2342	139.2295	149.5635	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	31.9753	(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)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	117.7614	115.9532	112.5758	105.3168	100.8381	96.1699	93.3664	95.7799	98.5972	103.7762	110.7423	116.8445	(72)
Total internal gains													
	406.0742	414.3453	398.4208	385.0821	366.9774	351.6059	339.2679	340.0579	349.5973	363.8560	384.4480	398.2536	(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	
Southeast	2.3300	36.7938	0.6300	0.7000	0.7700	26.2001	(77)
Southwest	6.1100	36.7938	0.6300	0.7000	0.7700	68.7050	(79)
Northwest	3.7800	11.2829	0.6300	0.7000	0.7700	13.0342	(81)
Southeast	1.1600	26.0000	0.6300	0.7000	1.0000	11.9705	(82)

Solar gains	119.9098	213.0518	313.1883	421.6271	500.8952	509.3343	486.0727	425.4454	350.6932	241.4773	145.2682	101.5318	(83)
Total gains	525.9840	627.3971	711.6091	806.7092	867.8726	860.9402	825.3406	765.5032	700.2905	605.3334	529.7162	499.7854	(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	71.4680	71.6355	71.8005	72.5857	72.7345	73.4354	73.4354	73.5667	73.1639	72.7345	72.4341	72.1226	
alpha	5.7645	5.7757	5.7867	5.8390	5.8490	5.8957	5.8957	5.9044	5.8776	5.8490	5.8289	5.8082	
util living area													
	0.9943	0.9841	0.9562	0.8655	0.6971	0.4994	0.3607	0.4053	0.6478	0.9134	0.9854	0.9957	(86)
MIT	20.0106	20.2249	20.4977	20.7962	20.9513	20.9941	20.9993	20.9986	20.9756	20.7539	20.3288	19.9754	(87)
Th 2	19.8407	19.8430	19.8454	19.8564	19.8584	19.8681	19.8681	19.8698	19.8643	19.8584	19.8543	19.8499	(88)
util rest of house													
	0.9919	0.9777	0.9392	0.8217	0.6250	0.4133	0.2683	0.3065	0.5516	0.8727	0.9783	0.9938	(89)
MIT 2	18.7288	19.0000	19.3357	19.6806	19.8269	19.8657	19.8679	19.8695	19.8528	19.6490	19.1421	18.6910	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	19.4109	19.6518	19.9540	20.2742	20.4252	20.4661	20.4699	20.4703	20.4502	20.2369	19.7736	19.3744	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4109	19.6518	19.9540	20.2742	20.4252	20.4661	20.4699	20.4703	20.4502	20.2369	19.7736	19.3744	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9764	0.9410	0.8390	0.6618	0.4592	0.3175	0.3592	0.6025	0.8879	0.9776	0.9928	(94)
Useful gains	521.1090	612.5696	669.6572	676.8021	574.3954	395.3098	262.0713	274.9467	421.9398	537.4754	517.8730	496.2031	(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													
	1052.3129	1024.9063	932.5904	779.8972	597.0384	397.5698	262.2791	275.3683	431.9754	659.4228	870.8085	1047.1473	(97)
Space heating kWh													
	395.2157	277.0903	195.6223	74.2285	16.8464	0.0000	0.0000	0.0000	0.0000	90.7289	254.1136	409.9024	(98a)
Space heating requirement - total per year (kWh/year)												1713.7480	
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													
	395.2157	277.0903	195.6223	74.2285	16.8464	0.0000	0.0000	0.0000	0.0000	90.7289	254.1136	409.9024	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1713.7480	
Space heating per m2											(98c) / (4) =	31.9968	(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													
	395.2157	277.0903	195.6223	74.2285	16.8464	0.0000	0.0000	0.0000	0.0000	90.7289	254.1136	409.9024	(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)													
	428.1860	300.2061	211.9418	80.4209	18.2518	0.0000	0.0000	0.0000	0.0000	98.2978	275.3126	444.0980	(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													
	197.9890	175.1743	186.3858	164.6547	160.1216	144.8477	143.4029	148.8035	150.1039	166.6959	176.4030	195.9373	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.5786	85.0833	84.1684	82.3949	80.5774	79.8000	79.8000	79.8000	79.8000	82.7561	84.8776	85.6750	(217)
Fuel for water heating, kWh/month													

	231.3533	205.8857	221.4439	199.8361	198.7177	181.5135	179.7029	186.4705	188.1001	201.4302	207.8322	228.6984 (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	16.3980	13.1551	11.8447	8.6779	6.7031	5.4765	6.1148	7.9482	10.3239	13.5456	15.2997	16.8537 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-11.9664	-17.9997	-27.5889	-33.1538	-37.6644	-35.8780	-35.4558	-32.5194	-27.6824	-21.5080	-13.5549	-10.2192 (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	-3.7180	-8.0416	-16.3987	-25.2483	-33.9919	-34.3642	-33.9460	-28.4509	-20.4850	-11.6850	-5.0235	-2.9231 (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	1856.7151 (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	2430.9846 (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)	132.3410 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-529.4674 (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	3976.5733 (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	1856.7151	0.2100	389.9102	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2430.9846	0.2100	510.5068	(264)
Space and water heating			900.4169	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	132.3410	0.1443	19.1009	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	0.1332	-40.6623	
PV Unit electricity exported	-224.2764	0.1252	-28.0767	
Total			-68.7389	(269)
Total CO2, kg/year			862.7082	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			16.1100	(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	1856.7151	1.1300	2098.0881	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2430.9846	1.1300	2747.0126	(278)
Space and water heating			4845.1007	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	132.3410	1.5338	202.9890	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-305.1910	1.4923	-455.4483	
PV Unit electricity exported	-224.2764	0.4595	-103.0532	
Total			-558.5015	(283)
Total Primary energy kWh/year			4619.6890	(286)
Target Primary Energy Rate (TPER)			86.2500	(287)

Full SAP Calculation Printout

Plot Reference	Flat 10	**Issued on Date**	24/09/2026
Assessment Reference	Flat 10 - Be Green	**Plot Type Ref**	Flat 10
Plot Address	Flat 10, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	94 A	**DER**	1.61	**TER**	16.11
Environmental	99 A	**% DER < TER**			90.01
CO_2 Emissions (t/year)	0.05	**DFEE**	36.98	**TFEE**	40.97
Compliance Check	See BREL	**% DFEE < TFEE**			9.76
% DPER < TPER	76.47	**DPER**	20.30	**TPER**	86.25

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)

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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	
Main dwelling								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0280	0.2184	
E18 Party wall between dwellings	15.6000	0.0160	0.2496	
E14 Flat roof	26.0000	0.0800	2.0800	
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200	
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696	
E3 Sill	8.4000	0.0460	0.3864	
E4 Jamb	26.4000	0.0590	1.5576	
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.4676	(36)
Point Thermal bridges		(36a) =	0.0000	
Total fabric heat loss		(33) + (36) + (36a) =	39.0951	(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	13.4413	13.2685	13.0956	12.2313	12.0584	11.1941	11.1941	11.0212	11.5398	12.0584	12.4042	12.7499	(38)
Heat transfer coeff	52.5365	52.3636	52.1908	51.3264	51.1536	50.2892	50.2892	50.1164	50.6350	51.1536	51.4993	51.8450	(39)
Average = Sum(39)m / 12 =												51.2832	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9809	0.9777	0.9744	0.9583	0.9551	0.9389	0.9389	0.9357	0.9454	0.9551	0.9615	0.9680	(40)
HLP (average)												0.9575	
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												1.7951	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)
Hot water usage for other uses	34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)
Average daily hot water use (litres/day)												92.6655	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
										Total per year (kWh/year) = Sum(64)m =		2179.3465	(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	96.5070	85.8885	92.4459	83.9622	83.2534	77.0298	77.4018	79.2920	78.8694	85.5544	88.0741	95.7889	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.5644	14.7123	11.9649	9.0582	6.7711	5.7164	6.1768	8.0289	10.7763	13.6830	15.9701	17.0247	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	129.7137	127.8103	124.2552	116.6142	111.8997	106.9858	104.0347	106.5753	109.5409	114.9925	122.3252	128.7485	(72)
Total internal gains	463.2778	461.9457	449.5364	425.9881	402.5757	381.1833	368.3885	370.3578	382.1775	403.5363	429.5670	452.4689	(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	
Southeast	3.5200	36.7938	0.4000	0.7000	0.7700	25.1310	(77)
Southwest	9.2400	36.7938	0.4000	0.7000	0.7700	65.9688	(79)
Northwest	5.7200	11.2829	0.4000	0.7000	0.7700	12.5230	(81)
Southeast	1.7600	26.0000	0.4000	0.7000	1.0000	11.5315	(82)

Solar gains	115.1543	204.6176	300.8239	405.0266	481.2062	489.3257	466.9731	408.7076	336.8640	231.9274	139.5098	97.5032	(83)
Total gains	578.4320	666.5633	750.3602	831.0148	883.7819	870.5090	835.3616	779.0653	719.0415	635.4638	569.0768	549.9721	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	94.7341	95.0468	95.3616	96.9675	97.2952	98.9674	98.9674	99.3087	98.2916	97.2952	96.6420	95.9975	
alpha	7.3156	7.3365	7.3574	7.4645	7.4863	7.5978	7.5978	7.6206	7.5528	7.4863	7.4428	7.3998	
util living area	0.9833	0.9565	0.8841	0.7239	0.5359	0.3696	0.2649	0.2959	0.4848	0.7909	0.9566	0.9875	(86)
Living	20.5829	20.7080	20.8442	20.9346	20.9558	20.9589	20.9590	20.9591	20.9579	20.9226	20.7494	20.5591	
Non living	19.6323	19.7863	19.9433	20.0460	20.0660	20.0819	20.0820	20.0849	20.0758	20.0405	19.8508	19.6124	
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	20.7866	20.7080	20.8442	20.9346	20.9558	20.9589	20.9590	20.9591	20.9579	20.9226	20.7494	20.6208	(87)
Th 2	20.0993	20.1020	20.1047	20.1182	20.1209	20.1345	20.1345	20.1373	20.1291	20.1209	20.1155	20.1101	(88)
util rest of house	0.9773	0.9427	0.8547	0.6785	0.4863	0.3197	0.2128	0.2404	0.4242	0.7391	0.9404	0.9828	(89)
MIT 2	19.9131	19.7863	19.9433	20.0460	20.0660	20.0819	20.0820	20.0849	20.0758	20.0405	19.8508	19.7021	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	20.3779	20.2768	20.4227	20.5188	20.5395	20.5486	20.5487	20.5501	20.5452	20.5099	20.3290	20.1909	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3779	20.2768	20.4227	20.5188	20.5395	20.5486	20.5487	20.5501	20.5452	20.5099	20.3290	20.1909	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9457	0.8657	0.6995	0.5100	0.3436	0.2377	0.2670	0.4532	0.7629	0.9448	0.9833	(94)
Useful gains	566.4942	630.3792	649.6108	581.2988	450.7042	299.0912	198.5731	207.9805	325.8930	484.7877	537.6412	540.7975	(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	844.6772	805.1832	726.6349	596.3534	452.1721	299.1499	198.5759	207.9869	326.3504	506.9258	681.2819	829.0503	(97)
Space heating kWh	206.9682	117.4683	57.3059	10.8393	1.0921	0.0000	0.0000	0.0000	0.0000	16.4707	103.4213	214.4601	(98a)
Space heating requirement - total per year (kWh/year)												728.0259	
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	206.9682	117.4683	57.3059	10.8393	1.0921	0.0000	0.0000	0.0000	0.0000	16.4707	103.4213	214.4601	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												728.0259	
Space heating per m2											(98c) / (4) =	13.5927	(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 %) 213.5980 (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	206.9682	117.4683	57.3059	10.8393	1.0921	0.0000	0.0000	0.0000	0.0000	16.4707	103.4213	214.4601	(98)
Space heating efficiency (main heating system 1)	213.5980	213.5980	213.5980	213.5980	213.5980	0.0000	0.0000	0.0000	0.0000	213.5980	213.5980	213.5980	(210)
Space heating fuel (main heating system)	96.8961	54.9950	26.8289	5.0746	0.5113	0.0000	0.0000	0.0000	0.0000	7.7111	48.4187	100.4036	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
Efficiency of water heater												177.5028	(216)
(217)m	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	(217)
Fuel for water heating, kWh/month	120.4268	106.6054	113.5459	100.5616	97.9706	88.8156	88.0560	91.2587	91.9326	101.8693	107.5286	119.2101	(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	13.0048	11.7462	13.0048	12.5853	13.0048	12.5853	13.0048	13.0048	12.5853	13.0048	12.5853	13.0048	(231)
Lighting	14.4987	11.6314	10.4728	7.6728	5.9267	4.8422	5.4065	7.0276	9.1282	11.9767	13.5276	14.9017	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.0615	-60.7083	-100.0065	-125.6872	-146.1598	-140.2566	-138.3798	-125.6262	-103.1314	-74.8544	-43.3843	-30.9821	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.7301	-5.7924	-17.1840	-35.8303	-56.3315	-59.8042	-58.6401	-44.7220	-27.3033	-11.3015	-2.9953	-1.2223	(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												340.8393	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.5028	

Water heating fuel used	1227.7813	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	153.1207	(230a)
Total electricity for the above, kWh/year	153.1207	(231)
Electricity for lighting (calculated in Appendix L)	117.0127	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	389.6592	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	340.8393	16.4900	56.2044	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.7813	16.4900	202.4611	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	153.1207	16.4900	25.2496	(249)
Energy for lighting	117.0127	16.4900	19.2954	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1126.2381	16.4900	-185.7167	
PV Unit electricity exported	-322.8568	5.5900	-18.0477	
Total			-203.7644	(252)
Total energy cost			99.4462	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3632	(257)
SAP value		94.1119	
SAP rating (Section 12)		94	(258)
SAP band		A	

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	340.8393	0.1591	54.2170	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.7813	0.1407	172.7625	(264)
Space and water heating			226.9795	(265)
Pumps, fans and electric keep-hot	153.1207	0.1387	21.2397	(267)
Energy for lighting	117.0127	0.1443	16.8886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1126.2381	0.1323	-148.9461	
PV Unit electricity exported	-322.8568	0.1189	-38.3989	
Total			-187.3450	(269)
Total CO2, kg/year			77.7628	(272)
CO2 emissions per m2			1.4500	(273)
EI value			98.9428	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	53.5600 (1b)	x 2.6300 (2b)	= 140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.5600				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.8628	(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	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.1636	0.1562	0.1562	0.1450	0.1450	0.1264	0.1302	0.1376	0.1339	0.1413	0.1413	0.1562	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2557	0.2557	0.2445	0.2445	0.2259	0.2297	0.2371	0.2334	0.2408	0.2408	0.2557	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17917.1800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	334.5254 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696
E3 Sill	8.4000	0.0460	0.3864
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.4676 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	39.0951 (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	12.2313	11.8856	11.8856	11.3670	11.3670	10.5026	10.6755	11.0212	10.8484	11.1941	11.1941	11.8856	(38)
Heat transfer coeff	51.3264	50.9807	50.9807	50.4621	50.4621	49.5978	49.7706	50.1164	49.9435	50.2892	50.2892	50.9807	(39)
Average = Sum(39)m / 12 =												50.4333	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9583	0.9518	0.9518	0.9422	0.9422	0.9260	0.9293	0.9357	0.9325	0.9389	0.9389	0.9518	(40)
HLP (average)												0.9416	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7951 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day)	92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)

Water storage loss (or HIU loss):	
Store volume	150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.8600 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	1.0044 (55)

Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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

	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(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													
	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
									Total per year (kWh/year) = Sum(64)m =			2179.3465	(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													
	96.5070	85.8885	92.4459	83.9622	83.2534	77.0298	77.4018	79.2920	78.8694	85.5544	88.0741	95.7889	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5644	14.7123	11.9649	9.0582	6.7711	5.7164	6.1768	8.0289	10.7763	13.6830	15.9701	17.0247	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)													
	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)													
	129.7137	127.8103	124.2552	116.6142	111.8997	106.9858	104.0347	106.5753	109.5409	114.9925	122.3252	128.7485	(72)
Total internal gains													
	463.2778	461.9457	449.5364	425.9881	402.5757	381.1833	368.3885	370.3578	382.1775	403.5363	429.5670	452.4689	(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	
Southeast	3.5200	39.1209	0.4000	0.7000	0.7700	26.7204	(77)
Southwest	9.2400	39.1209	0.4000	0.7000	0.7700	70.1410	(79)
Northwest	5.7200	12.4928	0.4000	0.7000	0.7700	13.8658	(81)
Southeast	1.7600	29.0000	0.4000	0.7000	1.0000	12.8621	(82)

Solar gains	123.5894	197.4772	292.4076	410.7916	475.7139	519.0993	496.6656	443.4749	362.9916	244.7431	154.6831	107.1678	(83)
Total gains	586.8671	659.4229	741.9440	836.7798	878.2896	900.2826	865.0541	813.8327	745.1691	648.2795	584.2501	559.6367	(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	96.9675	97.6251	97.6251	98.6284	98.6284	100.3471	99.9986	99.3087	99.6525	98.9674	98.9674	97.6251	
alpha	7.4645	7.5083	7.5083	7.5752	7.5752	7.6898	7.6666	7.6206	7.6435	7.5978	7.5978	7.5083	
util living area													
	0.9717	0.9387	0.8352	0.6313	0.4362	0.2534	0.1438	0.1663	0.3551	0.6770	0.9162	0.9777	(86)
Living	20.6776	20.7747	20.8936	20.9508	20.9584	20.9595	20.9594	20.9592	20.9592	20.9485	20.8389	20.6560	
Non living	19.7660	19.8850	20.0134	20.0734	20.0789	20.0935	20.0906	20.0849	20.0877	20.0753	19.9703	19.7449	
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	20.8351	20.7747	20.8936	20.9508	20.9584	20.9595	20.9594	20.9592	20.9592	20.9485	20.8389	20.7041	(87)
Th 2	20.1182	20.1237	20.1237	20.1318	20.1318	20.1454	20.1427	20.1373	20.1400	20.1345	20.1345	20.1237	(88)
util rest of house													
	0.9616	0.9199	0.7976	0.5826	0.3866	0.2063	0.0945	0.1131	0.2976	0.6167	0.8881	0.9694	(89)
MIT 2	19.9778	19.8850	20.0134	20.0734	20.0789	20.0935	20.0906	20.0849	20.0877	20.0753	19.9703	19.8132	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	20.4340	20.3584	20.4818	20.5403	20.5469	20.5543	20.5529	20.5501	20.5515	20.5399	20.4325	20.2873	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4340	20.3584	20.4818	20.5403	20.5469	20.5543	20.5529	20.5501	20.5515	20.5399	20.4325	20.2873	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9656	0.9254	0.8136	0.6057	0.4103	0.2289	0.1181	0.1386	0.3251	0.6454	0.8986	0.9712	(94)
Useful gains	566.6606	610.2355	603.6613	506.8388	360.3963	206.0436	102.1750	112.7664	242.2681	418.4129	524.9953	543.5088	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	771.6409	737.1018	646.5251	511.7008	360.6472	206.0455	102.1750	112.7664	242.2986	424.4373	605.1049	758.9634	(97)
Space heating kWh													
	152.5053	85.2541	31.8907	3.5006	0.1866	0.0000	0.0000	0.0000	0.0000	4.4822	57.6789	160.2982	(98a)
Space heating requirement - total per year (kWh/year)												495.7967	
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													
	152.5053	85.2541	31.8907	3.5006	0.1866	0.0000	0.0000	0.0000	0.0000	4.4822	57.6789	160.2982	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												495.7967	
Space heating per m2											(98c) / (4) =	9.2568	(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 %)												213.2089	(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													
	152.5053	85.2541	31.8907	3.5006	0.1866	0.0000	0.0000	0.0000	0.0000	4.4822	57.6789	160.2982	(98)
Space heating efficiency (main heating system 1)													
	213.2089	213.2089	213.2089	213.2089	213.2089	0.0000	0.0000	0.0000	0.0000	213.2089	213.2089	213.2089	(210)
Space heating fuel (main heating system)													
	71.5286	39.9862	14.9575	1.6419	0.0875	0.0000	0.0000	0.0000	0.0000	2.1022	27.0528	75.1836	(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													
	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
Efficiency of water heater												177.5923	(216)
(217)m	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	(217)
Fuel for water heating, kWh/month													
	120.3661	106.5517	113.4887	100.5109	97.9212	88.7708	88.0116	91.2127	91.8863	101.8180	107.4744	119.1500	(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	13.0048	11.7462	13.0048	12.5853	13.0048	12.5853	13.0048	13.0048	12.5853	13.0048	12.5853	13.0048	(231)
Lighting	14.4987	11.6314	10.4728	7.6728	5.9267	4.8422	5.4065	7.0276	9.1282	11.9767	13.5276	14.9017	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.1515	-59.3617	-98.0627	-127.2650	-145.1451	-145.8551	-144.2125	-133.4084	-110.0111	-79.1393	-48.2667	-34.3780	(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	-2.1612	-5.7913	-17.1560	-37.5400	-55.4705	-66.5433	-65.6179	-52.2151	-31.8540	-13.0546	-3.9858	-1.6000	(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												232.5403	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.5923	
Water heating fuel used												1227.1625	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)													
mechanical ventilation fans (SFP = 0.8910)												153.1207	(230a)
Total electricity for the above, kWh/year												153.1207	(231)
Electricity for lighting (calculated in Appendix L)												117.0127	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1518.2466	(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												211.5895	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	232.5403	26.0000	60.4605	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.1625	26.0000	319.0622	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	153.1207	26.0000	39.8114	(249)
Energy for lighting	117.0127	26.0000	30.4233	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.2570	26.0000	-302.9668	
PV Unit electricity exported	-352.9897	5.8100	-20.5087	
Total			-323.4755	(252)
Total energy cost			126.2819	(255)

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	232.5403	0.1600	37.2176	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.1625	0.1407	172.6754	(264)
Space and water heating			209.8930	(265)
Pumps, fans and electric keep-hot	153.1207	0.1387	21.2397	(267)
Energy for lighting	117.0127	0.1443	16.8886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.2570	0.1321	-153.9323	
PV Unit electricity exported	-352.9897	0.1180	-41.6663	
Total			-195.5986	(269)
Total CO2, kg/year			52.4227	(272)

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	232.5403	1.5924	370.2869	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.1625	1.5203	1865.6421	(278)
Space and water heating			2235.9290	(279)
Pumps, fans and electric keep-hot	153.1207	1.5128	231.6410	(281)
Energy for lighting	117.0127	1.5338	179.4780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.2570	1.4881	-1733.9906	
PV Unit electricity exported	-352.9897	0.4328	-152.7608	
Total			-1886.7514	(283)
Total Primary energy kWh/year			760.2966	(286)

SAP 10 EPC IMPROVEMENTS

Flat 10 - Be Green

Current energy efficiency rating: A 94
Current environmental impact rating: A 99

N Solar water heating — Not applicable
U Solar photovoltaic panels — Not applicable
V2 Wind turbine — Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 94
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£450	£450	£0
Space heating	£100	£100	£0
Water heating	£319	£319	£0
Lighting	£30	£30	£0
Generated (PV)	-£323	-£323	£0
Total cost of fuels	£127	£127	£0
Total cost of uses	£126	£126	£0
Delivered energy	4 kWh/m²	4 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.1 tonnes	0.1 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	14 kWh/m²	14 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	140.8628	(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	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	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	
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17917.1800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	334.5254	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696
E3 Sill	8.4000	0.0460	0.3864
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.4676	(36)
Point Thermal bridges	(36a) = 0.0000	
Total fabric heat loss	(33) + (36) + (36a) = 39.0951	(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	13.4413	13.2685	13.0956	12.2313	12.0584	11.1941	11.1941	11.0212	11.5398	12.0584	12.4042	12.7499	(38)
Heat transfer coeff													
	52.5365	52.3636	52.1908	51.3264	51.1536	50.2892	50.2892	50.1164	50.6350	51.1536	51.4993	51.8450	(39)
Average = Sum(39)m / 12 =												51.2832	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9809	0.9777	0.9744	0.9583	0.9551	0.9389	0.9389	0.9357	0.9454	0.9551	0.9615	0.9680	(40)
HLP (average)												0.9575	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7951	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)
Hot water usage for other uses													
	34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)
Average daily hot water use (litres/day)												92.6655	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)											Total = Sum(45)m =	1538.8445	
Distribution loss (46)m = 0.15 x (45)m													
	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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													
	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
									Total per year (kWh/year) = Sum(64)m =			2179.3465	(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	96.5070	85.8885	92.4459	83.9622	83.2534	77.0298	77.4018	79.2920	78.8694	85.5544	88.0741	95.7889	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.5644	14.7123	11.9649	9.0582	6.7711	5.7164	6.1768	8.0289	10.7763	13.6830	15.9701	17.0247	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	129.7137	127.8103	124.2552	116.6142	111.8997	106.9858	104.0347	106.5753	109.5409	114.9925	122.3252	128.7485	(72)
Total internal gains	463.2778	461.9457	449.5364	425.9881	402.5757	381.1833	368.3885	370.3578	382.1775	403.5363	429.5670	452.4689	(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	
Southeast	3.5200	36.7938	0.4000	0.7000	0.7700	25.1310	(77)
Southwest	9.2400	36.7938	0.4000	0.7000	0.7700	65.9688	(79)
Northwest	5.7200	11.2829	0.4000	0.7000	0.7700	12.5230	(81)
Southeast	1.7600	26.0000	0.4000	0.7000	1.0000	11.5315	(82)

Solar gains	115.1543	204.6176	300.8239	405.0266	481.2062	489.3257	466.9731	408.7076	336.8640	231.9274	139.5098	97.5032	(83)
Total gains	578.4320	666.5633	750.3602	831.0148	883.7819	870.5090	835.3616	779.0653	719.0415	635.4638	569.0768	549.9721	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	94.7341	95.0468	95.3616	96.9675	97.2952	98.9674	98.9674	99.3087	98.2916	97.2952	96.6420	95.9975	
alpha	7.3156	7.3365	7.3574	7.4645	7.4863	7.5978	7.5978	7.6206	7.5528	7.4863	7.4428	7.3998	
util living area	0.9833	0.9565	0.8841	0.7239	0.5359	0.3696	0.2649	0.2959	0.4848	0.7909	0.9566	0.9875	(86)
Living	20.5829	20.7080	20.8442	20.9346	20.9558	20.9589	20.9590	20.9591	20.9579	20.9226	20.7494	20.5591	
Non living	19.6323	19.7863	19.9433	20.0460	20.0660	20.0819	20.0820	20.0849	20.0758	20.0405	19.8508	19.6124	
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	20.7866	20.7080	20.8442	20.9346	20.9558	20.9589	20.9590	20.9591	20.9579	20.9226	20.7494	20.6208	(87)
Th 2	20.0993	20.1020	20.1047	20.1182	20.1209	20.1345	20.1345	20.1373	20.1291	20.1209	20.1155	20.1101	(88)
util rest of house	0.9773	0.9427	0.8547	0.6785	0.4863	0.3197	0.2128	0.2404	0.4242	0.7391	0.9404	0.9828	(89)
MIT 2	19.9131	19.7863	19.9433	20.0460	20.0660	20.0819	20.0820	20.0849	20.0758	20.0405	19.8508	19.7021	(90)
Living area fraction									fLA = Living area / (4) =			0.5321	(91)
MIT	20.3779	20.2768	20.4227	20.5188	20.5395	20.5486	20.5487	20.5501	20.5452	20.5099	20.3290	20.1909	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3779	20.2768	20.4227	20.5188	20.5395	20.5486	20.5487	20.5501	20.5452	20.5099	20.3290	20.1909	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9794	0.9457	0.8657	0.6995	0.5100	0.3436	0.2377	0.2670	0.4532	0.7629	0.9448	0.9833	(94)
Useful gains	566.4942	630.3792	649.6108	581.2988	450.7042	299.0912	198.5731	207.9805	325.8930	484.7877	537.6412	540.7975	(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	844.6772	805.1832	726.6349	596.3534	452.1721	299.1499	198.5759	207.9869	326.3504	506.9258	681.2819	829.0503	(97)
Space heating kWh	206.9682	117.4683	57.3059	10.8393	1.0921	0.0000	0.0000	0.0000	0.0000	16.4707	103.4213	214.4601	(98a)
Space heating requirement - total per year (kWh/year)												728.0259	
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	206.9682	117.4683	57.3059	10.8393	1.0921	0.0000	0.0000	0.0000	0.0000	16.4707	103.4213	214.4601	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												728.0259	
Space heating per m2											(98c) / (4) =	13.5927	(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 %)	213.5980	(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	206.9682	117.4683	57.3059	10.8393	1.0921	0.0000	0.0000	0.0000	0.0000	16.4707	103.4213	214.4601	(98)
Space heating efficiency (main heating system 1)	213.5980	213.5980	213.5980	213.5980	213.5980	0.0000	0.0000	0.0000	0.0000	213.5980	213.5980	213.5980	(210)
Space heating fuel (main heating system)	96.8961	54.9950	26.8289	5.0746	0.5113	0.0000	0.0000	0.0000	0.0000	7.7111	48.4187	100.4036	(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	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
Efficiency of water heater												177.5028	(216)
(217)m	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	177.5028	(217)
Fuel for water heating, kWh/month	120.4268	106.6054	113.5459	100.5616	97.9706	88.8156	88.0560	91.2587	91.9326	101.8693	107.5286	119.2101	(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	13.0048	11.7462	13.0048	12.5853	13.0048	12.5853	13.0048	13.0048	12.5853	13.0048	12.5853	13.0048	(231)
Lighting	14.4987	11.6314	10.4728	7.6728	5.9267	4.8422	5.4065	7.0276	9.1282	11.9767	13.5276	14.9017	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.0615	-60.7083	-100.0065	-125.6872	-146.1598	-140.2566	-138.3798	-125.6262	-103.1314	-74.8544	-43.3843	-30.9821	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.7301	-5.7924	-17.1840	-35.8303	-56.3315	-59.8042	-58.6401	-44.7220	-27.3033	-11.3015	-2.9953	-1.2223	(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	340.8393	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	177.5028	
Water heating fuel used	1227.7813	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	153.1207	(230a)
Total electricity for the above, kWh/year	153.1207	(231)
Electricity for lighting (calculated in Appendix L)	117.0127	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	389.6592	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	340.8393	16.4900	56.2044	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.7813	16.4900	202.4611	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	153.1207	16.4900	25.2496	(249)
Energy for lighting	117.0127	16.4900	19.2954	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1126.2381	16.4900	-185.7167	
PV Unit electricity exported	-322.8568	5.5900	-18.0477	
Total			-203.7644	(252)
Total energy cost			99.4462	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] =	0.3632	(257)
SAP value	94.1119	
SAP rating (Section 12)	94	(258)
SAP band	A	

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	340.8393	0.1591	54.2170	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.7813	0.1407	172.7625	(264)
Space and water heating			226.9795	(265)
Pumps, fans and electric keep-hot	153.1207	0.1387	21.2397	(267)

Energy for lighting	117.0127	0.1443	16.8886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1126.2381	0.1323	-148.9461	
PV Unit electricity exported	-322.8568	0.1189	-38.3989	
Total			-187.3450	(269)
Total CO2, kg/year			77.7628	(272)
CO2 emissions per m2			1.4500	(273)
EI value			98.9428	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	53.5600 (1b)	x	2.6300 (2b)	=	140.8628	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.5600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	140.8628	(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	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.1636	0.1562	0.1562	0.1450	0.1450	0.1264	0.1302	0.1376	0.1339	0.1413	0.1413	0.1562	(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	0.2631	0.2557	0.2557	0.2445	0.2445	0.2259	0.2297	0.2371	0.2334	0.2408	0.2408	0.2557	(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								
Windows			18.4800	0.9615	17.7692			(27)
Rooflights			1.7600	0.9615	1.6923			(27a)
External Wall	68.3800	18.4800	49.9000	0.1400	6.9860	190.0000	9481.0000	(29a)
External Roof 1	53.5600	1.7600	51.8000	0.1000	5.1800	9.0000	466.2000	(30)
Total net area of external elements Aum(A, m2)			121.9400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.6275			(33)
Main dwelling								
Party Wall 1			32.8000	0.0000	0.0000	180.0000	5904.0000	(32)
Party Floor 1			53.5600			30.0000	1606.8000	(32d)
Internal Wall 1			51.0200			9.0000	459.1800	(32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		17917.1800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							334.5254	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	26.0000	0.0120	0.3120
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.0000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0280	0.2184
E18 Party wall between dwellings	15.6000	0.0160	0.2496
E14 Flat roof	26.0000	0.0800	2.0800
P4 Party wall - Roof (insulation at ceiling level)	16.0000	0.1200	1.9200
E2 Other lintels (including other steel lintels)	8.4000	0.0440	0.3696
E3 Sill	8.4000	0.0460	0.3864
E4 Jamb	26.4000	0.0590	1.5576
R11 Upstands or kerbs of rooflights	7.6000	0.0800	0.6080
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			7.4676 (36)

Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 39.0951 (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	12.2313	11.8856	11.8856	11.3670	11.3670	10.5026	10.6755	11.0212	10.8484	11.1941	11.1941	11.8856	(38)
Heat transfer coeff	51.3264	50.9807	50.9807	50.4621	50.4621	49.5978	49.7706	50.1164	49.9435	50.2892	50.2892	50.9807	(39)
Average = Sum(39)m / 12 =												50.4333	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9583	0.9518	0.9518	0.9422	0.9422	0.9260	0.9293	0.9357	0.9325	0.9389	0.9389	0.9518	(40)
HLP (average)												0.9416	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7951 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.8722	64.8940	63.5163	60.9762	59.0742	56.9651	55.8259	57.1939	58.6834	60.9402	63.5326	65.6496	(42b)

Hot water usage for other uses

34.7507	33.4871	32.2234	30.9597	29.6961	28.4324	28.4324	29.6961	30.9597	32.2234	33.4871	34.7507	(42c)

Average daily hot water use (litres/day) 92.6655 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6230	98.3810	95.7397	91.9359	88.7702	85.3975	84.2583	86.8900	89.6432	93.1636	97.0197	100.4003	(44)
Energy conte	159.3622	140.0932	147.1484	125.8557	119.5018	105.0062	101.9031	107.5880	110.5390	126.4221	138.2223	157.2026	(45)
Energy content (annual)										Total = Sum(45)m =		1538.8445	
Distribution loss (46)m = 0.15 x (45)m	23.9043	21.0140	22.0723	18.8783	17.9253	15.7509	15.2855	16.1382	16.5808	18.9633	20.7333	23.5804	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.0044 (55)

Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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

213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(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

213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)

Total per year (kWh/year) = Sum(64)m = 2179.3465 (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

96.5070	85.8885	92.4459	83.9622	83.2534	77.0298	77.4018	79.2920	78.8694	85.5544	88.0741	95.7889	(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	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	107.7034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.5644	14.7123	11.9649	9.0582	6.7711	5.7164	6.1768	8.0289	10.7763	13.6830	15.9701	17.0247	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.5332	235.9565	229.8498	216.8492	200.4384	185.0145	174.7104	172.2871	178.3938	191.3943	207.8052	223.2291	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	47.5654	(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)	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	-71.8023	(71)
Water heating gains (Table 5)	129.7137	127.8103	124.2552	116.6142	111.8997	106.9858	104.0347	106.5753	109.5409	114.9925	122.3252	128.7485	(72)
Total internal gains	463.2778	461.9457	449.5364	425.9881	402.5757	381.1833	368.3885	370.3578	382.1775	403.5363	429.5670	452.4689	(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	
Southeast	3.5200	39.1209	0.4000	0.7000	0.7700	26.7204	(77)
Southwest	9.2400	39.1209	0.4000	0.7000	0.7700	70.1410	(79)
Northwest	5.7200	12.4928	0.4000	0.7000	0.7700	13.8658	(81)
Southeast	1.7600	29.0000	0.4000	0.7000	1.0000	12.8621	(82)

Solar gains	123.5894	197.4772	292.4076	410.7916	475.7139	519.0993	496.6656	443.4749	362.9916	244.7431	154.6831	107.1678	(83)
Total gains	586.8671	659.4229	741.9440	836.7798	878.2896	900.2826	865.0541	813.8327	745.1691	648.2795	584.2501	559.6367	(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	96.9675	97.6251	97.6251	98.6284	98.6284	100.3471	99.9986	99.3087	99.6525	98.9674	98.9674	97.6251	
alpha	7.4645	7.5083	7.5083	7.5752	7.5752	7.6898	7.6666	7.6206	7.6435	7.5978	7.5978	7.5083	
util living area													
	0.9717	0.9387	0.8352	0.6313	0.4362	0.2534	0.1438	0.1663	0.3551	0.6770	0.9162	0.9777	(86)
Living	20.6776	20.7747	20.8936	20.9508	20.9584	20.9595	20.9594	20.9592	20.9592	20.9485	20.8389	20.6560	
Non living	19.7660	19.8850	20.0134	20.0734	20.0789	20.0935	20.0906	20.0849	20.0877	20.0753	19.9703	19.7449	
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	20.8351	20.7747	20.8936	20.9508	20.9584	20.9595	20.9594	20.9592	20.9592	20.9485	20.8389	20.7041	(87)
Th 2	20.1182	20.1237	20.1237	20.1318	20.1318	20.1454	20.1427	20.1373	20.1400	20.1345	20.1345	20.1237	(88)
util rest of house													
	0.9616	0.9199	0.7976	0.5826	0.3866	0.2063	0.0945	0.1131	0.2976	0.6167	0.8881	0.9694	(89)
MIT 2	19.9778	19.8850	20.0134	20.0734	20.0789	20.0935	20.0906	20.0849	20.0877	20.0753	19.9703	19.8132	(90)
Living area fraction										fLA = Living area / (4) =		0.5321	(91)
MIT	20.4340	20.3584	20.4818	20.5403	20.5469	20.5543	20.5529	20.5501	20.5515	20.5399	20.4325	20.2873	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4340	20.3584	20.4818	20.5403	20.5469	20.5543	20.5529	20.5501	20.5515	20.5399	20.4325	20.2873	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9656	0.9254	0.8136	0.6057	0.4103	0.2289	0.1181	0.1386	0.3251	0.6454	0.8986	0.9712	(94)
Useful gains	566.6606	610.2355	603.6613	506.8388	360.3963	206.0436	102.1750	112.7664	242.2681	418.4129	524.9953	543.5088	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	771.6409	737.1018	646.5251	511.7008	360.6472	206.0455	102.1750	112.7664	242.2986	424.4373	605.1049	758.9634	(97)
Space heating kWh													
	152.5053	85.2541	31.8907	3.5006	0.1866	0.0000	0.0000	0.0000	0.0000	4.4822	57.6789	160.2982	(98a)
Space heating requirement - total per year (kWh/year)												495.7967	
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													
	152.5053	85.2541	31.8907	3.5006	0.1866	0.0000	0.0000	0.0000	0.0000	4.4822	57.6789	160.2982	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												495.7967	
Space heating per m2										(98c) / (4) =		9.2568	(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 %)												213.2089	(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													
	152.5053	85.2541	31.8907	3.5006	0.1866	0.0000	0.0000	0.0000	0.0000	4.4822	57.6789	160.2982	(98)
Space heating efficiency (main heating system 1)													
	213.2089	213.2089	213.2089	213.2089	213.2089	0.0000	0.0000	0.0000	0.0000	213.2089	213.2089	213.2089	(210)
Space heating fuel (main heating system)													
	71.5286	39.9862	14.9575	1.6419	0.0875	0.0000	0.0000	0.0000	0.0000	2.1022	27.0528	75.1836	(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													
	213.7610	189.2276	201.5472	178.4997	173.9006	157.6502	156.3019	161.9868	163.1830	180.8209	190.8663	211.6014	(64)
Efficiency of water heater												177.5923	(216)
(217)m	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	177.5923	(217)
Fuel for water heating, kWh/month													
	120.3661	106.5517	113.4887	100.5109	97.9212	88.7708	88.0116	91.2127	91.8863	101.8180	107.4744	119.1500	(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	13.0048	11.7462	13.0048	12.5853	13.0048	12.5853	13.0048	13.0048	12.5853	13.0048	12.5853	13.0048	(231)
Lighting	14.4987	11.6314	10.4728	7.6728	5.9267	4.8422	5.4065	7.0276	9.1282	11.9767	13.5276	14.9017	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.1515	-59.3617	-98.0627	-127.2650	-145.1451	-145.8551	-144.2125	-133.4084	-110.0111	-79.1393	-48.2667	-34.3780	(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	-2.1612	-5.7913	-17.1560	-37.5400	-55.4705	-66.5433	-65.6179	-52.2151	-31.8540	-13.0546	-3.9858	-1.6000	(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												232.5403	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.5923	
Water heating fuel used												1227.1625	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)													
mechanical ventilation fans (SFP = 0.8910)												153.1207	(230a)
Total electricity for the above, kWh/year												153.1207	(231)
Electricity for lighting (calculated in Appendix L)												117.0127	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1518.2466	(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	211.5895	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	232.5403	26.0000	60.4605	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.1625	26.0000	319.0622	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	153.1207	26.0000	39.8114	(249)
Energy for lighting	117.0127	26.0000	30.4233	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.2570	26.0000	-302.9668	
PV Unit electricity exported	-352.9897	5.8100	-20.5087	
Total			-323.4755	(252)
Total energy cost			126.2819	(255)

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	232.5403	0.1600	37.2176	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1227.1625	0.1407	172.6754	(264)
Space and water heating			209.8930	(265)
Pumps, fans and electric keep-hot	153.1207	0.1387	21.2397	(267)
Energy for lighting	117.0127	0.1443	16.8886	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.2570	0.1321	-153.9323	
PV Unit electricity exported	-352.9897	0.1180	-41.6663	
Total			-195.5986	(269)
Total CO2, kg/year			52.4227	(272)

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	232.5403	1.5924	370.2869	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1227.1625	1.5203	1865.6421	(278)
Space and water heating			2235.9290	(279)
Pumps, fans and electric keep-hot	153.1207	1.5128	231.6410	(281)
Energy for lighting	117.0127	1.5338	179.4780	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1165.2570	1.4881	-1733.9906	
PV Unit electricity exported	-352.9897	0.4328	-152.7608	
Total			-1886.7514	(283)
Total Primary energy kWh/year			760.2966	(286)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9 - Be Green	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	95 A	**DER**	1.28	**TER**	13.69
Environmental	99 A	**% DER < TER**			90.65
CO_2 Emissions (t/year)	0.05	**DFEE**	29.48	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			8.21
% DPER < TPER	77.52	**DPER**	16.44	**TPER**	73.13

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)

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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	
Main dwelling								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12072.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000	
E16 Corner (normal)	2.6000	0.0370	0.0962	
E18 Party wall between dwellings	23.4000	0.0160	0.3744	
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100	
E3 Sill	10.5000	0.0230	0.2415	
E4 Jamb	30.8000	0.0240	0.7392	
E14 Flat roof	8.2000	0.0800	0.6560	
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	14.7592	14.5694	14.3796	13.4305	13.2407	12.2917	12.2917	12.1018	12.6713	13.2407	13.6204	14.0000	(38)
Heat transfer coeff	43.7133	43.5235	43.3336	42.3846	42.1948	41.2457	41.2457	41.0559	41.6253	42.1948	42.5744	42.9540	(39)

Average = Sum(39)m / 12 = 42.3371

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7348	0.7316	0.7284	0.7125	0.7093	0.6933	0.6933	0.6901	0.6997	0.7093	0.7157	0.7220	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

HLP (average) 0.7117

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)

Energy content (annual) Total = Sum(45)m = 1539.9585

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

23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.0044 (55)

Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
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)
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)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(62)
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)
-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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS

Output from w/h

213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)

Total per year (kWh/year) = Sum(64)m = 2180.4605 (64)

12Total per year (kWh/year) 2180 (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

96.5453	85.9222	92.4813	83.9925	83.2821	77.0550	77.4264	79.3179	78.8960	85.5848	88.1074	95.8267	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	129.7652	127.8605	124.3028	116.6563	111.9384	107.0209	104.0677	106.6101	109.5778	115.0334	122.3714	128.7994	(72)
Total internal gains	440.5140	449.6672	432.3441	418.0275	398.3607	384.9920	371.5787	372.3398	382.6824	394.8079	417.0948	431.9741	(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	
Northeast	11.2200	11.2829	0.4000	0.7000	0.7700	24.5644	(75)
Southwest	1.3200	36.7938	0.4000	0.7000	0.7700	9.4241	(79)
Northwest	10.5600	11.2829	0.4000	0.7000	0.7700	23.1195	(81)

Solar gains	57.1080	113.1146	196.8387	314.4090	416.5282	441.8276	414.1870	333.6731	236.8699	136.3590	71.2866	47.0061	(83)

Total gains	497.6219	562.7818	629.1828	732.4365	814.8889	826.8196	785.7657	706.0130	619.5523	531.1669	488.3814	478.9802	(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	76.7152	77.0498	77.3873	79.1201	79.4760	81.3048	81.3048	81.6807	80.5633	79.4760	78.7674	78.0712	
alpha	6.1143	6.1367	6.1592	6.2747	6.2984	6.4203	6.4203	6.4454	6.3709	6.2984	6.2512	6.2047	
util living area													
	0.9673	0.9352	0.8597	0.6760	0.4790	0.3191	0.2309	0.2675	0.4617	0.7688	0.9300	0.9721	(86)
Living	20.4222	20.5944	20.7966	20.9585	20.9952	20.9997	21.0000	20.9999	20.9973	20.9288	20.6789	20.4034	
Non living	19.6488	19.8618	20.1026	20.2912	20.3288	20.3466	20.3467	20.3495	20.3393	20.2674	19.9794	19.6347	
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	20.7044	20.5944	20.7966	20.9585	20.9952	20.9997	21.0000	20.9999	20.9973	20.9288	20.6789	20.4868	(87)
Th 2	20.3102	20.3130	20.3158	20.3298	20.3326	20.3467	20.3467	20.3496	20.3411	20.3326	20.3270	20.3214	(88)
util rest of house													
	0.9606	0.9233	0.8381	0.6438	0.4454	0.2866	0.1967	0.2297	0.4184	0.7322	0.9154	0.9663	(89)
MIT 2	20.0465	19.8618	20.1026	20.2912	20.3288	20.3466	20.3467	20.3495	20.3393	20.2674	19.9794	19.7585	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	20.3617	20.2128	20.4351	20.6109	20.6481	20.6595	20.6597	20.6611	20.6545	20.5842	20.3145	20.1074	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3617	20.2128	20.4351	20.6109	20.6481	20.6595	20.6597	20.6611	20.6545	20.5842	20.3145	20.1074	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9612	0.9214	0.8420	0.6575	0.4614	0.3022	0.2131	0.2478	0.4390	0.7464	0.9151	0.9642	(94)
Useful gains	478.2905	518.5235	529.7965	481.5617	375.9629	249.8469	167.4378	174.9277	272.0110	396.4669	446.9050	461.8543	(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													
	702.1099	666.4644	603.8586	496.3609	377.5622	249.9273	167.4442	174.9440	272.8345	421.2828	562.5989	683.2873	(97)
Space heating kWh													
	166.5216	99.4163	55.1021	10.6554	1.1899	0.0000	0.0000	0.0000	0.0000	18.4630	83.2996	164.7461	(98a)
Space heating requirement - total per year (kWh/year)												599.3940	
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													
	166.5216	99.4163	55.1021	10.6554	1.1899	0.0000	0.0000	0.0000	0.0000	18.4630	83.2996	164.7461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												599.3940	
Space heating per m2											(98c) / (4) =	10.0755	(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 %)												207.8483	(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													
	166.5216	99.4163	55.1021	10.6554	1.1899	0.0000	0.0000	0.0000	0.0000	18.4630	83.2996	164.7461	(98)
Space heating efficiency (main heating system 1)													
	207.8483	207.8483	207.8483	207.8483	207.8483	0.0000	0.0000	0.0000	0.0000	207.8483	207.8483	207.8483	(210)
Space heating fuel (main heating system)													
	80.1169	47.8311	26.5107	5.1265	0.5725	0.0000	0.0000	0.0000	0.0000	8.8829	40.0771	79.2627	(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													
	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
Efficiency of water heater												176.2152	(216)
(217)m	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	(217)
Fuel for water heating, kWh/month													
	121.3722	107.4419	114.4360	101.3481	98.7356	89.5077	88.7413	91.9697	92.6498	102.6656	108.3711	120.1458	(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	14.2799	12.8979	14.2799	13.8192	14.2799	13.8192	14.2799	14.2799	13.8192	14.2799	13.8192	14.2799	(231)
Lighting	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.0827	-60.8931	-100.8613	-127.5148	-148.9218	-143.1160	-141.1886	-127.8219	-104.5423	-75.4950	-43.4726	-30.9842	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.7090	-5.6076	-16.3291	-34.0027	-53.5695	-56.9448	-55.8313	-42.5263	-25.8923	-10.6608	-2.9069	-1.2201	(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												288.3805	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.2152	
Water heating fuel used												1237.3848	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	168.1337	(230a)
Total electricity for the above, kWh/year	168.1337	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	387.0267	(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	288.3805	0.1587	45.7564	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1237.3848	0.1407	174.1144	(264)
Space and water heating			219.8708	(265)
Pumps, fans and electric keep-hot	168.1337	0.1387	23.3222	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1141.8943	0.1322	-150.9096	
PV Unit electricity exported	-307.2006	0.1190	-36.5494	
Total			-187.4591	(269)
Total CO2, kg/year			76.2610	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2800	(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	288.3805	1.5873	457.7433	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1237.3848	1.5203	1881.1850	(278)
Space and water heating			2338.9284	(279)
Pumps, fans and electric keep-hot	168.1337	1.5128	254.3527	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1141.8943	1.4883	-1699.4778	
PV Unit electricity exported	-307.2006	0.4364	-134.0556	
Total			-1833.5334	(283)
Total Primary energy kWh/year			977.8933	(286)
Dwelling Primary energy Rate (DPER)			16.4400	(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	59.4900	(1b) x	2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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													
	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(25)

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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 Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.6683 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff													
	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
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 1.9672 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m													
	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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													
	206.0724	182.2804	193.8498	171.0386	166.1832	150.1741	148.5718	154.2608	155.7109	173.1085	183.4142	203.9113	(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													
	206.0724	182.2804	193.8498	171.0386	166.1832	150.1741	148.5718	154.2608	155.7109	173.1085	183.4142	203.9113	(64)
										Total per year (kWh/year) = Sum(64)m =		2088.5759	(64)
12Total per year (kWh/year)												2089	(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													
	90.3022	80.2833	86.2382	77.9508	77.0390	71.0133	71.1832	73.0748	72.8543	79.3417	82.0657	89.5836	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	121.3739	119.4692	115.9115	108.2650	103.5471	98.6296	95.6764	98.2188	101.1865	106.6421	113.9801	120.4081	(72)
Total internal gains													
	435.1227	444.2759	426.9528	412.6362	392.9695	376.6007	363.1874	363.9485	374.2911	389.4166	411.7035	426.5828	(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	
Northeast	7.2200	11.2829	0.6300	0.7000	0.7700	24.8961	(75)
Southwest	0.8500	36.7938	0.6300	0.7000	0.7700	9.5580	(79)
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479	(81)

Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	493.0246	558.9622	626.5243	731.4074	815.2747	824.5555	783.1185	702.2504	614.4486	527.6697	483.9810	474.2425	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area													
	0.9821	0.9671	0.9304	0.8192	0.6382	0.4491	0.3281	0.3806	0.6270	0.8842	0.9661	0.9848	(86)
MIT	19.8534	20.0606	20.3682	20.7384	20.9327	20.9898	20.9982	20.9964	20.9546	20.6723	20.2125	19.8238	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house													
	0.9777	0.9593	0.9145	0.7845	0.5858	0.3879	0.2612	0.3071	0.5561	0.8519	0.9567	0.9810	(89)
MIT 2	18.7493	19.0108	19.3913	19.8304	20.0322	20.0901	20.0954	20.0964	20.0618	19.7702	19.2126	18.7186	(90)
Living area fraction									fLA = Living area / (4) =			0.4791	(91)
MIT	19.2783	19.5137	19.8593	20.2654	20.4636	20.5211	20.5279	20.5276	20.4895	20.2024	19.6916	19.2480	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2783	19.5137	19.8593	20.2654	20.4636	20.5211	20.5279	20.5276	20.4895	20.2024	19.6916	19.2480	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9537	0.9103	0.7918	0.6079	0.4169	0.2933	0.3423	0.5880	0.8564	0.9519	0.9767	(94)
Useful gains	479.7098	533.0794	570.3274	579.1460	495.6421	343.7554	229.6646	240.3777	361.3110	451.8981	460.6973	463.1934	(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													
	906.2156	881.7134	803.8376	675.0985	519.2884	346.8805	230.1108	241.2947	375.9725	568.9913	749.7921	900.6571	(97)
Space heating kWh													
	317.3203	234.2820	173.7316	69.0858	17.5929	0.0000	0.0000	0.0000	0.0000	87.1174	208.1483	325.4730	(98a)
Space heating requirement - total per year (kWh/year)												1432.7513	
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													
	317.3203	234.2820	173.7316	69.0858	17.5929	0.0000	0.0000	0.0000	0.0000	87.1174	208.1483	325.4730	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1432.7513	
Space heating per m2											(98c) / (4) =	24.0839	(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													
	317.3203	234.2820	173.7316	69.0858	17.5929	0.0000	0.0000	0.0000	0.0000	87.1174	208.1483	325.4730	(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)													
	343.7923	253.8267	188.2249	74.8492	19.0606	0.0000	0.0000	0.0000	0.0000	94.3850	225.5127	352.6251	(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													
	206.0724	182.2804	193.8498	171.0386	166.1832	150.1741	148.5718	154.2608	155.7109	173.1085	183.4142	203.9113	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0245	84.6237	83.8149	82.1968	80.5818	79.8000	79.8000	79.8000	79.8000	82.6027	84.3442	85.1030	(217)
Fuel for water heating, kWh/month													
	242.3683	215.4011	231.2832	208.0842	206.2291	188.1881	186.1802	193.3092	195.1264	209.5676	217.4592	239.6054	(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	17.9901	14.4323	12.9947	9.5205	7.3539	6.0082	6.7085	8.7199	11.3263	14.8607	16.7851	18.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.2539	-19.9158	-30.4928	-36.5992	-41.5339	-39.5415	-39.0700	-35.8526	-30.5508	-23.7735	-15.0044	-11.3205	(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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.1671	-9.0087	-18.3650	-28.2691	-38.0559	-38.4777	-38.0158	-31.8682	-22.9496	-13.0946	-5.6310	-3.2769 (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	(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	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1552.2766	(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	2532.8020	(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)	145.1902	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-588.0885	(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	3728.1803	(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	1552.2766	0.2100	325.9781	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2532.8020	0.2100	531.8884	(264)
Space and water heating			857.8665	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	145.1902	0.1443	20.9554	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	0.1333	-44.8970	
PV Unit electricity exported	-251.1796	0.1252	-31.4452	
Total			-76.3422	(269)
Total CO2, kg/year			814.4090	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6900	(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	1552.2766	1.1300	1754.0725	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2532.8020	1.1300	2862.0663	(278)
Space and water heating			4616.1388	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	145.1902	1.5338	222.6975	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	1.4924	-502.8150	
PV Unit electricity exported	-251.1796	0.4595	-115.4171	
Total			-618.2321	(283)
Total Primary energy kWh/year			4350.7050	(286)
Target Primary Energy Rate (TPER)			73.1300	(287)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9 - Be Green	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	95 A	**DER**	1.28	**TER**	13.69
Environmental	99 A	**% DER < TER**			90.65
CO_2 Emissions (t/year)	0.05	**DFEE**	29.48	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			8.21
% DPER < TPER	77.52	**DPER**	16.44	**TPER**	73.13

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3043	(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) =	0.2587	(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	0.3298	0.3233	0.3169	0.2845	0.2781	0.2457	0.2457	0.2393	0.2587	0.2781	0.2910	0.3039	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000 (23c)

Effective ac	0.5544	0.5523	0.5502	0.5405	0.5387	0.5302	0.5302	0.5286	0.5335	0.5387	0.5423	0.5462	(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)	
Main dwelling								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962

E18 Party wall between dwellings	23.4000	0.0160	0.3744	
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100	
E3 Sill	10.5000	0.0230	0.2415	
E4 Jamb	30.8000	0.0240	0.7392	
E14 Flat roof	8.2000	0.0800	0.6560	
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	28.2969	28.1891	28.0835	27.5873	27.4944	27.0622	27.0622	26.9822	27.2287	27.4944	27.6822	27.8786	(38)
Heat transfer coeff	57.2510	57.1432	57.0375	56.5413	56.4485	56.0162	56.0162	55.9362	56.1827	56.4485	56.6363	56.8326	(39)
Average = Sum(39)m / 12 =												56.5409	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9624	0.9606	0.9588	0.9504	0.9489	0.9416	0.9416	0.9403	0.9444	0.9489	0.9520	0.9553	(40)
HLP (average)												0.9504	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.7223	24.3551	23.8381	22.8847	22.1709	21.3794	20.9518	21.4652	22.0242	22.8712	23.8442	24.6387	(42b)
Hot water usage for other uses	34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)
Average daily hot water use (litres/day)												54.5359	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.4981	57.8664	56.0848	53.8669	51.8885	49.8323	49.4048	51.1828	53.0064	55.1179	57.3555	59.4145	(44)
Energy conte	94.2305	82.4010	86.2002	73.7410	69.8518	61.2747	59.7508	63.3750	65.3622	74.7945	81.7134	93.0288	(45)
Energy content (annual)											Total = Sum(45)m =	905.7239	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(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	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(64)
										Total per year (kWh/year) = Sum(64)m =		769.8653	(64)
12Total per year (kWh/year)												770	(64)
Electric shower(s)	45.8098	40.8169	44.5705	42.5331	43.3312	41.3338	42.7116	43.3312	42.5331	44.5705	43.7324	45.8098	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		521.0839	(64a)
Heat gains from water heating, kWh/month	31.4764	27.7144	29.4602	26.3032	25.6763	23.3543	23.3749	24.3000	24.5227	27.0365	28.2972	31.2211	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	42.3070	41.2417	39.5970	36.5323	34.5112	32.4365	31.4179	32.6613	34.0594	36.3393	39.3017	41.9638	(72)
Total internal gains	353.0558	363.0484	347.6383	337.9036	320.9336	310.4076	298.9289	298.3910	307.1639	316.1139	334.0251	345.1385	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.4000	0.7000	0.7700	24.5644	(75)
Southwest	1.3200	36.7938	0.4000	0.7000	0.7700	9.4241	(79)
Northwest	10.5600	11.2829	0.4000	0.7000	0.7700	23.1195	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	57.1080	113.1146	196.8387	314.4090	416.5282	441.8276	414.1870	333.6731	236.8699	136.3590	71.2866	47.0061	(83)
Total gains	410.1638	476.1630	544.4770	652.3125	737.4618	752.2353	713.1159	632.0641	544.0338	452.4729	405.3116	392.1446	(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	58.5749	58.6854	58.7941	59.3101	59.4077	59.8661	59.8661	59.9517	59.6887	59.4077	59.2107	59.0061	
alpha	4.9050	4.9124	4.9196	4.9540	4.9605	4.9911	4.9911	4.9968	4.9792	4.9605	4.9474	4.9337	
util living area	0.9909	0.9806	0.9523	0.8512	0.6681	0.4703	0.3445	0.4044	0.6689	0.9201	0.9815	0.9927	(86)
MIT	19.7877	20.0003	20.3189	20.7150	20.9286	20.9896	20.9982	20.9962	20.9474	20.6222	20.1391	19.7507	(87)
Th 2	20.1148	20.1163	20.1178	20.1248	20.1262	20.1323	20.1323	20.1334	20.1299	20.1262	20.1235	20.1207	(88)
util rest of house	0.9886	0.9758	0.9407	0.8204	0.6169	0.4091	0.2771	0.3295	0.5991	0.8952	0.9760	0.9908	(89)
MIT 2	19.0122	19.2230	19.5339	19.9048	20.0804	20.1274	20.1318	20.1322	20.1015	19.8326	19.3674	18.9802	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	19.3838	19.5954	19.9100	20.2930	20.4867	20.5405	20.5469	20.5461	20.5067	20.2109	19.7371	19.3494	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3838	19.5954	19.9100	20.2930	20.4867	20.5405	20.5469	20.5461	20.5067	20.2109	19.7371	19.3494	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9862	0.9724	0.9375	0.8268	0.6386	0.4381	0.3094	0.3654	0.6304	0.8979	0.9731	0.9886	(94)
Useful gains	404.5070	463.0019	510.4552	539.3182	470.9376	329.5720	220.6458	230.9355	342.9338	406.2961	394.3916	387.6934	(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	863.5593	839.7425	764.8721	644.1724	495.9974	332.7624	221.0878	231.9175	359.9484	542.5218	715.7185	860.9778	(97)
Space heating kWh	341.5349	253.1697	189.2861	75.4950	18.6445	0.0000	0.0000	0.0000	0.0000	101.3519	231.3554	352.1236	(98a)
Space heating requirement - total per year (kWh/year)												1562.9611	
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	341.5349	253.1697	189.2861	75.4950	18.6445	0.0000	0.0000	0.0000	0.0000	101.3519	231.3554	352.1236	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1562.9611	
Space heating per m2											(98c) / (4) =	26.2727	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	526.5527	414.5202	425.1152	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9626	0.9819	0.9676	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	506.8791	407.0013	411.3627	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	847.5257	803.5054	710.4374	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	245.2655	294.9991	222.5116	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.3164	73.7498	55.6279	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												190.6941	(107)
Energy for space heating												26.2727	(99)
Energy for space cooling												3.2055	(108)
Total												29.4782	(109)
Fabric Energy Efficiency (DFEE)												29.5	(109)

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

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1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.6740	(5)

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2. Ventilation rate

	m3 per hour		
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	

Measured/design AP50	5.0000	(17)
Infiltration rate	0.3793	(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) =	0.3224	(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	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.3430	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	30.6683	(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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9672	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.7223	24.3551	23.8381	22.8847	22.1709	21.3794	20.9518	21.4652	22.0242	22.8712	23.8442	24.6387	(42b)
Hot water usage for other uses	34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)
Average daily hot water use (litres/day)												54.5359	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.4981	57.8664	56.0848	53.8669	51.8885	49.8323	49.4048	51.1828	53.0064	55.1179	57.3555	59.4145	(44)
Energy conte	94.2305	82.4010	86.2002	73.7410	69.8518	61.2747	59.7508	63.3750	65.3622	74.7945	81.7134	93.0288	(45)
Energy content (annual)										Total = Sum(45)m =		905.7239	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(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	80.0959	70.0408	73.2702	62.6799	59.3741	52.0835	50.7882	53.8687	55.5579	63.5753	69.4564	79.0745	(64)
									Total per year (kWh/year) = Sum(64)m =			769.8653	(64)
12Total per year (kWh/year)												770	(64)
Electric shower(s)	45.8098	40.8169	44.5705	42.5331	43.3312	41.3338	42.7116	43.3312	42.5331	44.5705	43.7324	45.8098	(64a)
					Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =							521.0839	(64a)
Heat gains from water heating, kWh/month	31.4764	27.7144	29.4602	26.3032	25.6763	23.3543	23.3749	24.3000	24.5227	27.0365	28.2972	31.2211	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	42.3070	41.2417	39.5970	36.5323	34.5112	32.4365	31.4179	32.6613	34.0594	36.3393	39.3017	41.9638	(72)
Total internal gains													
	353.0558	363.0484	347.6383	337.9036	320.9336	310.4076	298.9289	298.3910	307.1639	316.1139	334.0251	345.1385	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	7.2200	11.2829	0.6300	0.7000	0.7700	24.8961	(75)
Southwest	0.8500	36.7938	0.6300	0.7000	0.7700	9.5580	(79)
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479	(81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	410.9577	477.7347	547.2098	656.6747	743.2388	758.3624	718.8601	636.6928	547.3214	454.3669	406.3025	392.7983	(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	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area													
	0.9913	0.9817	0.9556	0.8616	0.6855	0.4859	0.3569	0.4185	0.6863	0.9259	0.9824	0.9929	(86)
MIT	19.6860	19.9045	20.2374	20.6654	20.9090	20.9858	20.9974	20.9946	20.9334	20.5719	20.0629	19.6555	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house													
	0.9890	0.9770	0.9444	0.8313	0.6327	0.4206	0.2844	0.3383	0.6141	0.9019	0.9772	0.9910	(89)
MIT 2	18.8759	19.0934	19.4194	19.8254	20.0281	20.0894	20.0953	20.0961	20.0563	19.7531	19.2602	18.8527	(90)
Living area fraction									fLA = Living area / (4) =			0.4791	(91)
MIT	19.2640	19.4820	19.8113	20.2278	20.4501	20.5188	20.5275	20.5266	20.4765	20.1454	19.6447	19.2373	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2640	19.4820	19.8113	20.2278	20.4501	20.5188	20.5275	20.5266	20.4765	20.1454	19.6447	19.2373	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9865	0.9734	0.9407	0.8364	0.6544	0.4514	0.3192	0.3767	0.6459	0.9036	0.9740	0.9888	(94)
Useful gains	405.3938	465.0063	514.7763	549.2498	486.3603	342.3588	229.4366	239.8433	353.5072	410.5796	395.7406	388.3949	(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													
	905.3524	879.7984	800.9463	672.8648	518.4908	346.7482	230.0854	241.2357	375.2067	565.6127	747.0026	900.0151	(97)
Space heating kWh													
	371.9692	278.7403	212.9105	89.0028	23.9051	0.0000	0.0000	0.0000	0.0000	115.3447	252.9086	380.6454	(98a)
Space heating requirement - total per year (kWh/year)												1725.4267	
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													
	371.9692	278.7403	212.9105	89.0028	23.9051	0.0000	0.0000	0.0000	0.0000	115.3447	252.9086	380.6454	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1725.4267	
Space heating per m2										(98c) / (4) =		29.0036	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	550.6871	433.5196	444.2913	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9536	0.9765	0.9595	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	525.1236	423.3349	426.2937	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	854.6873	810.2194	715.8476	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	237.2859	287.8420	215.4281	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	59.3215	71.9605	53.8570	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												185.1390	(107)
Energy for space heating												29.0036	(99)
Energy for space cooling												3.1121	(108)
Total												32.1157	(109)
Fabric Energy Efficiency (TFEE)												32.1	(109)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9 - Be Green	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	95 A	**DER**	1.28	**TER**	13.69
Environmental	99 A	**% DER < TER**			90.65
CO_2 Emissions (t/year)	0.05	**DFEE**	29.48	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			8.21
% DPER < TPER	77.52	**DPER**	16.44	**TPER**	73.13

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)

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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	
Main dwelling								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12072.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000	
E16 Corner (normal)	2.6000	0.0370	0.0962	
E18 Party wall between dwellings	23.4000	0.0160	0.3744	
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100	
E3 Sill	10.5000	0.0230	0.2415	
E4 Jamb	30.8000	0.0240	0.7392	
E14 Flat roof	8.2000	0.0800	0.6560	
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	14.7592	14.5694	14.3796	13.4305	13.2407	12.2917	12.2917	12.1018	12.6713	13.2407	13.6204	14.0000	(38)
Heat transfer coeff	43.7133	43.5235	43.3336	42.3846	42.1948	41.2457	41.2457	41.0559	41.6253	42.1948	42.5744	42.9540	(39)

Average = Sum(39)m / 12 = 42.3371

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7348	0.7316	0.7284	0.7125	0.7093	0.6933	0.6933	0.6901	0.6997	0.7093	0.7157	0.7220	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

HLP (average) 0.7117

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4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)

Energy content (annual) Total = Sum(45)m = 1539.9585

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

23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 1.0044 (55)

Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
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)
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)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(62)
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)
-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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS

Output from w/h

213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)

Total per year (kWh/year) = Sum(64)m = 2180.4605 (64)

12Total per year (kWh/year) 2180 (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

96.5453	85.9222	92.4813	83.9925	83.2821	77.0550	77.4264	79.3179	78.8960	85.5848	88.1074	95.8267	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	129.7652	127.8605	124.3028	116.6563	111.9384	107.0209	104.0677	106.6101	109.5778	115.0334	122.3714	128.7994	(72)
Total internal gains	440.5140	449.6672	432.3441	418.0275	398.3607	384.9920	371.5787	372.3398	382.6824	394.8079	417.0948	431.9741	(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	
Northeast	11.2200	11.2829	0.4000	0.7000	0.7700	24.5644	(75)
Southwest	1.3200	36.7938	0.4000	0.7000	0.7700	9.4241	(79)
Northwest	10.5600	11.2829	0.4000	0.7000	0.7700	23.1195	(81)

Solar gains	57.1080	113.1146	196.8387	314.4090	416.5282	441.8276	414.1870	333.6731	236.8699	136.3590	71.2866	47.0061	(83)

Total gains	497.6219	562.7818	629.1828	732.4365	814.8889	826.8196	785.7657	706.0130	619.5523	531.1669	488.3814	478.9802	(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	76.7152	77.0498	77.3873	79.1201	79.4760	81.3048	81.3048	81.6807	80.5633	79.4760	78.7674	78.0712	
alpha	6.1143	6.1367	6.1592	6.2747	6.2984	6.4203	6.4203	6.4454	6.3709	6.2984	6.2512	6.2047	
util living area													
	0.9673	0.9352	0.8597	0.6760	0.4790	0.3191	0.2309	0.2675	0.4617	0.7688	0.9300	0.9721	(86)
Living	20.4222	20.5944	20.7966	20.9585	20.9952	20.9997	21.0000	20.9999	20.9973	20.9288	20.6789	20.4034	
Non living	19.6488	19.8618	20.1026	20.2912	20.3288	20.3466	20.3467	20.3495	20.3393	20.2674	19.9794	19.6347	
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	20.7044	20.5944	20.7966	20.9585	20.9952	20.9997	21.0000	20.9999	20.9973	20.9288	20.6789	20.4868	(87)
Th 2	20.3102	20.3130	20.3158	20.3298	20.3326	20.3467	20.3467	20.3496	20.3411	20.3326	20.3270	20.3214	(88)
util rest of house													
	0.9606	0.9233	0.8381	0.6438	0.4454	0.2866	0.1967	0.2297	0.4184	0.7322	0.9154	0.9663	(89)
MIT 2	20.0465	19.8618	20.1026	20.2912	20.3288	20.3466	20.3467	20.3495	20.3393	20.2674	19.9794	19.7585	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	20.3617	20.2128	20.4351	20.6109	20.6481	20.6595	20.6597	20.6611	20.6545	20.5842	20.3145	20.1074	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3617	20.2128	20.4351	20.6109	20.6481	20.6595	20.6597	20.6611	20.6545	20.5842	20.3145	20.1074	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9612	0.9214	0.8420	0.6575	0.4614	0.3022	0.2131	0.2478	0.4390	0.7464	0.9151	0.9642	(94)
Useful gains	478.2905	518.5235	529.7965	481.5617	375.9629	249.8469	167.4378	174.9277	272.0110	396.4669	446.9050	461.8543	(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													
	702.1099	666.4644	603.8586	496.3609	377.5622	249.9273	167.4442	174.9440	272.8345	421.2828	562.5989	683.2873	(97)
Space heating kWh													
	166.5216	99.4163	55.1021	10.6554	1.1899	0.0000	0.0000	0.0000	0.0000	18.4630	83.2996	164.7461	(98a)
Space heating requirement - total per year (kWh/year)												599.3940	
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													
	166.5216	99.4163	55.1021	10.6554	1.1899	0.0000	0.0000	0.0000	0.0000	18.4630	83.2996	164.7461	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												599.3940	
Space heating per m2											(98c) / (4) =	10.0755	(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 %)												207.8483	(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													
	166.5216	99.4163	55.1021	10.6554	1.1899	0.0000	0.0000	0.0000	0.0000	18.4630	83.2996	164.7461	(98)
Space heating efficiency (main heating system 1)													
	207.8483	207.8483	207.8483	207.8483	207.8483	0.0000	0.0000	0.0000	0.0000	207.8483	207.8483	207.8483	(210)
Space heating fuel (main heating system)													
	80.1169	47.8311	26.5107	5.1265	0.5725	0.0000	0.0000	0.0000	0.0000	8.8829	40.0771	79.2627	(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													
	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
Efficiency of water heater												176.2152	(216)
(217)m	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	(217)
Fuel for water heating, kWh/month													
	121.3722	107.4419	114.4360	101.3481	98.7356	89.5077	88.7413	91.9697	92.6498	102.6656	108.3711	120.1458	(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	14.2799	12.8979	14.2799	13.8192	14.2799	13.8192	14.2799	14.2799	13.8192	14.2799	13.8192	14.2799	(231)
Lighting	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.0827	-60.8931	-100.8613	-127.5148	-148.9218	-143.1160	-141.1886	-127.8219	-104.5423	-75.4950	-43.4726	-30.9842	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.7090	-5.6076	-16.3291	-34.0027	-53.5695	-56.9448	-55.8313	-42.5263	-25.8923	-10.6608	-2.9069	-1.2201	(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												288.3805	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.2152	
Water heating fuel used												1237.3848	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	168.1337	(230a)
Total electricity for the above, kWh/year	168.1337	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	387.0267	(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	288.3805	0.1587	45.7564	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1237.3848	0.1407	174.1144	(264)
Space and water heating			219.8708	(265)
Pumps, fans and electric keep-hot	168.1337	0.1387	23.3222	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1141.8943	0.1322	-150.9096	
PV Unit electricity exported	-307.2006	0.1190	-36.5494	
Total			-187.4591	(269)
Total CO2, kg/year			76.2610	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2800	(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	288.3805	1.5873	457.7433	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1237.3848	1.5203	1881.1850	(278)
Space and water heating			2338.9284	(279)
Pumps, fans and electric keep-hot	168.1337	1.5128	254.3527	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1141.8943	1.4883	-1699.4778	
PV Unit electricity exported	-307.2006	0.4364	-134.0556	
Total			-1833.5334	(283)
Total Primary energy kWh/year			977.8933	(286)
Dwelling Primary energy Rate (DPER)			16.4400	(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	59.4900	(1b) x	2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1293	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3793	(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) =	0.3224	(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													
	0.4111	0.4030	0.3950	0.3546	0.3466	0.3063	0.3063	0.2982	0.3224	0.3466	0.3627	0.3788	(22b)
Effective ac	0.5845	0.5812	0.5780	0.5629	0.5601	0.5469	0.5469	0.5445	0.5520	0.5601	0.5658	0.5718	(25)

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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 Opening Type			14.8700	1.1450	17.0267			(27)
External Wall	44.4600	14.8700	29.5900	0.1800	5.3262			(29a)
External Roof	8.8400		8.8400	0.1100	0.9724			(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.3253			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0700	2.3030
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0900	0.2340
E18 Party wall between dwellings	23.4000	0.0600	1.4040
E2 Other lintels (including other steel lintels)	10.5000	0.0500	0.5250
E3 Sill	10.5000	0.0500	0.5250
E4 Jamb	30.8000	0.0500	1.5400
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 7.3430 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 30.6683 (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	29.8338	29.6663	29.5022	28.7312	28.5869	27.9154	27.9154	27.7911	28.1741	28.5869	28.8787	29.1838	(38)
Heat transfer coeff													
	60.5021	60.3346	60.1705	59.3995	59.2552	58.5837	58.5837	58.4594	58.8424	59.2552	59.5471	59.8521	(39)
Average = Sum(39)m / 12 =												59.3988	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0170	1.0142	1.0114	0.9985	0.9961	0.9848	0.9848	0.9827	0.9891	0.9961	1.0010	1.0061	(40)
HLP (average)												0.9985	
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 1.9672 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m													
	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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													
	206.0724	182.2804	193.8498	171.0386	166.1832	150.1741	148.5718	154.2608	155.7109	173.1085	183.4142	203.9113	(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													
	206.0724	182.2804	193.8498	171.0386	166.1832	150.1741	148.5718	154.2608	155.7109	173.1085	183.4142	203.9113	(64)
										Total per year (kWh/year) = Sum(64)m =		2088.5759	(64)
12Total per year (kWh/year)												2089	(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													
	90.3022	80.2833	86.2382	77.9508	77.0390	71.0133	71.1832	73.0748	72.8543	79.3417	82.0657	89.5836	(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	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	98.3589	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	86.5822	95.8589	86.5822	89.4683	86.5822	89.4683	86.5822	86.5822	89.4683	86.5822	89.4683	86.5822	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	171.6589	173.4402	168.9514	159.3953	147.3325	135.9952	128.4211	126.6398	131.1286	140.6847	152.7475	164.0848	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	32.8359	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	121.3739	119.4692	115.9115	108.2650	103.5471	98.6296	95.6764	98.2188	101.1865	106.6421	113.9801	120.4081	(72)
Total internal gains													
	435.1227	444.2759	426.9528	412.6362	392.9695	376.6007	363.1874	363.9485	374.2911	389.4166	411.7035	426.5828	(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	
Northeast	7.2200	11.2829	0.6300	0.7000	0.7700	24.8961	(75)
Southwest	0.8500	36.7938	0.6300	0.7000	0.7700	9.5580	(79)
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479	(81)

Solar gains	57.9019	114.6863	199.5715	318.7712	422.3052	447.9548	419.9311	338.3018	240.1575	138.2531	72.2775	47.6597	(83)
Total gains	493.0246	558.9622	626.5243	731.4074	815.2747	824.5555	783.1185	702.2504	614.4486	527.6697	483.9810	474.2425	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.4274	55.5812	55.7329	56.4562	56.5937	57.2424	57.2424	57.3641	56.9908	56.5937	56.3163	56.0293	
alpha	4.6952	4.7054	4.7155	4.7637	4.7729	4.8162	4.8162	4.8243	4.7994	4.7729	4.7544	4.7353	
util living area													
	0.9821	0.9671	0.9304	0.8192	0.6382	0.4491	0.3281	0.3806	0.6270	0.8842	0.9661	0.9848	(86)
MIT	19.8534	20.0606	20.3682	20.7384	20.9327	20.9898	20.9982	20.9964	20.9546	20.6723	20.2125	19.8238	(87)
Th 2	20.0692	20.0715	20.0738	20.0846	20.0866	20.0960	20.0960	20.0978	20.0924	20.0866	20.0825	20.0783	(88)
util rest of house													
	0.9777	0.9593	0.9145	0.7845	0.5858	0.3879	0.2612	0.3071	0.5561	0.8519	0.9567	0.9810	(89)
MIT 2	18.7493	19.0108	19.3913	19.8304	20.0322	20.0901	20.0954	20.0964	20.0618	19.7702	19.2126	18.7186	(90)
Living area fraction									fLA = Living area / (4) =			0.4791	(91)
MIT	19.2783	19.5137	19.8593	20.2654	20.4636	20.5211	20.5279	20.5276	20.4895	20.2024	19.6916	19.2480	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2783	19.5137	19.8593	20.2654	20.4636	20.5211	20.5279	20.5276	20.4895	20.2024	19.6916	19.2480	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9730	0.9537	0.9103	0.7918	0.6079	0.4169	0.2933	0.3423	0.5880	0.8564	0.9519	0.9767	(94)
Useful gains	479.7098	533.0794	570.3274	579.1460	495.6421	343.7554	229.6646	240.3777	361.3110	451.8981	460.6973	463.1934	(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													
	906.2156	881.7134	803.8376	675.0985	519.2884	346.8805	230.1108	241.2947	375.9725	568.9913	749.7921	900.6571	(97)
Space heating kWh													
	317.3203	234.2820	173.7316	69.0858	17.5929	0.0000	0.0000	0.0000	0.0000	87.1174	208.1483	325.4730	(98a)
Space heating requirement - total per year (kWh/year)												1432.7513	
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													
	317.3203	234.2820	173.7316	69.0858	17.5929	0.0000	0.0000	0.0000	0.0000	87.1174	208.1483	325.4730	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1432.7513	
Space heating per m2											(98c) / (4) =	24.0839	(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													
	317.3203	234.2820	173.7316	69.0858	17.5929	0.0000	0.0000	0.0000	0.0000	87.1174	208.1483	325.4730	(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)													
	343.7923	253.8267	188.2249	74.8492	19.0606	0.0000	0.0000	0.0000	0.0000	94.3850	225.5127	352.6251	(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													
	206.0724	182.2804	193.8498	171.0386	166.1832	150.1741	148.5718	154.2608	155.7109	173.1085	183.4142	203.9113	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0245	84.6237	83.8149	82.1968	80.5818	79.8000	79.8000	79.8000	79.8000	82.6027	84.3442	85.1030	(217)
Fuel for water heating, kWh/month													
	242.3683	215.4011	231.2832	208.0842	206.2291	188.1881	186.1802	193.3092	195.1264	209.5676	217.4592	239.6054	(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	17.9901	14.4323	12.9947	9.5205	7.3539	6.0082	6.7085	8.7199	11.3263	14.8607	16.7851	18.4901	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.2539	-19.9158	-30.4928	-36.5992	-41.5339	-39.5415	-39.0700	-35.8526	-30.5508	-23.7735	-15.0044	-11.3205	(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	(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	(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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-4.1671	-9.0087	-18.3650	-28.2691	-38.0559	-38.4777	-38.0158	-31.8682	-22.9496	-13.0946	-5.6310	-3.2769 (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	(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	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	1552.2766	(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	2532.8020	(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)	145.1902	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-588.0885	(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	3728.1803	(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	1552.2766	0.2100	325.9781	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2532.8020	0.2100	531.8884	(264)
Space and water heating			857.8665	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	145.1902	0.1443	20.9554	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	0.1333	-44.8970	
PV Unit electricity exported	-251.1796	0.1252	-31.4452	
Total			-76.3422	(269)
Total CO2, kg/year			814.4090	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.6900	(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	1552.2766	1.1300	1754.0725	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2532.8020	1.1300	2862.0663	(278)
Space and water heating			4616.1388	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	145.1902	1.5338	222.6975	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-336.9088	1.4924	-502.8150	
PV Unit electricity exported	-251.1796	0.4595	-115.4171	
Total			-618.2321	(283)
Total Primary energy kWh/year			4350.7050	(286)
Target Primary Energy Rate (TPER)			73.1300	(287)

Full SAP Calculation Printout

Plot Reference	Flat 9	**Issued on Date**	24/09/2026
Assessment Reference	Flat 9 - Be Green	**Plot Type Ref**	Flat 9
Plot Address	Flat 9, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	95 A	**DER**	1.28	**TER**	13.69
Environmental	99 A	**% DER < TER**			90.65
CO_2 Emissions (t/year)	0.05	**DFEE**	29.48	**TFEE**	32.12
Compliance Check	See BREL	**% DFEE < TFEE**			8.21
% DPER < TPER	77.52	**DPER**	16.44	**TPER**	73.13

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900 (1b)	x	2.6000 (2b)	=	154.6740	(1b) - (3b) (4)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	154.6740	(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	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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)

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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	
Main dwelling								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total

E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000	
E16 Corner (normal)	2.6000	0.0370	0.0962	
E18 Party wall between dwellings	23.4000	0.0160	0.3744	
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100	
E3 Sill	10.5000	0.0230	0.2415	
E4 Jamb	30.8000	0.0240	0.7392	
E14 Flat roof	8.2000	0.0800	0.6560	
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	14.7592	14.5694	14.3796	13.4305	13.2407	12.2917	12.2917	12.1018	12.6713	13.2407	13.6204	14.0000	(38)
Heat transfer coeff	43.7133	43.5235	43.3336	42.3846	42.1948	41.2457	41.2457	41.0559	41.6253	42.1948	42.5744	42.9540	(39)

Average = Sum(39)m / 12 = 42.3371

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7348	0.7316	0.7284	0.7125	0.7093	0.6933	0.6933	0.6901	0.6997	0.7093	0.7157	0.7220	(40)
HLP (average)												0.7117	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9672 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)

Water storage loss (or HIU loss):

Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.0044 (55)

Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
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)
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)

Primary loss
Combi loss

Total heat required for water heating calculated for each month

213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(62)
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)
-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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS

Output from w/h

213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
									Total per year (kWh/year) = Sum(64)m =		2180.4605	(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

96.5453	85.9222	92.4813	83.9925	83.2821	77.0550	77.4264	79.3179	78.8960	85.5848	88.1074	95.8267	(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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)	129.7652	127.8605	124.3028	116.6563	111.9384	107.0209	104.0677	106.6101	109.5778	115.0334	122.3714	128.7994	(72)
Total internal gains	494.2194	492.7222	479.1255	453.6832	428.1813	405.0606	391.3624	393.4973	406.5040	429.7552	457.8773	482.5086	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	11.2829	0.4000	0.7000	0.7700	24.5644	(75)
Southwest	1.3200	36.7938	0.4000	0.7000	0.7700	9.4241	(79)
Northwest	10.5600	11.2829	0.4000	0.7000	0.7700	23.1195	(81)

Solar gains	57.1080	113.1146	196.8387	314.4090	416.5282	441.8276	414.1870	333.6731	236.8699	136.3590	71.2866	47.0061	(83)
Total gains	551.3274	605.8369	675.9642	768.0922	844.7095	846.8882	805.5494	727.1704	643.3739	566.1143	529.1638	529.5147	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.7152	77.0498	77.3873	79.1201	79.4760	81.3048	81.3048	81.6807	80.5633	79.4760	78.7674	78.0712	
alpha	6.1143	6.1367	6.1592	6.2747	6.2984	6.4203	6.4203	6.4454	6.3709	6.2984	6.2512	6.2047	
util living area	0.9491	0.9142	0.8270	0.6491	0.4626	0.3116	0.2253	0.2597	0.4450	0.7336	0.9053	0.9563	(86)
Living	20.5196	20.6585	20.8387	20.9667	20.9961	20.9998	21.0000	20.9999	20.9978	20.9451	20.7369	20.4984	
Non living	19.7680	19.9378	20.1492	20.2990	20.3295	20.3466	20.3467	20.3495	20.3397	20.2831	20.0468	19.7516	
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	20.7543	20.6585	20.8387	20.9667	20.9961	20.9998	21.0000	20.9999	20.9978	20.9451	20.7369	20.5685	(87)
Th 2	20.3102	20.3130	20.3158	20.3298	20.3326	20.3467	20.3467	20.3496	20.3411	20.3326	20.3270	20.3214	(88)
util rest of house	0.9396	0.8997	0.8031	0.6173	0.4300	0.2798	0.1918	0.2230	0.4030	0.6962	0.8874	0.9479	(89)
MIT 2	20.0941	19.9378	20.1492	20.2990	20.3295	20.3466	20.3467	20.3495	20.3397	20.2831	20.0468	19.8543	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	20.4103	20.2830	20.4795	20.6189	20.6488	20.6595	20.6597	20.6611	20.6550	20.6002	20.3775	20.1965	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4103	20.2830	20.4795	20.6189	20.6488	20.6595	20.6597	20.6611	20.6550	20.6002	20.3775	20.1965	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9411	0.8990	0.8091	0.6312	0.4455	0.2950	0.2079	0.2406	0.4231	0.7116	0.8888	0.9462	(94)
Useful gains	518.8337	544.6471	546.9021	484.8151	376.2807	249.8589	167.4388	174.9307	272.1858	402.8424	470.3469	501.0395	(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	704.2359	669.5222	605.7836	496.6993	377.5944	249.9285	167.4443	174.9444	272.8522	421.9575	565.2794	687.1129	(97)
Space heating kWh	137.9392	83.9161	43.8078	8.5567	0.9775	0.0000	0.0000	0.0000	0.0000	14.2216	68.3514	138.4386	(98a)
Space heating requirement - total per year (kWh/year)												496.2090	
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	137.9392	83.9161	43.8078	8.5567	0.9775	0.0000	0.0000	0.0000	0.0000	14.2216	68.3514	138.4386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												496.2090	
Space heating per m2											(98c) / (4) =	8.3410	(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 %) 207.8483 (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	137.9392	83.9161	43.8078	8.5567	0.9775	0.0000	0.0000	0.0000	0.0000	14.2216	68.3514	138.4386	(98)
Space heating efficiency (main heating system 1)	207.8483	207.8483	207.8483	207.8483	207.8483	0.0000	0.0000	0.0000	0.0000	207.8483	207.8483	207.8483	(210)
Space heating fuel (main heating system)	66.3653	40.3737	21.0768	4.1168	0.4703	0.0000	0.0000	0.0000	0.0000	6.8423	32.8852	66.6056	(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	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
Efficiency of water heater												176.2152	(216)
(217)m	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	176.2152	(217)
Fuel for water heating, kWh/month	121.3722	107.4419	114.4360	101.3481	98.7356	89.5077	88.7413	91.9697	92.6498	102.6656	108.3711	120.1458	(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	14.2799	12.8979	14.2799	13.8192	14.2799	13.8192	14.2799	14.2799	13.8192	14.2799	13.8192	14.2799	(231)
Lighting	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.0320	-60.7894	-100.6498	-127.4238	-148.9071	-143.1160	-141.1886	-127.8219	-104.5423	-75.4333	-43.4184	-30.9500	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.7597	-5.7113	-16.5406	-34.0936	-53.5842	-56.9448	-55.8313	-42.5263	-25.8923	-10.7226	-2.9612	-1.2543	(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												238.7361	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												176.2152	
Water heating fuel used												1237.3848	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)

mechanical ventilation fans (SFP = 0.8910)	168.1337	(230a)
Total electricity for the above, kWh/year	168.1337	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	337.3823	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	238.7361	16.4900	39.3676	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1237.3848	16.4900	204.0448	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	168.1337	16.4900	27.7253	(249)
Energy for lighting	142.2226	16.4900	23.4525	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1141.2726	16.4900	-188.1958	
PV Unit electricity exported	-307.8223	5.5900	-17.2073	
Total			-205.4031	(252)
Total energy cost			89.1870	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3073	(257)
SAP value		95.0190	
SAP rating (Section 12)		95	(258)
SAP band		A	

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	238.7361	0.1588	37.9058	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1237.3848	0.1407	174.1144	(264)
Space and water heating			212.0202	(265)
Pumps, fans and electric keep-hot	168.1337	0.1387	23.3222	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1141.2726	0.1321	-150.8153	
PV Unit electricity exported	-307.8223	0.1191	-36.6563	
Total			-187.4716	(269)
Total CO2, kg/year			68.3979	(272)
CO2 emissions per m2			1.1500	(273)
EI value			99.1229	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b) x	2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		154.6740	(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	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate													
	0.1636	0.1562	0.1562	0.1450	0.1450	0.1264	0.1302	0.1376	0.1339	0.1413	0.1413	0.1562	(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	0.2631	0.2557	0.2557	0.2445	0.2445	0.2259	0.2297	0.2371	0.2334	0.2408	0.2408	0.2557	(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	
Main dwelling								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 202.9333 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100
E3 Sill	10.5000	0.0230	0.2415
E4 Jamb	30.8000	0.0240	0.7392
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.8681 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 28.9540 (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	13.4305	13.0509	13.0509	12.4815	12.4815	11.5324	11.7222	12.1018	11.9120	12.2917	12.2917	13.0509	(38)
Heat transfer coeff													
	42.3846	42.0049	42.0049	41.4355	41.4355	40.4864	40.6762	41.0559	40.8661	41.2457	41.2457	42.0049	(39)
Average = Sum(39)m / 12 =												41.4039	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7125	0.7061	0.7061	0.6965	0.6965	0.6806	0.6837	0.6901	0.6869	0.6933	0.6933	0.7061	(40)
HLP (average)												0.6960	
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 1.9672 (42)
Hot water usage for mixer showers

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

	65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)

Hot water usage for other uses

	34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)

Average daily hot water use (litres/day) 92.7326 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m													
	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)

Water storage loss (or HIU loss):
Store volume 150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.0044 (55)
Total storage loss

	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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													
	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(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													
	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
											Total per year (kWh/year) = Sum(64)m =	2180.4605	(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													
	96.5453	85.9222	92.4813	83.9925	83.2821	77.0550	77.4264	79.3179	78.8960	85.5848	88.1074	95.8267	(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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	129.7652	127.8605	124.3028	116.6563	111.9384	107.0209	104.0677	106.6101	109.5778	115.0334	122.3714	128.7994	(72)
Total internal gains													
	494.2194	492.7222	479.1255	453.6832	428.1813	405.0606	391.3624	393.4973	406.5040	429.7552	457.8773	482.5086	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Northeast	11.2200	12.4928	0.4000	0.7000	0.7700	27.1984	(75)
Southwest	1.3200	39.1209	0.4000	0.7000	0.7700	10.0201	(79)
Northwest	10.5600	12.4928	0.4000	0.7000	0.7700	25.5985	(81)

Solar gains	62.8170	112.2929	197.0333	327.0017	419.8726	476.5345	448.4551	370.4169	262.5542	148.1666	81.1081	52.8802	(83)
Total gains	557.0364	605.0151	676.1588	780.6849	848.0539	881.5951	839.8174	763.9142	669.0582	577.9218	538.9854	535.3888	(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	79.1201	79.8352	79.8352	80.9323	80.9323	82.8295	82.4430	81.6807	82.0601	81.3048	81.3048	79.8352	
alpha	6.2747	6.3223	6.3223	6.3955	6.3955	6.5220	6.4962	6.4454	6.4707	6.4203	6.4203	6.3223	
util living area													
	0.9246	0.8829	0.7651	0.5563	0.3709	0.2112	0.1211	0.1451	0.3236	0.6222	0.8490	0.9340	(86)
Living	20.6586	20.7659	20.9131	20.9885	20.9992	21.0000	21.0000	21.0000	20.9998	20.9823	20.8543	20.6369	
Non living	19.9542	20.0851	20.2498	20.3340	20.3433	20.3580	20.3552	20.3496	20.3523	20.3324	20.1995	19.9335	
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	20.8254	20.7659	20.9131	20.9885	20.9992	21.0000	21.0000	21.0000	20.9998	20.9823	20.8543	20.6877	(87)
Th 2	20.3298	20.3355	20.3355	20.3439	20.3439	20.3580	20.3552	20.3496	20.3524	20.3467	20.3467	20.3355	(88)
util rest of house													
	0.9110	0.8644	0.7365	0.5236	0.3391	0.1818	0.0899	0.1102	0.2841	0.5803	0.8235	0.9216	(89)
MIT 2	20.1801	20.0851	20.2498	20.3340	20.3433	20.3580	20.3552	20.3496	20.3523	20.3324	20.1995	20.0059	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	20.4892	20.4113	20.5676	20.6475	20.6575	20.6656	20.6641	20.6612	20.6625	20.6438	20.5132	20.3325	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4892	20.4113	20.5676	20.6475	20.6575	20.6656	20.6641	20.6612	20.6625	20.6438	20.5132	20.3325	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9145	0.8666	0.7467	0.5388	0.3543	0.1959	0.1048	0.1269	0.3030	0.5996	0.8303	0.9216	(94)
Useful gains	509.3844	524.3247	504.9184	420.6271	300.4635	172.6946	88.0279	96.9396	202.7339	346.5031	447.5139	493.4089	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	639.5502	609.5452	536.3005	424.6117	300.7197	172.6979	88.0279	96.9398	202.7964	352.3945	499.6163	627.2395	(97)
Space heating kWh													
	96.8434	57.2682	23.3483	2.8689	0.1906	0.0000	0.0000	0.0000	0.0000	4.3832	37.5137	99.5699	(98a)
Space heating requirement - total per year (kWh/year)												321.9862	
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													
	96.8434	57.2682	23.3483	2.8689	0.1906	0.0000	0.0000	0.0000	0.0000	4.3832	37.5137	99.5699	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												321.9862	
Space heating per m2											(98c) / (4) =	5.4124	(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 %)	206.9265	(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													
	96.8434	57.2682	23.3483	2.8689	0.1906	0.0000	0.0000	0.0000	0.0000	4.3832	37.5137	99.5699	(98)
Space heating efficiency (main heating system 1)													
	206.9265	206.9265	206.9265	206.9265	206.9265	0.0000	0.0000	0.0000	0.0000	206.9265	206.9265	206.9265	(210)
Space heating fuel (main heating system)													
	46.8009	27.6756	11.2834	1.3864	0.0921	0.0000	0.0000	0.0000	0.0000	2.1182	18.1290	48.1185	(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													
	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
Efficiency of water heater												175.5521	(216)
(217)m	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	(217)
Fuel for water heating, kWh/month													
	121.8307	107.8478	114.8683	101.7309	99.1085	89.8458	89.0765	92.3171	92.9998	103.0534	108.7805	120.5996	(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	14.2799	12.8979	14.2799	13.8192	14.2799	13.8192	14.2799	14.2799	13.8192	14.2799	13.8192	14.2799	(231)
Lighting	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.1438	-59.4867	-98.8294	-129.2059	-147.9242	-149.0746	-147.3914	-135.9975	-111.6783	-79.8634	-48.3898	-34.3610	(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	-2.1689	-5.6663	-16.3894	-35.5991	-52.6914	-63.3237	-62.4390	-49.6260	-30.1868	-12.3305	-3.8627	-1.6170	(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	155.6041	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	175.5521	
Water heating fuel used	1242.0589	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)		
mechanical ventilation fans (SFP = 0.8910)	168.1337	(230a)
Total electricity for the above, kWh/year	168.1337	(231)
Electricity for lighting (calculated in Appendix L)	142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1518.2466	(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	189.7727	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	155.6041	26.0000	40.4571	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1242.0589	26.0000	322.9353	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	168.1337	26.0000	43.7148	(249)
Energy for lighting	142.2226	26.0000	36.9779	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1182.3459	26.0000	-307.4099	
PV Unit electricity exported	-335.9007	5.8100	-19.5158	
Total			-326.9258	(252)
Total energy cost			117.1592	(255)

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	155.6041	0.1598	24.8623	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1242.0589	0.1407	174.7721	(264)
Space and water heating			199.6344	(265)
Pumps, fans and electric keep-hot	168.1337	0.1387	23.3222	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1182.3459	0.1320	-156.0596	
PV Unit electricity exported	-335.9007	0.1181	-39.6791	
Total			-195.7387	(269)
Total CO2, kg/year			47.7450	(272)

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	155.6041	1.5914	247.6257	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1242.0589	1.5203	1888.2910	(278)
Space and water heating			2135.9166	(279)
Pumps, fans and electric keep-hot	168.1337	1.5128	254.3527	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1182.3459	1.4877	-1758.9310	
PV Unit electricity exported	-335.9007	0.4331	-145.4732	
Total			-1904.4043	(283)
Total Primary energy kWh/year			704.0108	(286)

SAP 10 EPC IMPROVEMENTS

Flat 9 - Be Green

Current energy efficiency rating: A 95
Current environmental impact rating: A 99

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
(none)			
Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£444	£444	£0
Space heating	£84	£84	£0
Water heating	£323	£323	£0
Lighting	£37	£37	£0
Generated (PV)	-£327	-£327	£0
Total cost of fuels	£117	£117	£0
Total cost of uses	£117	£117	£0
Delivered energy	3 kWh/m²	3 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	12 kWh/m²	12 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	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								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 12072.5000	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	202.9333	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100
E3 Sill	10.5000	0.0230	0.2415
E4 Jamb	30.8000	0.0240	0.7392
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		2.8681	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	28.9540	(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	14.7592	14.5694	14.3796	13.4305	13.2407	12.2917	12.2917	12.1018	12.6713	13.2407	13.6204	14.0000	(38)
Heat transfer coeff	43.7133	43.5235	43.3336	42.3846	42.1948	41.2457	41.2457	41.0559	41.6253	42.1948	42.5744	42.9540	(39)
Average = Sum(39)m / 12 =												42.3371	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7348	0.7316	0.7284	0.7125	0.7093	0.6933	0.6933	0.6901	0.6997	0.7093	0.7157	0.7220	(40)
HLP (average)												0.7117	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9672	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)
Hot water usage for other uses	34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)
Average daily hot water use (litres/day)												92.7326	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)

Water storage loss (or HIU loss):		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.8600	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	1.0044	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(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	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
										Total per year (kWh/year) = Sum(64)m =		2180.4605	(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

	96.5453	85.9222	92.4813	83.9925	83.2821	77.0550	77.4264	79.3179	78.8960	85.5848	88.1074	95.8267 (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	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)

	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)

Water heating gains (Table 5)

	129.7652	127.8605	124.3028	116.6563	111.9384	107.0209	104.0677	106.6101	109.5778	115.0334	122.3714	128.7994	(72)

Total internal gains

	494.2194	492.7222	479.1255	453.6832	428.1813	405.0606	391.3624	393.4973	406.5040	429.7552	457.8773	482.5086	(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	
Northeast	11.2200	11.2829	0.4000	0.7000	0.7700	24.5644	(75)
Southwest	1.3200	36.7938	0.4000	0.7000	0.7700	9.4241	(79)
Northwest	10.5600	11.2829	0.4000	0.7000	0.7700	23.1195	(81)

Solar gains	57.1080	113.1146	196.8387	314.4090	416.5282	441.8276	414.1870	333.6731	236.8699	136.3590	71.2866	47.0061	(83)
Total gains	551.3274	605.8369	675.9642	768.0922	844.7095	846.8882	805.5494	727.1704	643.3739	566.1143	529.1638	529.5147	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.7152	77.0498	77.3873	79.1201	79.4760	81.3048	81.3048	81.6807	80.5633	79.4760	78.7674	78.0712	
alpha	6.1143	6.1367	6.1592	6.2747	6.2984	6.4203	6.4203	6.4454	6.3709	6.2984	6.2512	6.2047	
util living area													
	0.9491	0.9142	0.8270	0.6491	0.4626	0.3116	0.2253	0.2597	0.4450	0.7336	0.9053	0.9563	(86)
Living	20.5196	20.6585	20.8387	20.9667	20.9961	20.9998	21.0000	20.9999	20.9978	20.9451	20.7369	20.4984	
Non living	19.7680	19.9378	20.1492	20.2990	20.3295	20.3466	20.3467	20.3495	20.3397	20.2831	20.0468	19.7516	
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	20.7543	20.6585	20.8387	20.9667	20.9961	20.9998	21.0000	20.9999	20.9978	20.9451	20.7369	20.5685	(87)
Th 2	20.3102	20.3130	20.3158	20.3298	20.3326	20.3467	20.3467	20.3496	20.3411	20.3326	20.3270	20.3214	(88)
util rest of house													
	0.9396	0.8997	0.8031	0.6173	0.4300	0.2798	0.1918	0.2230	0.4030	0.6962	0.8874	0.9479	(89)
MIT 2	20.0941	19.9378	20.1492	20.2990	20.3295	20.3466	20.3467	20.3495	20.3397	20.2831	20.0468	19.8543	(90)
Living area fraction									fLA = Living area / (4) =			0.4791	(91)
MIT	20.4103	20.2830	20.4795	20.6189	20.6488	20.6595	20.6597	20.6611	20.6550	20.6002	20.3775	20.1965	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4103	20.2830	20.4795	20.6189	20.6488	20.6595	20.6597	20.6611	20.6550	20.6002	20.3775	20.1965	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9411	0.8990	0.8091	0.6312	0.4455	0.2950	0.2079	0.2406	0.4231	0.7116	0.8888	0.9462	(94)
Useful gains	518.8337	544.6471	546.9021	484.8151	376.2807	249.8589	167.4388	174.9307	272.1858	402.8424	470.3469	501.0395	(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													
	704.2359	669.5222	605.7836	496.6993	377.5944	249.9285	167.4443	174.9444	272.8522	421.9575	565.2794	687.1129	(97)
Space heating kWh													
	137.9392	83.9161	43.8078	8.5567	0.9775	0.0000	0.0000	0.0000	0.0000	14.2216	68.3514	138.4386	(98a)
Space heating requirement - total per year (kWh/year)												496.2090	
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													
	137.9392	83.9161	43.8078	8.5567	0.9775	0.0000	0.0000	0.0000	0.0000	14.2216	68.3514	138.4386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												496.2090	
Space heating per m2											(98c) / (4) =	8.3410	(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 %)	207.8483	(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													
	137.9392	83.9161	43.8078	8.5567	0.9775	0.0000	0.0000	0.0000	0.0000	14.2216	68.3514	138.4386	(98)
Space heating efficiency (main heating system 1)													
	207.8483	207.8483	207.8483	207.8483	207.8483	0.0000	0.0000	0.0000	0.0000	207.8483	207.8483	207.8483	(210)
Space heating fuel (main heating system)													
	66.3653	40.3737	21.0768	4.1168	0.4703	0.0000	0.0000	0.0000	0.0000	6.8423	32.8852	66.6056	(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
213.8763 189.3291 201.6537 178.5908 173.9871 157.7262 156.3757 162.0647 163.2630 180.9124 190.9664 211.7152 (64)
Efficiency of water heater 176.2152 (216)
(217)m 176.2152 176.2152 176.2152 176.2152 176.2152 176.2152 176.2152 176.2152 176.2152 176.2152 176.2152 176.2152 (217)
Fuel for water heating, kWh/month
121.3722 107.4419 114.4360 101.3481 98.7356 89.5077 88.7413 91.9697 92.6498 102.6656 108.3711 120.1458 (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 14.2799 12.8979 14.2799 13.8192 14.2799 13.8192 14.2799 14.2799 13.8192 14.2799 13.8192 14.2799 (231)
Lighting 17.6224 14.1373 12.7291 9.3259 7.2036 5.8854 6.5713 8.5417 11.0948 14.5570 16.4421 18.1121 (232)
Electricity generated by PVs (Appendix M) (negative quantity)
(233a)m -37.0320 -60.7894 -100.6498 -127.4238 -148.9071 -143.1160 -141.1886 -127.8219 -104.5423 -75.4333 -43.4184 -30.9500 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)
(234a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)
(235a)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)
(235c)m 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)
(233b)m -1.7597 -5.7113 -16.5406 -34.0936 -53.5842 -56.9448 -55.8313 -42.5263 -25.8923 -10.7226 -2.9612 -1.2543 (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 1 238.7361 (211)
Space heating fuel - main system 2 0.0000 (213)
Space heating fuel - secondary 0.0000 (215)
Efficiency of water heater 176.2152
Water heating fuel used 1237.3848 (219)
Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)
mechanical ventilation fans (SFP = 0.8910) 168.1337 (230a)
Total electricity for the above, kWh/year 168.1337 (231)
Electricity for lighting (calculated in Appendix L) 142.2226 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV generation -1449.0949 (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 337.3823 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	238.7361	16.4900	39.3676	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1237.3848	16.4900	204.0448	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	168.1337	16.4900	27.7253	(249)
Energy for lighting	142.2226	16.4900	23.4525	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1141.2726	16.4900	-188.1958	
PV Unit electricity exported	-307.8223	5.5900	-17.2073	
Total			-205.4031	(252)
Total energy cost			89.1870	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 0.3073 (257)
SAP value 95.0190
SAP rating (Section 12) 95 (258)
SAP band A

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	238.7361	0.1588	37.9058	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1237.3848	0.1407	174.1144	(264)
Space and water heating			212.0202	(265)
Pumps, fans and electric keep-hot	168.1337	0.1387	23.3222	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1141.2726	0.1321	-150.8153	
PV Unit electricity exported	-307.8223	0.1191	-36.6563	
Total			-187.4716	(269)
Total CO2, kg/year			68.3979	(272)
CO2 emissions per m2			1.1500	(273)
EI value			99.1229	

EI rating 99 (274)
EI band A

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	59.4900	(1b)	x 2.6000	(2b) =	154.6740	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	59.4900					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	154.6740	(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	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.1636	0.1562	0.1562	0.1450	0.1450	0.1264	0.1302	0.1376	0.1339	0.1413	0.1413	0.1562	(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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2631	0.2557	0.2557	0.2445	0.2445	0.2259	0.2297	0.2371	0.2334	0.2408	0.2408	0.2557	(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								
Windows			23.1000	0.9615	22.2115			(27)
External Wall	44.4600	23.1000	21.3600	0.1400	2.9904	190.0000	4058.4000	(29a)
External Roof	8.8400		8.8400	0.1000	0.8840	9.0000	79.5600	(30)
Total net area of external elements Aum(A, m2)			53.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0859			(33)
Main dwelling								
Party Wall 1			24.7000	0.0000	0.0000	180.0000	4446.0000	(32)
Party Floor 1			59.4900			30.0000	1784.7000	(32d)
Party Ceiling 1			50.5600			20.0000	1011.2000	(32b)
Internal Wall 1			76.9600			9.0000	692.6400	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	12072.5000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		202.9333 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E7 Party floor between dwellings (in blocks of flats)	32.9000	0.0120	0.3948
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	37.4000	0.0000	0.0000
E16 Corner (normal)	2.6000	0.0370	0.0962
E18 Party wall between dwellings	23.4000	0.0160	0.3744
E2 Other lintels (including other steel lintels)	10.5000	0.0200	0.2100
E3 Sill	10.5000	0.0230	0.2415
E4 Jamb	30.8000	0.0240	0.7392
E14 Flat roof	8.2000	0.0800	0.6560
P4 Party wall - Roof (insulation at ceiling level)	1.3000	0.1200	0.1560

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		2.8681 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	28.9540 (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	13.4305	13.0509	13.0509	12.4815	12.4815	11.5324	11.7222	12.1018	11.9120	12.2917	12.2917	13.0509	(38)
Heat transfer coeff	42.3846	42.0049	42.0049	41.4355	41.4355	40.4864	40.6762	41.0559	40.8661	41.2457	41.2457	42.0049	(39)

Average = Sum(39)m / 12 =	41.4039

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

HLP	0.7125	0.7061	0.7061	0.6965	0.6965	0.6806	0.6837	0.6901	0.6869	0.6933	0.6933	0.7061	(40)
HLP (average)												0.6960	
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												1.9672	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	65.9199	64.9409	63.5623	61.0203	59.1169	57.0064	55.8663	57.2353	58.7259	60.9843	63.5786	65.6971	(42b)
Hot water usage for other uses													
	34.7759	33.5113	32.2467	30.9821	29.7176	28.4530	28.4530	29.7176	30.9821	32.2467	33.5113	34.7759	(42c)
Average daily hot water use (litres/day)												92.7326	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	100.6958	98.4522	95.8090	92.0025	88.8345	85.4593	84.3193	86.9529	89.7081	93.2310	97.0899	100.4730	(44)
Energy conte	159.4775	140.1947	147.2549	125.9468	119.5883	105.0822	101.9769	107.6659	110.6190	126.5136	138.3224	157.3164	(45)
Energy content (annual)										Total = Sum(45)m =		1539.9585	
Distribution loss (46)m = 0.15 x (45)m													
	23.9216	21.0292	22.0882	18.8920	17.9382	15.7623	15.2965	16.1499	16.5929	18.9770	20.7484	23.5975	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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													
	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(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													
	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
										Total per year (kWh/year) = Sum(64)m =		2180.4605	(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													
	96.5453	85.9222	92.4813	83.9925	83.2821	77.0550	77.4264	79.3179	78.8960	85.5848	88.1074	95.8267	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	118.0307	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	20.1331	17.8820	14.5426	11.0097	8.2299	6.9480	7.5076	9.7586	13.0980	16.6309	19.4108	20.6926	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	256.2073	258.8659	252.1663	237.9035	219.8993	202.9778	191.6733	189.0147	195.7143	209.9771	227.9813	244.9027	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	48.7702	(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)													
	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	-78.6871	(71)
Water heating gains (Table 5)													
	129.7652	127.8605	124.3028	116.6563	111.9384	107.0209	104.0677	106.6101	109.5778	115.0334	122.3714	128.7994	(72)
Total internal gains													
	494.2194	492.7222	479.1255	453.6832	428.1813	405.0606	391.3624	393.4973	406.5040	429.7552	457.8773	482.5086	(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	
Northeast	11.2200	12.4928	0.4000	0.7000	0.7700	27.1984	(75)
Southwest	1.3200	39.1209	0.4000	0.7000	0.7700	10.0201	(79)
Northwest	10.5600	12.4928	0.4000	0.7000	0.7700	25.5985	(81)

Solar gains	62.8170	112.2929	197.0333	327.0017	419.8726	476.5345	448.4551	370.4169	262.5542	148.1666	81.1081	52.8802	(83)
Total gains	557.0364	605.0151	676.1588	780.6849	848.0539	881.5951	839.8174	763.9142	669.0582	577.9218	538.9854	535.3888	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	79.1201	79.8352	79.8352	80.9323	80.9323	82.8295	82.4430	81.6807	82.0601	81.3048	81.3048	79.8352	
alpha	6.2747	6.3223	6.3223	6.3955	6.3955	6.5220	6.4962	6.4454	6.4707	6.4203	6.4203	6.3223	
util living area													
	0.9246	0.8829	0.7651	0.5563	0.3709	0.2112	0.1211	0.1451	0.3236	0.6222	0.8490	0.9340	(86)
Living	20.6586	20.7659	20.9131	20.9885	20.9992	21.0000	21.0000	21.0000	20.9998	20.9823	20.8543	20.6369	
Non living	19.9542	20.0851	20.2498	20.3340	20.3433	20.3580	20.3552	20.3496	20.3523	20.3324	20.1995	19.9335	
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	20.8254	20.7659	20.9131	20.9885	20.9992	21.0000	21.0000	21.0000	20.9998	20.9823	20.8543	20.6877	(87)
Th 2	20.3298	20.3355	20.3355	20.3439	20.3439	20.3580	20.3552	20.3496	20.3524	20.3467	20.3467	20.3355	(88)

util rest of house													
	0.9110	0.8644	0.7365	0.5236	0.3391	0.1818	0.0899	0.1102	0.2841	0.5803	0.8235	0.9216	(89)
MIT 2	20.1801	20.0851	20.2498	20.3340	20.3433	20.3580	20.3552	20.3496	20.3523	20.3324	20.1995	20.0059	(90)
Living area fraction										fLA = Living area / (4) =		0.4791	(91)
MIT	20.4892	20.4113	20.5676	20.6475	20.6575	20.6656	20.6641	20.6612	20.6625	20.6438	20.5132	20.3325	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4892	20.4113	20.5676	20.6475	20.6575	20.6656	20.6641	20.6612	20.6625	20.6438	20.5132	20.3325	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9145	0.8666	0.7467	0.5388	0.3543	0.1959	0.1048	0.1269	0.3030	0.5996	0.8303	0.9216	(94)
Useful gains	509.3844	524.3247	504.9184	420.6271	300.4635	172.6946	88.0279	96.9396	202.7339	346.5031	447.5139	493.4089	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W													
	639.5502	609.5452	536.3005	424.6117	300.7197	172.6979	88.0279	96.9398	202.7964	352.3945	499.6163	627.2395	(97)
Space heating kWh													
	96.8434	57.2682	23.3483	2.8689	0.1906	0.0000	0.0000	0.0000	0.0000	4.3832	37.5137	99.5699	(98a)
Space heating requirement - total per year (kWh/year)												321.9862	
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													
	96.8434	57.2682	23.3483	2.8689	0.1906	0.0000	0.0000	0.0000	0.0000	4.3832	37.5137	99.5699	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												321.9862	
Space heating per m2											(98c) / (4) =	5.4124	(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 %)												206.9265	(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													
	96.8434	57.2682	23.3483	2.8689	0.1906	0.0000	0.0000	0.0000	0.0000	4.3832	37.5137	99.5699	(98)
Space heating efficiency (main heating system 1)													
	206.9265	206.9265	206.9265	206.9265	206.9265	0.0000	0.0000	0.0000	0.0000	206.9265	206.9265	206.9265	(210)
Space heating fuel (main heating system)													
	46.8009	27.6756	11.2834	1.3864	0.0921	0.0000	0.0000	0.0000	0.0000	2.1182	18.1290	48.1185	(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													
	213.8763	189.3291	201.6537	178.5908	173.9871	157.7262	156.3757	162.0647	163.2630	180.9124	190.9664	211.7152	(64)
Efficiency of water heater												175.5521	(216)
(217)m	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	175.5521	(217)
Fuel for water heating, kWh/month													
	121.8307	107.8478	114.8683	101.7309	99.1085	89.8458	89.0765	92.3171	92.9998	103.0534	108.7805	120.5996	(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	14.2799	12.8979	14.2799	13.8192	14.2799	13.8192	14.2799	14.2799	13.8192	14.2799	13.8192	14.2799	(231)
Lighting	17.6224	14.1373	12.7291	9.3259	7.2036	5.8854	6.5713	8.5417	11.0948	14.5570	16.4421	18.1121	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.1438	-59.4867	-98.8294	-129.2059	-147.9242	-149.0746	-147.3914	-135.9975	-111.6783	-79.8634	-48.3898	-34.3610	(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	-2.1689	-5.6663	-16.3894	-35.5991	-52.6914	-63.3237	-62.4390	-49.6260	-30.1868	-12.3305	-3.8627	-1.6170	(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												155.6041	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												175.5521	
Water heating fuel used												1242.0589	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 0.8910)													
mechanical ventilation fans (SFP = 0.8910)												168.1337	(230a)
Total electricity for the above, kWh/year												168.1337	(231)
Electricity for lighting (calculated in Appendix L)												142.2226	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1518.2466	(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												189.7727	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	155.6041	26.0000	40.4571	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1242.0589	26.0000	322.9353	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	168.1337	26.0000	43.7148	(249)
Energy for lighting	142.2226	26.0000	36.9779	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1182.3459	26.0000	-307.4099	
PV Unit electricity exported	-335.9007	5.8100	-19.5158	
Total			-326.9258	(252)
Total energy cost			117.1592	(255)

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	155.6041	0.1598	24.8623	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1242.0589	0.1407	174.7721	(264)
Space and water heating			199.6344	(265)
Pumps, fans and electric keep-hot	168.1337	0.1387	23.3222	(267)
Energy for lighting	142.2226	0.1443	20.5271	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1182.3459	0.1320	-156.0596	
PV Unit electricity exported	-335.9007	0.1181	-39.6791	
Total			-195.7387	(269)
Total CO2, kg/year			47.7450	(272)

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	155.6041	1.5914	247.6257	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1242.0589	1.5203	1888.2910	(278)
Space and water heating			2135.9166	(279)
Pumps, fans and electric keep-hot	168.1337	1.5128	254.3527	(281)
Energy for lighting	142.2226	1.5338	218.1457	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1182.3459	1.4877	-1758.9310	
PV Unit electricity exported	-335.9007	0.4331	-145.4732	
Total			-1904.4043	(283)
Total Primary energy kWh/year			704.0108	(286)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8 - Be Green	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	95 A	**DER**	1.29	**TER**	13.49
Environmental	99 A	**% DER < TER**			90.44
CO_2 Emissions (t/year)	0.05	**DFEE**	26.50	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			14.02
% DPER < TPER	77.09	**DPER**	16.50	**TPER**	72.03

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling							
Ground floor		60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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		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) =												69.6000	(23c)
Effective ac	0.3417	0.3379	0.3342	0.3156	0.3119	0.2933	0.2933	0.2896	0.3007	0.3119	0.3193	0.3268	(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	
Main dwelling								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160

E3 Sill	10.8000	0.0230	0.2484	
E4 Jamb	35.2000	0.0240	0.8448	
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0370	0.2886	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820	
E18 Party wall between dwellings	15.6000	0.0160	0.2496	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.3398 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	32.0880 (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	17.6588	17.4666	17.2744	16.3134	16.1212	15.1601	15.1601	14.9679	15.5445	16.1212	16.5056	16.8900	(38)
Heat transfer coeff	49.7468	49.5546	49.3624	48.4013	48.2091	47.2481	47.2481	47.0559	47.6325	48.2091	48.5935	48.9779	(39)
Average = Sum(39)m / 12 =												48.3533	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8258	0.8226	0.8194	0.8035	0.8003	0.7843	0.7843	0.7811	0.7907	0.8003	0.8067	0.8130	(40)
HLP (average)												0.8027	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9884 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)

Hot water usage for other uses

34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 93.3125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
										Total per year (kWh/year) = Sum(64)m =		2190.0900	(64)
12Total per year (kWh/year)												2190	(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	96.8769	86.2137	92.7875	84.2544	83.5308	77.2735	77.6384	79.5418	79.1260	85.8479	88.3950	96.1538	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	130.2109	128.2942	124.7143	117.0199	112.2726	107.3243	104.3527	106.9110	109.8972	115.3869	122.7708	129.2390	(72)
Total internal gains	444.1258	453.3891	435.8919	421.4540	401.5929	388.1002	374.5531	375.3105	385.7529	397.9861	420.4837	435.4964	(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	
Southeast	4.8400	36.7938	0.4000	0.7000	0.7700	34.5551	(77)
Southwest	10.5600	36.7938	0.4000	0.7000	0.7700	75.3929	(79)
Northwest	8.3600	11.2829	0.4000	0.7000	0.7700	18.3029	(81)

Solar gains	128.2508	224.5381	323.3710	427.7392	503.8089	511.0327	488.1676	429.7548	359.2529	252.5164	154.7221	109.0396	(83)
Total gains	572.3767	677.9271	759.2629	849.1932	905.4018	899.1328	862.7207	805.0653	745.0058	650.5025	575.2058	544.5360	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	99.1986	99.5834	99.9711	101.9561	102.3626	104.4447	104.4447	104.8713	103.6018	102.3626	101.5528	100.7558	
alpha	7.6132	7.6389	7.6647	7.7971	7.8242	7.9630	7.9630	7.9914	7.9068	7.8242	7.7702	7.7171	
util living area													
	0.9810	0.9426	0.8568	0.6774	0.4942	0.3363	0.2410	0.2689	0.4408	0.7451	0.9436	0.9856	(86)
Living	20.6273	20.7635	20.8790	20.9472	20.9591	20.9609	20.9609	20.9610	20.9603	20.9396	20.7959	20.6063	
Non living	19.8080	19.9747	20.1072	20.1886	20.2013	20.2168	20.2168	20.2197	20.2107	20.1859	20.0283	19.7918	
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	20.8093	20.7635	20.8790	20.9472	20.9591	20.9609	20.9609	20.9610	20.9603	20.9396	20.7959	20.6614	(87)
Th 2	20.2310	20.2338	20.2365	20.2503	20.2531	20.2669	20.2669	20.2697	20.2614	20.2531	20.2476	20.2420	(88)
util rest of house													
	0.9752	0.9280	0.8288	0.6391	0.4549	0.2978	0.2008	0.2262	0.3938	0.6998	0.9268	0.9811	(89)
MIT 2	20.0624	19.9747	20.1072	20.1886	20.2013	20.2168	20.2168	20.2197	20.2107	20.1859	20.0283	19.8729	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	20.3538	20.2824	20.4083	20.4845	20.4969	20.5070	20.5071	20.5089	20.5031	20.4799	20.3277	20.1805	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3538	20.2824	20.4083	20.4845	20.4969	20.5070	20.5071	20.5089	20.5031	20.4799	20.3277	20.1805	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9291	0.8354	0.6512	0.4677	0.3104	0.2140	0.2402	0.4092	0.7139	0.9288	0.9807	(94)
Useful gains	558.7632	629.8368	634.3238	553.0195	423.4933	279.0788	184.6006	193.3470	304.8418	464.4109	534.2254	534.0129	(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													
	798.6229	762.2678	686.5455	560.7052	424.0909	279.0961	184.6012	193.3486	304.9963	476.3023	642.7831	782.6921	(97)
Space heating kWh													
	178.4556	88.9936	38.8530	5.5337	0.4446	0.0000	0.0000	0.0000	0.0000	8.8472	78.1615	185.0173	(98a)
Space heating requirement - total per year (kWh/year)												584.3065	
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													
	178.4556	88.9936	38.8530	5.5337	0.4446	0.0000	0.0000	0.0000	0.0000	8.8472	78.1615	185.0173	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												584.3065	
Space heating per m2											(98c) / (4) =	9.6996	(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 %) 212.2057 (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													
	178.4556	88.9936	38.8530	5.5337	0.4446	0.0000	0.0000	0.0000	0.0000	8.8472	78.1615	185.0173	(98)
Space heating efficiency (main heating system 1)													
	212.2057	212.2057	212.2057	212.2057	212.2057	0.0000	0.0000	0.0000	0.0000	212.2057	212.2057	212.2057	(210)
Space heating fuel (main heating system)													
	84.0956	41.9374	18.3091	2.6077	0.2095	0.0000	0.0000	0.0000	0.0000	4.1691	36.8329	87.1877	(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													
	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
Efficiency of water heater												177.8251	(216)
(217)m	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	(217)
Fuel for water heating, kWh/month													
	120.8342	106.9622	113.9178	100.8734	98.2622	89.0669	88.2965	91.5157	92.2000	102.1810	107.8764	119.6113	(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	18.0302	16.2854	18.0302	17.4486	18.0302	17.4486	18.0302	18.0302	17.4486	18.0302	17.4486	18.0302	(231)
Lighting	16.0818	12.9014	11.6163	8.5106	6.5738	5.3709	5.9969	7.7950	10.1249	13.2844	15.0047	16.5288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.1102	-60.8621	-100.7076	-127.6720	-149.5095	-143.8299	-141.8991	-128.3445	-104.8422	-75.4664	-43.4749	-31.0139	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.6815	-5.6386	-16.4828	-33.8455	-52.9818	-56.2309	-55.1208	-42.0037	-25.5925	-10.6894	-2.9046	-1.1904	(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												275.3491	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.8251	
Water heating fuel used												1231.5977	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 1.1110)		
mechanical ventilation fans (SFP = 1.1110)	212.2913	(230a)
Total electricity for the above, kWh/year	212.2913	(231)
Electricity for lighting (calculated in Appendix L)	129.7893	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	399.9325	(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	275.3491	0.1597	43.9598	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1231.5977	0.1407	173.3046	(264)
Space and water heating			217.2644	(265)
Pumps, fans and electric keep-hot	212.2913	0.1387	29.4474	(267)
Energy for lighting	129.7893	0.1443	18.7326	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.7324	0.1321	-151.2466	
PV Unit electricity exported	-304.3625	0.1191	-36.2520	
Total			-187.4987	(269)
Total CO2, kg/year			77.9457	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2900	(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	275.3491	1.5909	438.0427	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1231.5977	1.5203	1872.4037	(278)
Space and water heating			2310.4464	(279)
Pumps, fans and electric keep-hot	212.2913	1.5128	321.1543	(281)
Energy for lighting	129.7893	1.5338	199.0752	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.7324	1.4882	-1703.5577	
PV Unit electricity exported	-304.3625	0.4369	-132.9693	
Total			-1836.5270	(283)
Total Primary energy kWh/year			994.1488	(286)
Dwelling Primary energy Rate (DPER)			16.5000	(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	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 60.2400						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(25)

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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 Opening Type			15.0600	1.1450	17.2443			(27)
External Wall	73.0600	15.0600	58.0000	0.1800	10.4400			(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6843			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			294.9090 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	15.6000	0.0600	0.9360
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.1780 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)
Average = Sum(39)m / 12 =												64.9274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
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												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)
Hot water usage for other uses	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)
Average daily hot water use (litres/day)												93.3125	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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	212.2214	187.8102	199.9223	176.8117	172.0827	155.8167	154.3612	160.0857	161.3881	179.0513	189.2647	210.0467	(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	212.2214	187.8102	199.9223	176.8117	172.0827	155.8167	154.3612	160.0857	161.3881	179.0513	189.2647	210.0467	(64)
										Total per year (kWh/year) = Sum(64)m =		2158.8624	(64)
12Total per year (kWh/year)												2159	(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	94.7551	84.2973	90.6657	82.2010	81.4090	75.2202	75.5166	77.4200	77.0727	83.7261	86.3417	94.0320	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)													

	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365		(71)
Water heating gains (Table 5)													
	127.3590	125.4424	121.8625	114.1681	109.4207	104.4725	101.5008	104.0592	107.0454	112.5351	119.9190	126.3872	(72)
Total internal gains													
	444.2740	453.5372	436.0401	421.6022	401.7411	385.2484	371.7012	372.4586	382.9010	398.1342	420.6319	435.6445	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)
Northwest	5.3000	11.2829	0.6300	0.7000	0.7700	18.2755	(81)

Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	572.2975	677.6791	758.8448	848.5992	904.6818	895.4029	859.0290	801.4702	741.5271	650.2062	575.0801	544.4907	(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	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area													
	0.9904	0.9742	0.9349	0.8234	0.6460	0.4561	0.3281	0.3667	0.5882	0.8735	0.9755	0.9926	(86)
MIT	20.1576	20.3707	20.6174	20.8630	20.9716	20.9971	20.9997	20.9994	20.9874	20.8332	20.4587	20.1215	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house													
	0.9870	0.9658	0.9151	0.7808	0.5852	0.3881	0.2559	0.2898	0.5101	0.8301	0.9659	0.9900	(89)
MIT 2	19.0517	19.3192	19.6186	19.8989	20.0015	20.0288	20.0301	20.0317	20.0201	19.8782	19.4405	19.0131	(90)
Living area fraction									fLA = Living area / (4) =			0.3901	(91)
MIT	19.4831	19.7294	20.0082	20.2750	20.3799	20.4065	20.4083	20.4092	20.3974	20.2507	19.8377	19.4455	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4831	19.7294	20.0082	20.2750	20.3799	20.4065	20.4083	20.4092	20.3974	20.2507	19.8377	19.4455	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9629	0.9151	0.7926	0.6080	0.4146	0.2841	0.3199	0.5404	0.8413	0.9638	0.9880	(94)
Useful gains	563.5412	652.5417	694.4069	672.6052	550.0698	371.2500	244.0701	256.3654	400.7094	547.0472	554.2590	537.9590	(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													
	1002.6195	976.7655	887.5210	738.5582	562.3153	372.2523	244.1481	256.5250	405.3589	625.2069	828.9227	996.7898	(97)
Space heating kWh													
	326.6743	217.8783	143.6768	47.4862	9.1107	0.0000	0.0000	0.0000	0.0000	58.1508	197.7579	341.3702	(98a)
Space heating requirement - total per year (kWh/year)												1342.1051	
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													
	326.6743	217.8783	143.6768	47.4862	9.1107	0.0000	0.0000	0.0000	0.0000	58.1508	197.7579	341.3702	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1342.1051	
Space heating per m2											(98c) / (4) =	22.2793	(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													
	326.6743	217.8783	143.6768	47.4862	9.1107	0.0000	0.0000	0.0000	0.0000	58.1508	197.7579	341.3702	(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)													
	353.9266	236.0545	155.6629	51.4476	9.8707	0.0000	0.0000	0.0000	0.0000	63.0020	214.2555	369.8485	(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													
	212.2214	187.8102	199.9223	176.8117	172.0827	155.8167	154.3612	160.0857	161.3881	179.0513	189.2647	210.0467	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0237	84.3937	83.3316	81.5498	80.2088	79.8000	79.8000	79.8000	79.8000	81.8333	84.1584	85.1422	(217)
Fuel for water heating, kWh/month													
	249.6025	222.5405	239.9116	216.8143	214.5435	195.2590	193.4351	200.6086	202.2407	218.8001	224.8911	246.7010	(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	18.1885	14.5915	13.1380	9.6254	7.4350	6.0744	6.7824	8.8161	11.4512	15.0246	16.9702	18.6940	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4164	-20.1575	-30.8587	-37.0329	-42.0207	-40.0022	-39.5246	-36.2719	-30.9119	-24.0590	-15.1872	-11.4595	(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	-4.2243	-9.1318	-18.6151	-28.6532	-38.5725	-39.0005	-38.5331	-32.3027	-23.2630	-13.2739	-5.7083	-3.3219	(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	1454.0684	(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	2625.3481	(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)	146.7912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-595.5026	(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	3716.7051	(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	1454.0684	0.2100	305.3544	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2625.3481	0.2100	551.3231	(264)
Space and water heating			856.6775	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	146.7912	0.1443	21.1865	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	0.1333	-45.4303	
PV Unit electricity exported	-254.6002	0.1252	-31.8735	
Total			-77.3038	(269)
Total CO2, kg/year			812.4894	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4900	(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	1454.0684	1.1300	1643.0972	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2625.3481	1.1300	2966.6433	(278)
Space and water heating			4609.7406	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	146.7912	1.5338	225.1533	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	1.4924	-508.7792	
PV Unit electricity exported	-254.6002	0.4595	-116.9892	
Total			-625.7684	(283)
Total Primary energy kWh/year			4339.2262	(286)
Target Primary Energy Rate (TPER)			72.0300	(287)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8 - Be Green	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	95 A	**DER**	1.29	**TER**	13.49
Environmental	99 A	**% DER < TER**			90.44
CO_2 Emissions (t/year)	0.05	**DFEE**	26.50	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			14.02
% DPER < TPER	77.09	**DPER**	16.50	**TPER**	72.03

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.5000	(17)
Infiltration rate		0.3027	(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) =	0.2573	(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	0.3280	0.3216	0.3152	0.2830	0.2766	0.2444	0.2444	0.2380	0.2573	0.2766	0.2895	0.3023	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.0000	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.0000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.5538	0.5517	0.5497	0.5400	0.5383	0.5299	0.5299	0.5283	0.5331	0.5383	0.5419	0.5457	(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	
Main dwelling								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744

P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0370	0.2886	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820	
E18 Party wall between dwellings	15.6000	0.0160	0.2496	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.3398 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	32.0880 (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	28.6240	28.5160	28.4102	27.9130	27.8200	27.3869	27.3869	27.3067	27.5537	27.8200	28.0081	28.2049	(38)
Heat transfer coeff	60.7120	60.6040	60.4981	60.0009	59.9079	59.4749	59.4749	59.3947	59.6417	59.9079	60.0961	60.2928	(39)
Average = Sum(39)m / 12 =												60.0005	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0078	1.0060	1.0043	0.9960	0.9945	0.9873	0.9873	0.9860	0.9901	0.9945	0.9976	1.0009	(40)
HLP (average)												0.9960	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.8754	24.5059	23.9857	23.0265	22.3082	21.5118	21.0816	21.5982	22.1606	23.0129	23.9918	24.7913	(42b)
Hot water usage for other uses	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)
Average daily hot water use (litres/day)												54.8755	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.8687	58.2268	56.4340	54.2023	52.2116	50.1427	49.7125	51.5015	53.3365	55.4612	57.7127	59.7846	(44)
Energy conte	94.8174	82.9141	86.7370	74.2003	70.2868	61.6562	60.1229	63.7697	65.7693	75.2603	82.2223	93.6082	(45)
Energy content (annual)										Total = Sum(45)m =		911.3646	
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(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	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(64)
										Total per year (kWh/year) = Sum(64)m =		774.6599	(64)
12Total per year (kWh/year)												775	(64)
Electric shower(s)	46.0949	41.0710	44.8479	42.7978	43.6009	41.5910	42.9774	43.6009	42.7978	44.8479	44.0046	46.0949	(64a)
										Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =		524.3271	(64a)
Heat gains from water heating, kWh/month	31.6724	27.8870	29.6436	26.4670	25.8362	23.4997	23.5205	24.4513	24.6754	27.2048	28.4734	31.4155	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	42.5705	41.4985	39.8435	36.7597	34.7260	32.6385	31.6135	32.8646	34.2714	36.5656	39.5464	42.2251	(72)
Total internal gains	356.4854	366.5933	351.0211	341.1938	324.0464	313.4143	301.8139	301.2641	310.1271	319.1648	337.2593	348.4825	(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	
Southeast	4.8400	36.7938	0.4000	0.7000	0.7700	34.5551	(77)
Southwest	10.5600	36.7938	0.4000	0.7000	0.7700	75.3929	(79)
Northwest	8.3600	11.2829	0.4000	0.7000	0.7700	18.3029	(81)

Solar gains	128.2508	224.5381	323.3710	427.7392	503.8089	511.0327	488.1676	429.7548	359.2529	252.5164	154.7221	109.0396	(83)
Total gains	484.7362	591.1314	674.3921	768.9330	827.8552	824.4470	789.9816	731.0189	669.3799	571.6811	491.9813	457.5221	(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	81.2823	81.4272	81.5697	82.2456	82.3733	82.9730	82.9730	83.0851	82.7410	82.3733	82.1153	81.8474	
alpha	6.4188	6.4285	6.4380	6.4830	6.4916	6.5315	6.5315	6.5390	6.5161	6.4916	6.4744	6.4565	
util living area	0.9954	0.9839	0.9504	0.8402	0.6553	0.4601	0.3311	0.3734	0.6046	0.9007	0.9864	0.9968	(86)
MIT	20.1528	20.3714	20.6231	20.8723	20.9765	20.9979	20.9998	20.9996	20.9891	20.8273	20.4410	20.1111	(87)
Th 2	20.0768	20.0783	20.0798	20.0866	20.0879	20.0939	20.0939	20.0950	20.0916	20.0879	20.0853	20.0826	(88)
util rest of house	0.9937	0.9784	0.9347	0.8009	0.5974	0.3958	0.2630	0.3001	0.5296	0.8640	0.9807	0.9955	(89)
MIT 2	19.3177	19.5336	19.7747	19.9982	20.0753	20.0932	20.0939	20.0949	20.0871	19.9689	19.6096	19.2811	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.6434	19.8605	20.1057	20.3392	20.4269	20.4461	20.4473	20.4478	20.4390	20.3038	19.9339	19.6049	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6434	19.8605	20.1057	20.3392	20.4269	20.4461	20.4473	20.4478	20.4390	20.3038	19.9339	19.6049	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9927	0.9768	0.9352	0.8125	0.6194	0.4209	0.2896	0.3287	0.5588	0.8737	0.9796	0.9947	(94)
Useful gains	481.1973	577.4034	630.6887	624.7328	512.7372	346.9809	228.7674	240.3083	374.0347	499.4538	481.9358	455.1092	(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	931.5306	906.6637	823.1190	686.3626	522.8081	347.6969	228.8171	240.4204	378.0671	581.3332	771.2696	928.8055	(97)
Space heating kWh	335.0480	221.2630	143.1682	44.3735	7.4928	0.0000	0.0000	0.0000	0.0000	60.9183	208.3204	352.4301	(98a)
Space heating requirement - total per year (kWh/year)												1373.0141	
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	335.0480	221.2630	143.1682	44.3735	7.4928	0.0000	0.0000	0.0000	0.0000	60.9183	208.3204	352.4301	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1373.0141	
Space heating per m2											(98c) / (4) =	22.7924	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	559.0638	440.1141	451.3996	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9854	0.9950	0.9912	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	550.9260	437.9066	447.4132	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	931.5118	892.9491	825.7190	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	274.0218	338.5517	281.4595	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	68.5054	84.6379	70.3649	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												223.5082	(107)
Energy for space heating												22.7924	(99)
Energy for space cooling												3.7103	(108)
Total												26.5027	(109)
Fabric Energy Efficiency (DFEE)												26.5	(109)

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

1. Overall dwelling characteristics

		Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling							
Ground floor		60.2400 (1b)	x	2.6000 (2b)	=	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) = 0.3210 (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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)

If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) 0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0.0000 (23c)

Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
TER Opening Type			15.0600	1.1450	17.2443			(27)
External Wall	73.0600	15.0600	58.0000	0.1800	10.4400			(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6843			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 294.9090 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	15.6000	0.0600	0.9360

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 8.1780 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)

Average = Sum(39)m / 12 = 64.9274

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9884 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	24.8754	24.5059	23.9857	23.0265	22.3082	21.5118	21.0816	21.5982	22.1606	23.0129	23.9918	24.7913	(42b)
Hot water usage for other uses	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 54.8755 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	59.8687	58.2268	56.4340	54.2023	52.2116	50.1427	49.7125	51.5015	53.3365	55.4612	57.7127	59.7846	(44)
Energy conte	94.8174	82.9141	86.7370	74.2003	70.2868	61.6562	60.1229	63.7697	65.7693	75.2603	82.2223	93.6082	(45)

Energy content (annual) Total = Sum(45)m = 911.3646

Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)

Water storage loss (or HIU loss):

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(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	80.5948	70.4770	73.7265	63.0702	59.7438	52.4078	51.1045	54.2042	55.9039	63.9713	69.8890	79.5670	(64)

Total per year (kWh/year) = Sum(64)m = 774.6599 (64)

12Total per year (kWh/year) 775 (64)

Electric shower(s)	46.0949	41.0710	44.8479	42.7978	43.6009	41.5910	42.9774	43.6009	42.7978	44.8479	44.0046	46.0949	(64a)

Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 524.3271 (64a)

Heat gains from water heating, kWh/month	31.6724	27.8870	29.6436	26.4670	25.8362	23.4997	23.5205	24.4513	24.6754	27.2048	28.4734	31.4155	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)													
	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)													
	42.5705	41.4985	39.8435	36.7597	34.7260	32.6385	31.6135	32.8646	34.2714	36.5656	39.5464	42.2251	(72)
Total internal gains													
	356.4854	366.5933	351.0211	341.1938	324.0464	313.4143	301.8139	301.2641	310.1271	319.1648	337.2593	348.4825	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)
Northwest	5.3000	11.2829	0.6300	0.7000	0.7700	18.2755	(81)

Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	484.5090	590.7352	673.8259	768.1909	826.9871	823.5689	789.1417	730.2756	668.7532	571.2367	491.7075	457.3286	(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	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area													
	0.9959	0.9865	0.9599	0.8679	0.6963	0.4947	0.3570	0.4021	0.6448	0.9190	0.9885	0.9970	(86)
MIT	20.0251	20.2489	20.5188	20.8126	20.9579	20.9954	20.9995	20.9990	20.9796	20.7654	20.3405	19.9885	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house													
	0.9944	0.9817	0.9462	0.8305	0.6341	0.4215	0.2786	0.3180	0.5624	0.8855	0.9835	0.9959	(89)
MIT 2	19.1313	19.3535	19.6152	19.8866	19.9979	20.0285	20.0301	20.0316	20.0181	19.8562	19.4544	19.1021	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	19.4800	19.7028	19.9677	20.2479	20.3724	20.4057	20.4082	20.4090	20.3932	20.2109	19.8001	19.4479	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4800	19.7028	19.9677	20.2479	20.3724	20.4057	20.4082	20.4090	20.3932	20.2109	19.8001	19.4479	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9933	0.9798	0.9455	0.8400	0.6571	0.4500	0.3092	0.3509	0.5942	0.8929	0.9821	0.9951	(94)
Useful gains	481.2548	578.8306	637.1084	645.2576	543.4532	370.6289	244.0156	256.2427	397.4041	510.0548	482.8997	455.0689	(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													
	1002.4116	975.0167	884.8590	736.7956	561.8265	372.1998	244.1423	256.5124	405.0832	622.6239	826.4749	996.9467	(97)
Space heating kWh													
	387.7407	266.2371	184.3264	65.9074	13.6697	0.0000	0.0000	0.0000	0.0000	83.7515	247.3741	403.1571	(98a)
Space heating requirement - total per year (kWh/year)												1652.1639	
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													
	387.7407	266.2371	184.3264	65.9074	13.6697	0.0000	0.0000	0.0000	0.0000	83.7515	247.3741	403.1571	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1652.1639	
Space heating per m2											(98c) / (4) =	27.4264	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
	0.0000	0.0000	0.0000	0.0000	0.0000	602.6254	474.4073	486.2802	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9743	0.9901	0.9836	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	587.1277	469.7292	478.3222	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	930.4854	891.9675	824.8502	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	247.2176	314.1453	257.8168	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	61.8044	78.5363	64.4542	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												204.7949	(107)
Energy for space heating												27.4264	(99)
Energy for space cooling												3.3996	(108)
Total												30.8260	(109)
Fabric Energy Efficiency (TFEE)												30.8	(109)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8 - Be Green	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	95 A	**DER**	1.29	**TER**	13.49
Environmental	99 A	**% DER < TER**			90.44
CO_2 Emissions (t/year)	0.05	**DFEE**	26.50	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			14.02
% DPER < TPER	77.09	**DPER**	16.50	**TPER**	72.03

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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)	
Main dwelling							
Ground floor		60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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		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) =												69.6000	(23c)
Effective ac	0.3417	0.3379	0.3342	0.3156	0.3119	0.2933	0.2933	0.2896	0.3007	0.3119	0.3193	0.3268	(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	
Main dwelling								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160

E3 Sill	10.8000	0.0230	0.2484	
E4 Jamb	35.2000	0.0240	0.8448	
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0370	0.2886	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820	
E18 Party wall between dwellings	15.6000	0.0160	0.2496	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				2.3398 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	32.0880 (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	17.6588	17.4666	17.2744	16.3134	16.1212	15.1601	15.1601	14.9679	15.5445	16.1212	16.5056	16.8900	(38)
Heat transfer coeff	49.7468	49.5546	49.3624	48.4013	48.2091	47.2481	47.2481	47.0559	47.6325	48.2091	48.5935	48.9779	(39)
Average = Sum(39)m / 12 =												48.3533	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8258	0.8226	0.8194	0.8035	0.8003	0.7843	0.7843	0.7811	0.7907	0.8003	0.8067	0.8130	(40)
HLP (average)												0.8027	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9884 (42)

Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)

Hot water usage for other uses

34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 93.3125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
										Total per year (kWh/year) = Sum(64)m =		2190.0900	(64)
12Total per year (kWh/year)												2190	(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	96.8769	86.2137	92.7875	84.2544	83.5308	77.2735	77.6384	79.5418	79.1260	85.8479	88.3950	96.1538	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	130.2109	128.2942	124.7143	117.0199	112.2726	107.3243	104.3527	106.9110	109.8972	115.3869	122.7708	129.2390	(72)
Total internal gains	444.1258	453.3891	435.8919	421.4540	401.5929	388.1002	374.5531	375.3105	385.7529	397.9861	420.4837	435.4964	(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	
Southeast	4.8400	36.7938	0.4000	0.7000	0.7700	34.5551	(77)
Southwest	10.5600	36.7938	0.4000	0.7000	0.7700	75.3929	(79)
Northwest	8.3600	11.2829	0.4000	0.7000	0.7700	18.3029	(81)

Solar gains	128.2508	224.5381	323.3710	427.7392	503.8089	511.0327	488.1676	429.7548	359.2529	252.5164	154.7221	109.0396	(83)
Total gains	572.3767	677.9271	759.2629	849.1932	905.4018	899.1328	862.7207	805.0653	745.0058	650.5025	575.2058	544.5360	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	99.1986	99.5834	99.9711	101.9561	102.3626	104.4447	104.4447	104.8713	103.6018	102.3626	101.5528	100.7558	
alpha	7.6132	7.6389	7.6647	7.7971	7.8242	7.9630	7.9630	7.9914	7.9068	7.8242	7.7702	7.7171	
util living area													
	0.9810	0.9426	0.8568	0.6774	0.4942	0.3363	0.2410	0.2689	0.4408	0.7451	0.9436	0.9856	(86)
Living	20.6273	20.7635	20.8790	20.9472	20.9591	20.9609	20.9609	20.9610	20.9603	20.9396	20.7959	20.6063	
Non living	19.8080	19.9747	20.1072	20.1886	20.2013	20.2168	20.2168	20.2197	20.2107	20.1859	20.0283	19.7918	
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	20.8093	20.7635	20.8790	20.9472	20.9591	20.9609	20.9609	20.9610	20.9603	20.9396	20.7959	20.6614	(87)
Th 2	20.2310	20.2338	20.2365	20.2503	20.2531	20.2669	20.2669	20.2697	20.2614	20.2531	20.2476	20.2420	(88)
util rest of house													
	0.9752	0.9280	0.8288	0.6391	0.4549	0.2978	0.2008	0.2262	0.3938	0.6998	0.9268	0.9811	(89)
MIT 2	20.0624	19.9747	20.1072	20.1886	20.2013	20.2168	20.2168	20.2197	20.2107	20.1859	20.0283	19.8729	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	20.3538	20.2824	20.4083	20.4845	20.4969	20.5070	20.5071	20.5089	20.5031	20.4799	20.3277	20.1805	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3538	20.2824	20.4083	20.4845	20.4969	20.5070	20.5071	20.5089	20.5031	20.4799	20.3277	20.1805	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9762	0.9291	0.8354	0.6512	0.4677	0.3104	0.2140	0.2402	0.4092	0.7139	0.9288	0.9807	(94)
Useful gains	558.7632	629.8368	634.3238	553.0195	423.4933	279.0788	184.6006	193.3470	304.8418	464.4109	534.2254	534.0129	(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													
	798.6229	762.2678	686.5455	560.7052	424.0909	279.0961	184.6012	193.3486	304.9963	476.3023	642.7831	782.6921	(97)
Space heating kWh													
	178.4556	88.9936	38.8530	5.5337	0.4446	0.0000	0.0000	0.0000	0.0000	8.8472	78.1615	185.0173	(98a)
Space heating requirement - total per year (kWh/year)												584.3065	
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													
	178.4556	88.9936	38.8530	5.5337	0.4446	0.0000	0.0000	0.0000	0.0000	8.8472	78.1615	185.0173	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												584.3065	
Space heating per m2											(98c) / (4) =	9.6996	(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 %) 212.2057 (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													
	178.4556	88.9936	38.8530	5.5337	0.4446	0.0000	0.0000	0.0000	0.0000	8.8472	78.1615	185.0173	(98)
Space heating efficiency (main heating system 1)													
	212.2057	212.2057	212.2057	212.2057	212.2057	0.0000	0.0000	0.0000	0.0000	212.2057	212.2057	212.2057	(210)
Space heating fuel (main heating system)													
	84.0956	41.9374	18.3091	2.6077	0.2095	0.0000	0.0000	0.0000	0.0000	4.1691	36.8329	87.1877	(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													
	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
Efficiency of water heater												177.8251	(216)
(217)m	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	(217)
Fuel for water heating, kWh/month													
	120.8342	106.9622	113.9178	100.8734	98.2622	89.0669	88.2965	91.5157	92.2000	102.1810	107.8764	119.6113	(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	18.0302	16.2854	18.0302	17.4486	18.0302	17.4486	18.0302	18.0302	17.4486	18.0302	17.4486	18.0302	(231)
Lighting	16.0818	12.9014	11.6163	8.5106	6.5738	5.3709	5.9969	7.7950	10.1249	13.2844	15.0047	16.5288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.1102	-60.8621	-100.7076	-127.6720	-149.5095	-143.8299	-141.8991	-128.3445	-104.8422	-75.4664	-43.4749	-31.0139	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.6815	-5.6386	-16.4828	-33.8455	-52.9818	-56.2309	-55.1208	-42.0037	-25.5925	-10.6894	-2.9046	-1.1904	(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												275.3491	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												177.8251	
Water heating fuel used												1231.5977	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 1.1110)		
mechanical ventilation fans (SFP = 1.1110)	212.2913	(230a)
Total electricity for the above, kWh/year	212.2913	(231)
Electricity for lighting (calculated in Appendix L)	129.7893	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	399.9325	(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	275.3491	0.1597	43.9598	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1231.5977	0.1407	173.3046	(264)
Space and water heating			217.2644	(265)
Pumps, fans and electric keep-hot	212.2913	0.1387	29.4474	(267)
Energy for lighting	129.7893	0.1443	18.7326	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.7324	0.1321	-151.2466	
PV Unit electricity exported	-304.3625	0.1191	-36.2520	
Total			-187.4987	(269)
Total CO2, kg/year			77.9457	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.2900	(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	275.3491	1.5909	438.0427	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1231.5977	1.5203	1872.4037	(278)
Space and water heating			2310.4464	(279)
Pumps, fans and electric keep-hot	212.2913	1.5128	321.1543	(281)
Energy for lighting	129.7893	1.5338	199.0752	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.7324	1.4882	-1703.5577	
PV Unit electricity exported	-304.3625	0.4369	-132.9693	
Total			-1836.5270	(283)
Total Primary energy kWh/year			994.1488	(286)
Dwelling Primary energy Rate (DPER)			16.5000	(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	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 60.2400						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	2 * 10 =	20.0000	(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) =	20.0000 / (5) =	0.1277	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		5.0000	(17)
Infiltration rate		0.3777	(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) =	0.3210	(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	0.4093	0.4013	0.3933	0.3531	0.3451	0.3050	0.3050	0.2970	0.3210	0.3451	0.3612	0.3772	(22b)
Effective ac	0.5838	0.5805	0.5773	0.5624	0.5596	0.5465	0.5465	0.5441	0.5515	0.5596	0.5652	0.5711	(25)

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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 Opening Type			15.0600	1.1450	17.2443			(27)
External Wall	73.0600	15.0600	58.0000	0.1800	10.4400			(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.6843			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K			294.9090 (35)
List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	10.8000	0.0500	0.5400
E3 Sill	10.8000	0.0500	0.5400
E4 Jamb	35.2000	0.0500	1.7600
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0700	3.9340
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0900	0.7020
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0900	-0.2340
E18 Party wall between dwellings	15.6000	0.0600	0.9360
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			8.1780 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		35.8623 (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	30.1729	30.0048	29.8400	29.0659	28.9210	28.2468	28.2468	28.1220	28.5065	28.9210	29.2140	29.5203	(38)
Heat transfer coeff	66.0352	65.8670	65.7022	64.9281	64.7833	64.1091	64.1091	63.9842	64.3688	64.7833	65.0763	65.3826	(39)
Average = Sum(39)m / 12 =												64.9274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0962	1.0934	1.0907	1.0778	1.0754	1.0642	1.0642	1.0622	1.0685	1.0754	1.0803	1.0854	(40)
HLP (average)												1.0778	
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												1.9884	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)
Hot water usage for other uses	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)
Average daily hot water use (litres/day)												93.3125	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9188	(55)
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842	(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	212.2214	187.8102	199.9223	176.8117	172.0827	155.8167	154.3612	160.0857	161.3881	179.0513	189.2647	210.0467	(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	212.2214	187.8102	199.9223	176.8117	172.0827	155.8167	154.3612	160.0857	161.3881	179.0513	189.2647	210.0467	(64)
										Total per year (kWh/year) = Sum(64)m =		2158.8624	(64)
12Total per year (kWh/year)												2159	(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	94.7551	84.2973	90.6657	82.2010	81.4090	75.2202	75.5166	77.4200	77.0727	83.7261	86.3417	94.0320	(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	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	99.4206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.5370	96.9159	87.5370	90.4549	87.5370	90.4549	87.5370	87.5370	90.4549	87.5370	90.4549	87.5370	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	173.5518	175.3527	170.8145	161.1530	148.9572	137.4948	129.8372	128.0363	132.5746	142.2360	154.4319	165.8942	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	32.9421	(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)													

	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365		(71)
Water heating gains (Table 5)													
	127.3590	125.4424	121.8625	114.1681	109.4207	104.4725	101.5008	104.0592	107.0454	112.5351	119.9190	126.3872	(72)
Total internal gains													
	444.2740	453.5372	436.0401	421.6022	401.7411	385.2484	371.7012	372.4586	382.9010	398.1342	420.6319	435.6445	(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	
Southeast	3.0700	36.7938	0.6300	0.7000	0.7700	34.5211	(77)
Southwest	6.6900	36.7938	0.6300	0.7000	0.7700	75.2269	(79)
Northwest	5.3000	11.2829	0.6300	0.7000	0.7700	18.2755	(81)

Solar gains	128.0235	224.1418	322.8047	426.9971	502.9407	510.1545	487.3278	429.0115	358.6261	252.0720	154.4482	108.8461	(83)
Total gains	572.2975	677.6791	758.8448	848.5992	904.6818	895.4029	859.0290	801.4702	741.5271	650.2062	575.0801	544.4907	(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	74.7300	74.9208	75.1087	76.0042	76.1741	76.9752	76.9752	77.1254	76.6647	76.1741	75.8312	75.4759	
alpha	5.9820	5.9947	6.0072	6.0669	6.0783	6.1317	6.1317	6.1417	6.1110	6.0783	6.0554	6.0317	
util living area													
	0.9904	0.9742	0.9349	0.8234	0.6460	0.4561	0.3281	0.3667	0.5882	0.8735	0.9755	0.9926	(86)
MIT	20.1576	20.3707	20.6174	20.8630	20.9716	20.9971	20.9997	20.9994	20.9874	20.8332	20.4587	20.1215	(87)
Th 2	20.0039	20.0062	20.0085	20.0190	20.0210	20.0302	20.0302	20.0319	20.0266	20.0210	20.0170	20.0128	(88)
util rest of house													
	0.9870	0.9658	0.9151	0.7808	0.5852	0.3881	0.2559	0.2898	0.5101	0.8301	0.9659	0.9900	(89)
MIT 2	19.0517	19.3192	19.6186	19.8989	20.0015	20.0288	20.0301	20.0317	20.0201	19.8782	19.4405	19.0131	(90)
Living area fraction									fLA = Living area / (4) =			0.3901	(91)
MIT	19.4831	19.7294	20.0082	20.2750	20.3799	20.4065	20.4083	20.4092	20.3974	20.2507	19.8377	19.4455	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4831	19.7294	20.0082	20.2750	20.3799	20.4065	20.4083	20.4092	20.3974	20.2507	19.8377	19.4455	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9847	0.9629	0.9151	0.7926	0.6080	0.4146	0.2841	0.3199	0.5404	0.8413	0.9638	0.9880	(94)
Useful gains	563.5412	652.5417	694.4069	672.6052	550.0698	371.2500	244.0701	256.3654	400.7094	547.0472	554.2590	537.9590	(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													
	1002.6195	976.7655	887.5210	738.5582	562.3153	372.2523	244.1481	256.5250	405.3589	625.2069	828.9227	996.7898	(97)
Space heating kWh													
	326.6743	217.8783	143.6768	47.4862	9.1107	0.0000	0.0000	0.0000	0.0000	58.1508	197.7579	341.3702	(98a)
Space heating requirement - total per year (kWh/year)												1342.1051	
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													
	326.6743	217.8783	143.6768	47.4862	9.1107	0.0000	0.0000	0.0000	0.0000	58.1508	197.7579	341.3702	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1342.1051	
Space heating per m2											(98c) / (4) =	22.2793	(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													
	326.6743	217.8783	143.6768	47.4862	9.1107	0.0000	0.0000	0.0000	0.0000	58.1508	197.7579	341.3702	(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)													
	353.9266	236.0545	155.6629	51.4476	9.8707	0.0000	0.0000	0.0000	0.0000	63.0020	214.2555	369.8485	(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													
	212.2214	187.8102	199.9223	176.8117	172.0827	155.8167	154.3612	160.0857	161.3881	179.0513	189.2647	210.0467	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.0237	84.3937	83.3316	81.5498	80.2088	79.8000	79.8000	79.8000	79.8000	81.8333	84.1584	85.1422	(217)
Fuel for water heating, kWh/month													
	249.6025	222.5405	239.9116	216.8143	214.5435	195.2590	193.4351	200.6086	202.2407	218.8001	224.8911	246.7010	(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	18.1885	14.5915	13.1380	9.6254	7.4350	6.0744	6.7824	8.8161	11.4512	15.0246	16.9702	18.6940	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-13.4164	-20.1575	-30.8587	-37.0329	-42.0207	-40.0022	-39.5246	-36.2719	-30.9119	-24.0590	-15.1872	-11.4595	(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	-4.2243	-9.1318	-18.6151	-28.6532	-38.5725	-39.0005	-38.5331	-32.3027	-23.2630	-13.2739	-5.7083	-3.3219	(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	1454.0684	(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	2625.3481	(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)	146.7912	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-595.5026	(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	3716.7051	(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	1454.0684	0.2100	305.3544	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2625.3481	0.2100	551.3231	(264)
Space and water heating			856.6775	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	146.7912	0.1443	21.1865	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	0.1333	-45.4303	
PV Unit electricity exported	-254.6002	0.1252	-31.8735	
Total			-77.3038	(269)
Total CO2, kg/year			812.4894	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.4900	(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	1454.0684	1.1300	1643.0972	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2625.3481	1.1300	2966.6433	(278)
Space and water heating			4609.7406	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	146.7912	1.5338	225.1533	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-340.9024	1.4924	-508.7792	
PV Unit electricity exported	-254.6002	0.4595	-116.9892	
Total			-625.7684	(283)
Total Primary energy kWh/year			4339.2262	(286)
Target Primary Energy Rate (TPER)			72.0300	(287)

Full SAP Calculation Printout

Plot Reference	Flat 8	**Issued on Date**	24/09/2026
Assessment Reference	Flat 8 - Be Green	**Plot Type Ref**	Flat 8
Plot Address	Flat 8, 107, Mayes Road, London, N22 6UP	**SAP Version**	10.2

SAP Rating	95 A	**DER**	1.29	**TER**	13.49
Environmental	99 A	**% DER < TER**			90.44
CO_2 Emissions (t/year)	0.05	**DFEE**	26.50	**TFEE**	30.83
Compliance Check	See BREL	**% DFEE < TFEE**			14.02
% DPER < TPER	77.09	**DPER**	16.50	**TPER**	72.03

Assessor Details	Mr. Andreas Andreou	**Assessor ID**	AC35-0001
Client	UK Property Group, UK Property Group		

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

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1. Overall dwelling characteristics

		Area		Storey height		Volume	
Main dwelling		(m2)		(m)		(m3)	
Ground floor		60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400						(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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		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) =		69.6000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3417	0.3379	0.3342	0.3156	0.3119	0.2933	0.2933	0.2896	0.3007	0.3119	0.3193	0.3268	(25)

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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	
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160

E3 Sill	10.8000	0.0230	0.2484	
E4 Jamb	35.2000	0.0240	0.8448	
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000	
E16 Corner (normal)	7.8000	0.0370	0.2886	
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820	
E18 Party wall between dwellings	15.6000	0.0160	0.2496	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.3398 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.0880 (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	17.6588	17.4666	17.2744	16.3134	16.1212	15.1601	15.1601	14.9679	15.5445	16.1212	16.5056	16.8900	(38)
Heat transfer coeff	49.7468	49.5546	49.3624	48.4013	48.2091	47.2481	47.2481	47.0559	47.6325	48.2091	48.5935	48.9779	(39)
Average = Sum(39)m / 12 =												48.3533	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8258	0.8226	0.8194	0.8035	0.8003	0.7843	0.7843	0.7811	0.7907	0.8003	0.8067	0.8130	(40)
HLP (average)												0.8027	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.9884 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)

Hot water usage for other uses

34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 93.3125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
										Total per year (kWh/year) = Sum(64)m =		2190.0900	(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	96.8769	86.2137	92.7875	84.2544	83.5308	77.2735	77.6384	79.5418	79.1260	85.8479	88.3950	96.1538	(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	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3730	16.3188	13.2713	10.0472	7.5104	6.3406	6.8513	8.9055	11.9530	15.1770	17.7139	18.8837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)	130.2109	128.2942	124.7143	117.0199	112.2726	107.3243	104.3527	106.9110	109.8972	115.3869	122.7708	129.2390	(72)
Total internal gains	496.3036	495.0206	481.6197	456.2812	430.7943	407.5682	393.6780	395.6026	408.4099	431.5437	459.6671	484.4131	(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	
Southeast	4.8400	36.7938	0.4000	0.7000	0.7700	34.5551	(77)
Southwest	10.5600	36.7938	0.4000	0.7000	0.7700	75.3929	(79)
Northwest	8.3600	11.2829	0.4000	0.7000	0.7700	18.3029	(81)

Solar gains	128.2508	224.5381	323.3710	427.7392	503.8089	511.0327	488.1676	429.7548	359.2529	252.5164	154.7221	109.0396	(83)
Total gains	624.5544	719.5587	804.9907	884.0204	934.6031	918.6009	881.8456	825.3575	767.6628	684.0600	614.3892	593.4527	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	99.1986	99.5834	99.9711	101.9561	102.3626	104.4447	104.4447	104.8713	103.6018	102.3626	101.5528	100.7558	
alpha	7.6132	7.6389	7.6647	7.7971	7.8242	7.9630	7.9630	7.9914	7.9068	7.8242	7.7702	7.7171	
util living area	0.9691	0.9245	0.8264	0.6532	0.4789	0.3292	0.2357	0.2623	0.4278	0.7145	0.9233	0.9762	(86)
Living	20.6812	20.7957	20.8971	20.9499	20.9593	20.9609	20.9609	20.9610	20.9603	20.9446	20.8262	20.6590	
Non living	19.8738	20.0117	20.1257	20.1909	20.2014	20.2168	20.2168	20.2197	20.2107	20.1900	20.0623	19.8567	
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	20.8369	20.7957	20.8971	20.9499	20.9593	20.9609	20.9609	20.9610	20.9603	20.9446	20.8262	20.7067	(87)
Th 2	20.2310	20.2338	20.2365	20.2503	20.2531	20.2669	20.2669	20.2697	20.2614	20.2531	20.2476	20.2420	(88)
util rest of house	0.9603	0.9068	0.7963	0.6156	0.4408	0.2915	0.1965	0.2206	0.3822	0.6693	0.9025	0.9693	(89)
MIT 2	20.0886	20.0117	20.1257	20.1909	20.2014	20.2168	20.2168	20.2197	20.2107	20.1900	20.0623	19.9262	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	20.3805	20.3175	20.4267	20.4870	20.4971	20.5070	20.5071	20.5089	20.5032	20.4844	20.3603	20.2306	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3805	20.3175	20.4267	20.4870	20.4971	20.5070	20.5071	20.5089	20.5032	20.4844	20.3603	20.2306	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9622	0.9089	0.8041	0.6276	0.4533	0.3038	0.2093	0.2343	0.3971	0.6836	0.9059	0.9692	(94)
Useful gains	600.9506	654.0346	647.2824	554.8165	423.6206	279.0816	184.6007	193.3473	304.8741	467.6097	556.5865	575.1496	(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	799.9540	764.0098	687.4524	560.8263	424.0996	279.0963	184.6013	193.3486	304.9986	476.5189	644.3641	785.1477	(97)
Space heating kWh	148.0585	73.9033	29.8865	4.3271	0.3564	0.0000	0.0000	0.0000	0.0000	6.6284	63.1998	156.2386	(98a)
Space heating requirement - total per year (kWh/year)												482.5987	
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	148.0585	73.9033	29.8865	4.3271	0.3564	0.0000	0.0000	0.0000	0.0000	6.6284	63.1998	156.2386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												482.5987	
Space heating per m2											(98c) / (4) =	8.0113	(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 %) 212.2057 (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	148.0585	73.9033	29.8865	4.3271	0.3564	0.0000	0.0000	0.0000	0.0000	6.6284	63.1998	156.2386	(98)
Space heating efficiency (main heating system 1)	212.2057	212.2057	212.2057	212.2057	212.2057	0.0000	0.0000	0.0000	0.0000	212.2057	212.2057	212.2057	(210)
Space heating fuel (main heating system)	69.7712	34.8263	14.0837	2.0391	0.1679	0.0000	0.0000	0.0000	0.0000	3.1236	29.7824	73.6260	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
Efficiency of water heater												177.8251	(216)
(217)m	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	(217)
Fuel for water heating, kWh/month	120.8342	106.9622	113.9178	100.8734	98.2622	89.0669	88.2965	91.5157	92.2000	102.1810	107.8764	119.6113	(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	18.0302	16.2854	18.0302	17.4486	18.0302	17.4486	18.0302	18.0302	17.4486	18.0302	17.4486	18.0302	(231)
Lighting	16.0818	12.9014	11.6163	8.5106	6.5738	5.3709	5.9969	7.7950	10.1249	13.2844	15.0047	16.5288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.0591	-60.7621	-100.5404	-127.6213	-149.5036	-143.8299	-141.8991	-128.3445	-104.8422	-75.4347	-43.4218	-30.9791	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.7326	-5.7386	-16.6500	-33.8962	-52.9877	-56.2309	-55.1208	-42.0037	-25.5925	-10.7211	-2.9577	-1.2253	(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 1 227.4203 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 177.8251

Water heating fuel used 1231.5977 (219)

Space cooling fuel 0.0000 (221)

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 1.1110)

mechanical ventilation fans (SFP = 1.1110)	212.2913	(230a)
Total electricity for the above, kWh/year	212.2913	(231)
Electricity for lighting (calculated in Appendix L)	129.7893	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1449.0949	(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	352.0036	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	227.4203	16.4900	37.5016	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1231.5977	16.4900	203.0905	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	212.2913	16.4900	35.0068	(249)
Energy for lighting	129.7893	16.4900	21.4023	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.2379	16.4900	-188.6848	
PV Unit electricity exported	-304.8570	5.5900	-17.0415	
Total			-205.7263	(252)
Total energy cost			91.2748	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3122	(257)
SAP value		94.9388	
SAP rating (Section 12)		95	(258)
SAP band		A	

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	227.4203	0.1598	36.3365	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1231.5977	0.1407	173.3046	(264)
Space and water heating			209.6410	(265)
Pumps, fans and electric keep-hot	212.2913	0.1387	29.4474	(267)
Energy for lighting	129.7893	0.1443	18.7326	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.2379	0.1321	-151.1707	
PV Unit electricity exported	-304.8570	0.1192	-36.3390	
Total			-187.5098	(269)
Total CO2, kg/year			70.3113	(272)
CO2 emissions per m2			1.1700	(273)
EI value			99.1047	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	60.2400 (1b)	x 2.6000 (2b)	= 156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 60.2400				(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	156.6240	(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	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.1636	0.1562	0.1562	0.1450	0.1450	0.1264	0.1302	0.1376	0.1339	0.1413	0.1413	0.1562	(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) =	69.6000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3156	0.3082	0.3082	0.2970	0.2970	0.2784	0.2822	0.2896	0.2859	0.2933	0.2933	0.3082	(25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K	
	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
Main dwelling								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17765.3200	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	294.9090	(35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0370	0.2886
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820
E18 Party wall between dwellings	15.6000	0.0160	0.2496

Thermal bridges (Sum(L x Psi) calculated using Appendix K)		2.3398 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	32.0880 (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	16.3134	15.9290	15.9290	15.3523	15.3523	14.3913	14.5835	14.9679	14.7757	15.1601	15.1601	15.9290	(38)
Heat transfer coeff	48.4013	48.0169	48.0169	47.4403	47.4403	46.4793	46.6715	47.0559	46.8637	47.2481	47.2481	48.0169	(39)
Average = Sum(39)m / 12 =												47.4083	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8035	0.7971	0.7971	0.7875	0.7875	0.7716	0.7748	0.7811	0.7779	0.7843	0.7843	0.7971	(40)
HLP (average)												0.7870	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9884	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)
Hot water usage for other uses	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)
Average daily hot water use (litres/day)												93.3125	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
										Total per year (kWh/year) = Sum(64)m =		2190.0900	(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

	96.8769	86.2137	92.7875	84.2544	83.5308	77.2735	77.6384	79.5418	79.1260	85.8479	88.3950	96.1538 (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	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

	18.3730	16.3188	13.2713	10.0472	7.5104	6.3406	6.8513	8.9055	11.9530	15.1770	17.7139	18.8837	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)

	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)

Water heating gains (Table 5)

	130.2109	128.2942	124.7143	117.0199	112.2726	107.3243	104.3527	106.9110	109.8972	115.3869	122.7708	129.2390	(72)

Total internal gains

	496.3036	495.0206	481.6197	456.2812	430.7943	407.5682	393.6780	395.6026	408.4099	431.5437	459.6671	484.4131	(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	
Southeast	4.8400	39.1209	0.4000	0.7000	0.7700	36.7405	(77)
Southwest	10.5600	39.1209	0.4000	0.7000	0.7700	80.1612	(79)
Northwest	8.3600	12.4928	0.4000	0.7000	0.7700	20.2655	(81)

Solar gains	137.1672	215.9146	313.2867	432.8609	497.4491	541.6907	518.6981	465.4800	385.9805	265.5114	170.9413	119.4424	(83)
Total gains	633.4708	710.9353	794.9064	889.1421	928.2434	949.2589	912.3761	861.0827	794.3903	697.0550	630.6084	603.8555	(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	101.9561	102.7724	102.7724	104.0215	104.0215	106.1723	105.7351	104.8713	105.3014	104.4447	104.4447	102.7724	
alpha	7.7971	7.8515	7.8515	7.9348	7.9348	8.0782	8.0490	7.9914	8.0201	7.9630	7.9630	7.8515	
util living area	0.9479	0.8955	0.7658	0.5629	0.3883	0.2252	0.1279	0.1475	0.3126	0.5989	0.8612	0.9581	(86)
Living	20.7689	20.8509	20.9293	20.9578	20.9606	20.9615	20.9613	20.9610	20.9612	20.9572	20.8961	20.7492	
Non living	19.9973	20.0957	20.1776	20.2117	20.2137	20.2286	20.2256	20.2197	20.2227	20.2143	20.1571	19.9794	
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	20.8818	20.8509	20.9293	20.9578	20.9606	20.9615	20.9613	20.9610	20.9612	20.9572	20.8961	20.7843	(87)
Th 2	20.2503	20.2559	20.2559	20.2642	20.2642	20.2780	20.2753	20.2697	20.2725	20.2669	20.2669	20.2559	(88)
util rest of house	0.9339	0.8729	0.7307	0.5248	0.3508	0.1899	0.0908	0.1076	0.2697	0.5513	0.8297	0.9462	(89)
MIT 2	20.1494	20.0957	20.1776	20.2117	20.2137	20.2286	20.2256	20.2197	20.2227	20.2143	20.1571	20.0292	(90)
Living area fraction									fLA = Living area / (4) =			0.3901	(91)
MIT	20.4351	20.3903	20.4708	20.5027	20.5051	20.5145	20.5126	20.5089	20.5108	20.5041	20.4454	20.3238	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4351	20.3903	20.4708	20.5027	20.5051	20.5145	20.5126	20.5089	20.5108	20.5041	20.4454	20.3238	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9377	0.8772	0.7411	0.5372	0.3631	0.2015	0.1030	0.1207	0.2838	0.5669	0.8378	0.9474	(94)
Useful gains	593.9993	623.6579	589.1104	477.6305	336.9988	191.2379	93.9324	103.9426	225.4433	395.1299	528.3506	572.0989	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	727.7199	695.7799	608.4135	479.2765	337.0681	191.2383	93.9324	103.9426	225.4500	397.0771	569.1222	716.5932	(97)
Space heating kWh	99.4881	48.4660	14.3615	1.1851	0.0516	0.0000	0.0000	0.0000	0.0000	1.4487	29.3556	107.5037	(98a)

Space heating requirement - total per year (kWh/year) 301.8603

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	99.4881	48.4660	14.3615	1.1851	0.0516	0.0000	0.0000	0.0000	0.0000	1.4487	29.3556	107.5037	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 301.8603

Space heating per m2 (98c) / (4) = 5.0110 (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 %)	211.7241 (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	99.4881	48.4660	14.3615	1.1851	0.0516	0.0000	0.0000	0.0000	0.0000	1.4487	29.3556	107.5037	(98)

Space heating efficiency (main heating system 1)

	211.7241	211.7241	211.7241	211.7241	211.7241	0.0000	0.0000	0.0000	0.0000	211.7241	211.7241	211.7241	(210)
Space heating fuel (main heating system)													
	46.9895	22.8911	6.7831	0.5597	0.0244	0.0000	0.0000	0.0000	0.0000	0.6843	13.8650	50.7754	(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													
	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
Efficiency of water heater												177.9378	(216)
(217)m	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	(217)
Fuel for water heating, kWh/month													
	120.7577	106.8945	113.8456	100.8095	98.2000	89.0105	88.2406	91.4577	92.1416	102.1163	107.8081	119.5355	(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	18.0302	16.2854	18.0302	17.4486	18.0302	17.4486	18.0302	18.0302	17.4486	18.0302	17.4486	18.0302	(231)
Lighting	16.0818	12.9014	11.6163	8.5106	6.5738	5.3709	5.9969	7.7950	10.1249	13.2844	15.0047	16.5288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.1607	-59.4630	-98.7986	-129.4880	-148.4838	-149.7891	-148.1071	-136.5409	-111.9875	-79.9294	-48.3774	-34.3824	(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	-2.1520	-5.6900	-16.4201	-35.3169	-52.1317	-62.6093	-61.7233	-49.0825	-29.8775	-12.2645	-3.8751	-1.5956	(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	142.5725	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	177.9378	
Water heating fuel used	1230.8174	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 1.1110)		
mechanical ventilation fans (SFP = 1.1110)	212.2913	(230a)
Total electricity for the above, kWh/year	212.2913	(231)
Electricity for lighting (calculated in Appendix L)	129.7893	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1518.2466	(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	197.2239	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	142.5725	26.0000	37.0688	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1230.8174	26.0000	320.0125	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	212.2913	26.0000	55.1957	(249)
Energy for lighting	129.7893	26.0000	33.7452	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1185.5081	26.0000	-308.2321	
PV Unit electricity exported	-332.7385	5.8100	-19.3321	
Total			-327.5642	(252)
Total energy cost			118.4581	(255)

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	142.5725	0.1607	22.9060	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1230.8174	0.1407	173.1948	(264)
Space and water heating			196.1008	(265)
Pumps, fans and electric keep-hot	212.2913	0.1387	29.4474	(267)
Energy for lighting	129.7893	0.1443	18.7326	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1185.5081	0.1320	-156.4425	
PV Unit electricity exported	-332.7385	0.1182	-39.3329	
Total			-195.7754	(269)
Total CO2, kg/year			48.5054	(272)

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	142.5725	1.5946	227.3458	(275)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	1230.8174	1.5203	1871.2175	(278)
Space and water heating			2098.5633	(279)
Pumps, fans and electric keep-hot	212.2913	1.5128	321.1543	(281)
Energy for lighting	129.7893	1.5338	199.0752	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1185.5081	1.4876	-1763.5051	
PV Unit electricity exported	-332.7385	0.4334	-144.2065	
Total			-1907.7116	(283)
Total Primary energy kWh/year			711.0812	(286)

SAP 10 EPC IMPROVEMENTS

Flat 8 - Be Green

Current energy efficiency rating: A 95
Current environmental impact rating: A 99

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
(none)				
Total Savings	£0	0.00 kg/m²		

Potential energy efficiency rating: A 95
Potential environmental impact rating: A 99

Fuel prices for cost data on this page from database revision number 598 TEST (21 Aug 2026)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£446	£446	£0
Space heating	£92	£92	£0
Water heating	£320	£320	£0
Lighting	£34	£34	£0
Generated (PV)	-£328	-£328	£0
Total cost of fuels	£118	£118	£0
Total cost of uses	£118	£118	£0
Delivered energy	3 kWh/m²	3 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.0 tonnes	0.0 tonnes	0.0 tonnes
CO2 emissions per m²	1 kg/m²	1 kg/m²	0 kg/m²
Primary energy	12 kWh/m²	12 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.6240	(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	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) = 69.6000 (23c)

Effective ac	0.3417	0.3379	0.3342	0.3156	0.3119	0.2933	0.2933	0.2896	0.3007	0.3119	0.3193	0.3268	(25)

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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	
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 294.9090 (35)
List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0370	0.2886
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820
E18 Party wall between dwellings	15.6000	0.0160	0.2496

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 2.3398 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 32.0880 (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	17.6588	17.4666	17.2744	16.3134	16.1212	15.1601	15.1601	14.9679	15.5445	16.1212	16.5056	16.8900	(38)
Heat transfer coeff	49.7468	49.5546	49.3624	48.4013	48.2091	47.2481	47.2481	47.0559	47.6325	48.2091	48.5935	48.9779	(39)
Average = Sum(39)m / 12 =												48.3533	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8258	0.8226	0.8194	0.8035	0.8003	0.7843	0.7843	0.7811	0.7907	0.8003	0.8067	0.8130	(40)
HLP (average)												0.8027	
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 1.9884 (42)
Hot water usage for mixer showers

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)

Hot water usage for baths

66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)

Hot water usage for other uses

34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)

Average daily hot water use (litres/day) 93.3125 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)

Water storage loss (or HIU loss):
Store volume 210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day): 1.8600 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 1.0044 (55)
Total storage loss

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)

If cylinder contains dedicated solar storage

31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(57)
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)
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)

Primary loss
Combi loss
Total heat required for water heating calculated for each month

214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(62)
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)
-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)
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)
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)

WWHRS
PV diverter
Solar input
FGHRS
Output from w/h

214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)

Total per year (kWh/year) = Sum(64)m = 2190.0900 (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

96.8769	86.2137	92.7875	84.2544	83.5308	77.2735	77.6384	79.5418	79.1260	85.8479	88.3950	96.1538	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.3730	16.3188	13.2713	10.0472	7.5104	6.3406	6.8513	8.9055	11.9530	15.1770	17.7139	18.8837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)													
	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)													
	130.2109	128.2942	124.7143	117.0199	112.2726	107.3243	104.3527	106.9110	109.8972	115.3869	122.7708	129.2390	(72)
Total internal gains													
	496.3036	495.0206	481.6197	456.2812	430.7943	407.5682	393.6780	395.6026	408.4099	431.5437	459.6671	484.4131	(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	
Southeast	4.8400	36.7938	0.4000	0.7000	0.7700	34.5551	(77)
Southwest	10.5600	36.7938	0.4000	0.7000	0.7700	75.3929	(79)
Northwest	8.3600	11.2829	0.4000	0.7000	0.7700	18.3029	(81)

Solar gains	128.2508	224.5381	323.3710	427.7392	503.8089	511.0327	488.1676	429.7548	359.2529	252.5164	154.7221	109.0396	(83)
Total gains	624.5544	719.5587	804.9907	884.0204	934.6031	918.6009	881.8456	825.3575	767.6628	684.0600	614.3892	593.4527	(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	99.1986	99.5834	99.9711	101.9561	102.3626	104.4447	104.4447	104.8713	103.6018	102.3626	101.5528	100.7558	
alpha	7.6132	7.6389	7.6647	7.7971	7.8242	7.9630	7.9630	7.9914	7.9068	7.8242	7.7702	7.7171	
util living area													
	0.9691	0.9245	0.8264	0.6532	0.4789	0.3292	0.2357	0.2623	0.4278	0.7145	0.9233	0.9762	(86)
Living	20.6812	20.7957	20.8971	20.9499	20.9593	20.9609	20.9609	20.9610	20.9603	20.9446	20.8262	20.6590	
Non living	19.8738	20.0117	20.1257	20.1909	20.2014	20.2168	20.2168	20.2197	20.2107	20.1900	20.0623	19.8567	
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	20.8369	20.7957	20.8971	20.9499	20.9593	20.9609	20.9609	20.9610	20.9603	20.9446	20.8262	20.7067	(87)
Th 2	20.2310	20.2338	20.2365	20.2503	20.2531	20.2669	20.2669	20.2697	20.2614	20.2531	20.2476	20.2420	(88)
util rest of house													
	0.9603	0.9068	0.7963	0.6156	0.4408	0.2915	0.1965	0.2206	0.3822	0.6693	0.9025	0.9693	(89)
MIT 2	20.0886	20.0117	20.1257	20.1909	20.2014	20.2168	20.2168	20.2197	20.2107	20.1900	20.0623	19.9262	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	20.3805	20.3175	20.4267	20.4870	20.4971	20.5070	20.5071	20.5089	20.5032	20.4844	20.3603	20.2306	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.3805	20.3175	20.4267	20.4870	20.4971	20.5070	20.5071	20.5089	20.5032	20.4844	20.3603	20.2306	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9622	0.9089	0.8041	0.6276	0.4533	0.3038	0.2093	0.2343	0.3971	0.6836	0.9059	0.9692	(94)
Useful gains	600.9506	654.0346	647.2824	554.8165	423.6206	279.0816	184.6007	193.3473	304.8741	467.6097	556.5865	575.1496	(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													
	799.9540	764.0098	687.4524	560.8263	424.0996	279.0963	184.6013	193.3486	304.9986	476.5189	644.3641	785.1477	(97)
Space heating kWh													
	148.0585	73.9033	29.8865	4.3271	0.3564	0.0000	0.0000	0.0000	0.0000	6.6284	63.1998	156.2386	(98a)
Space heating requirement - total per year (kWh/year)												482.5987	
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													
	148.0585	73.9033	29.8865	4.3271	0.3564	0.0000	0.0000	0.0000	0.0000	6.6284	63.1998	156.2386	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												482.5987	
Space heating per m2											(98c) / (4) =	8.0113	(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 %)												212.2057	(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													
	148.0585	73.9033	29.8865	4.3271	0.3564	0.0000	0.0000	0.0000	0.0000	6.6284	63.1998	156.2386	(98)
Space heating efficiency (main heating system 1)													
	212.2057	212.2057	212.2057	212.2057	212.2057	0.0000	0.0000	0.0000	0.0000	212.2057	212.2057	212.2057	(210)
Space heating fuel (main heating system)													
	69.7712	34.8263	14.0837	2.0391	0.1679	0.0000	0.0000	0.0000	0.0000	3.1236	29.7824	73.6260	(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

	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
Efficiency of water heater												177.8251	(216)
(217)m	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	177.8251	(217)
Fuel for water heating, kWh/month													
	120.8342	106.9622	113.9178	100.8734	98.2622	89.0669	88.2965	91.5157	92.2000	102.1810	107.8764	119.6113	(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	18.0302	16.2854	18.0302	17.4486	18.0302	17.4486	18.0302	18.0302	17.4486	18.0302	17.4486	18.0302	(231)
Lighting	16.0818	12.9014	11.6163	8.5106	6.5738	5.3709	5.9969	7.7950	10.1249	13.2844	15.0047	16.5288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-37.0591	-60.7621	-100.5404	-127.6213	-149.5036	-143.8299	-141.8991	-128.3445	-104.8422	-75.4347	-43.4218	-30.9791	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	-1.7326	-5.7386	-16.6500	-33.8962	-52.9877	-56.2309	-55.1208	-42.0037	-25.5925	-10.7211	-2.9577	-1.2253	(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	227.4203	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	177.8251	
Water heating fuel used	1231.5977	(219)
Space cooling fuel	0.0000	(221)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 1.1110)

mechanical ventilation fans (SFP = 1.1110)	212.2913	(230a)
Total electricity for the above, kWh/year	212.2913	(231)
Electricity for lighting (calculated in Appendix L)	129.7893	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	-1449.0949	(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	352.0036	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	227.4203	16.4900	37.5016	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1231.5977	16.4900	203.0905	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	212.2913	16.4900	35.0068	(249)
Energy for lighting	129.7893	16.4900	21.4023	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.2379	16.4900	-188.6848	
PV Unit electricity exported	-304.8570	5.5900	-17.0415	
Total			-205.7263	(252)
Total energy cost			91.2748	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.3122 (257)
SAP value		94.9388
SAP rating (Section 12)		95 (258)
SAP band		A

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	227.4203	0.1598	36.3365	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1231.5977	0.1407	173.3046	(264)
Space and water heating			209.6410	(265)
Pumps, fans and electric keep-hot	212.2913	0.1387	29.4474	(267)
Energy for lighting	129.7893	0.1443	18.7326	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1144.2379	0.1321	-151.1707	
PV Unit electricity exported	-304.8570	0.1192	-36.3390	
Total			-187.5098	(269)
Total CO2, kg/year			70.3113	(272)
CO2 emissions per m2			1.1700	(273)
EI value			99.1047	
EI rating			99	(274)
EI band			A	

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	60.2400	(1b)	x 2.6000	(2b) =	156.6240	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.2400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		156.6240	(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	4.4000	4.2000	4.2000	3.9000	3.9000	3.4000	3.5000	3.7000	3.6000	3.8000	3.8000	4.2000	(22)
Wind factor	1.1000	1.0500	1.0500	0.9750	0.9750	0.8500	0.8750	0.9250	0.9000	0.9500	0.9500	1.0500	(22a)
Adj infilt rate	0.1636	0.1562	0.1562	0.1450	0.1450	0.1264	0.1302	0.1376	0.1339	0.1413	0.1413	0.1562	(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) =	69.6000 (23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.3156	0.3082	0.3082	0.2970	0.2970	0.2784	0.2822	0.2896	0.2859	0.2933	0.2933	0.3082	(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								
Windows			23.7600	0.9615	22.8462			(27)
External Wall	73.0600	23.7600	49.3000	0.1400	6.9020	190.0000	9367.0000	(29a)
Total net area of external elements Aum(A, m2)			73.0600					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.7482			(33)
Main dwelling								
Party Wall 1			25.4800	0.0000	0.0000	180.0000	4586.4000	(32)
Party Floor 1			60.2400			30.0000	1807.2000	(32d)
Party Ceiling 1			60.2400			20.0000	1204.8000	(32b)
Internal Wall 1			88.8800			9.0000	799.9200	(32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) = 17765.3200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	294.9090 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	10.8000	0.0200	0.2160
E3 Sill	10.8000	0.0230	0.2484
E4 Jamb	35.2000	0.0240	0.8448
E7 Party floor between dwellings (in blocks of flats)	56.2000	0.0120	0.6744
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	30.6000	0.0000	0.0000
E16 Corner (normal)	7.8000	0.0370	0.2886
E17 Corner (inverted - internal area greater than external area)	2.6000	-0.0700	-0.1820
E18 Party wall between dwellings	15.6000	0.0160	0.2496

Thermal bridges (Sum(L x Psi) calculated using Appendix K)	2.3398 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 32.0880 (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	16.3134	15.9290	15.9290	15.3523	15.3523	14.3913	14.5835	14.9679	14.7757	15.1601	15.1601	15.9290	(38)
Heat transfer coeff	48.4013	48.0169	48.0169	47.4403	47.4403	46.4793	46.6715	47.0559	46.8637	47.2481	47.2481	48.0169	(39)
Average = Sum(39)m / 12 =												47.4083	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8035	0.7971	0.7971	0.7875	0.7875	0.7716	0.7748	0.7811	0.7779	0.7843	0.7843	0.7971	(40)
HLP (average)												0.7870	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9884	(42)
Hot water usage for mixer showers													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
	66.3321	65.3470	63.9597	61.4019	59.4866	57.3628	56.2157	57.5932	59.0931	61.3656	63.9762	66.1079	(42b)
Hot water usage for other uses													
	34.9933	33.7208	32.4484	31.1759	29.9034	28.6309	28.6309	29.9034	31.1759	32.4484	33.7208	34.9933	(42c)
Average daily hot water use (litres/day)												93.3125	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	101.3255	99.0679	96.4081	92.5778	89.3900	85.9937	84.8466	87.4966	90.2690	93.8140	97.6970	101.1012	(44)
Energy conte	160.4748	141.0713	148.1757	126.7343	120.3361	105.7393	102.6146	108.3391	111.3107	127.3047	139.1873	158.3001	(45)
Energy content (annual)										Total = Sum(45)m =		1549.5880	
Distribution loss (46)m = 0.15 x (45)m													
	24.0712	21.1607	22.2264	19.0101	18.0504	15.8609	15.3922	16.2509	16.6966	19.0957	20.8781	23.7450	(46)
Water storage loss (or HIU loss):													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8600	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0044	(55)
Total storage loss													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(56)
If cylinder contains dedicated solar storage													
	31.1364	28.1232	31.1364	30.1320	31.1364	30.1320	31.1364	31.1364	30.1320	31.1364	30.1320	31.1364	(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													
	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(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													
	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
										Total per year (kWh/year) = Sum(64)m =		2190.0900	(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													
	96.8769	86.2137	92.7875	84.2544	83.5308	77.2735	77.6384	79.5418	79.1260	85.8479	88.3950	96.1538	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	119.3047	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	18.3730	16.3188	13.2713	10.0472	7.5104	6.3406	6.8513	8.9055	11.9530	15.1770	17.7139	18.8837	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	259.0326	261.7205	254.9470	240.5269	222.3242	205.2161	193.7869	191.0990	197.8725	212.2926	230.4953	247.6034	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	48.9189	(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)													
	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	-79.5365	(71)
Water heating gains (Table 5)													
	130.2109	128.2942	124.7143	117.0199	112.2726	107.3243	104.3527	106.9110	109.8972	115.3869	122.7708	129.2390	(72)
Total internal gains													
	496.3036	495.0206	481.6197	456.2812	430.7943	407.5682	393.6780	395.6026	408.4099	431.5437	459.6671	484.4131	(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	
Southeast	4.8400	39.1209	0.4000	0.7000	0.7700	36.7405	(77)
Southwest	10.5600	39.1209	0.4000	0.7000	0.7700	80.1612	(79)
Northwest	8.3600	12.4928	0.4000	0.7000	0.7700	20.2655	(81)

Solar gains	137.1672	215.9146	313.2867	432.8609	497.4491	541.6907	518.6981	465.4800	385.9805	265.5114	170.9413	119.4424	(83)
Total gains	633.4708	710.9353	794.9064	889.1421	928.2434	949.2589	912.3761	861.0827	794.3903	697.0550	630.6084	603.8555	(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	101.9561	102.7724	102.7724	104.0215	104.0215	106.1723	105.7351	104.8713	105.3014	104.4447	104.4447	102.7724	
alpha	7.7971	7.8515	7.8515	7.9348	7.9348	8.0782	8.0490	7.9914	8.0201	7.9630	7.9630	7.8515	
util living area													
	0.9479	0.8955	0.7658	0.5629	0.3883	0.2252	0.1279	0.1475	0.3126	0.5989	0.8612	0.9581	(86)
Living	20.7689	20.8509	20.9293	20.9578	20.9606	20.9615	20.9613	20.9610	20.9612	20.9572	20.8961	20.7492	
Non living	19.9973	20.0957	20.1776	20.2117	20.2137	20.2286	20.2256	20.2197	20.2227	20.2143	20.1571	19.9794	
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	20.8818	20.8509	20.9293	20.9578	20.9606	20.9615	20.9613	20.9610	20.9612	20.9572	20.8961	20.7843	(87)
Th 2	20.2503	20.2559	20.2559	20.2642	20.2642	20.2780	20.2753	20.2697	20.2725	20.2669	20.2669	20.2559	(88)
util rest of house													
	0.9339	0.8729	0.7307	0.5248	0.3508	0.1899	0.0908	0.1076	0.2697	0.5513	0.8297	0.9462	(89)
MIT 2	20.1494	20.0957	20.1776	20.2117	20.2137	20.2286	20.2256	20.2197	20.2227	20.2143	20.1571	20.0292	(90)
Living area fraction										fLA = Living area / (4) =		0.3901	(91)
MIT	20.4351	20.3903	20.4708	20.5027	20.5051	20.5145	20.5126	20.5089	20.5108	20.5041	20.4454	20.3238	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.4351	20.3903	20.4708	20.5027	20.5051	20.5145	20.5126	20.5089	20.5108	20.5041	20.4454	20.3238	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9377	0.8772	0.7411	0.5372	0.3631	0.2015	0.1030	0.1207	0.2838	0.5669	0.8378	0.9474	(94)
Useful gains	593.9993	623.6579	589.1104	477.6305	336.9988	191.2379	93.9324	103.9426	225.4433	395.1299	528.3506	572.0989	(95)
Ext temp.	5.4000	5.9000	7.8000	10.4000	13.4000	16.4000	18.5000	18.3000	15.7000	12.1000	8.4000	5.4000	(96)
Heat loss rate W	727.7199	695.7799	608.4135	479.2765	337.0681	191.2383	93.9324	103.9426	225.4500	397.0771	569.1222	716.5932	(97)
Space heating kWh	99.4881	48.4660	14.3615	1.1851	0.0516	0.0000	0.0000	0.0000	0.0000	1.4487	29.3556	107.5037	(98a)
Space heating requirement - total per year (kWh/year)												301.8603	
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	99.4881	48.4660	14.3615	1.1851	0.0516	0.0000	0.0000	0.0000	0.0000	1.4487	29.3556	107.5037	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												301.8603	
Space heating per m2											(98c) / (4) =	5.0110	(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 %)	211.7241	(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	99.4881	48.4660	14.3615	1.1851	0.0516	0.0000	0.0000	0.0000	0.0000	1.4487	29.3556	107.5037	(98)
Space heating efficiency (main heating system 1)	211.7241	211.7241	211.7241	211.7241	0.0000	0.0000	0.0000	0.0000	211.7241	211.7241	211.7241	211.7241	(210)
Space heating fuel (main heating system)	46.9895	22.8911	6.7831	0.5597	0.0244	0.0000	0.0000	0.0000	0.0000	0.6843	13.8650	50.7754	(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	214.8736	190.2057	202.5745	179.3783	174.7349	158.3833	157.0134	162.7379	163.9547	181.7035	191.8313	212.6989	(64)
Efficiency of water heater												177.9378	(216)
(217)m	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	177.9378	(217)
Fuel for water heating, kWh/month	120.7577	106.8945	113.8456	100.8095	98.2000	89.0105	88.2406	91.4577	92.1416	102.1163	107.8081	119.5355	(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	18.0302	16.2854	18.0302	17.4486	18.0302	17.4486	18.0302	18.0302	17.4486	18.0302	17.4486	18.0302	(231)
Lighting	16.0818	12.9014	11.6163	8.5106	6.5738	5.3709	5.9969	7.7950	10.1249	13.2844	15.0047	16.5288	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.1607	-59.4630	-98.7986	-129.4880	-148.4838	-149.7891	-148.1071	-136.5409	-111.9875	-79.9294	-48.3774	-34.3824	(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	-2.1520	-5.6900	-16.4201	-35.3169	-52.1317	-62.6093	-61.7233	-49.0825	-29.8775	-12.2645	-3.8751	-1.5956	(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	142.5725	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	177.9378	
Water heating fuel used	1230.8174	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.1000, SFP = 1.1110)		
mechanical ventilation fans (SFP = 1.1110)	212.2913	(230a)
Total electricity for the above, kWh/year	212.2913	(231)
Electricity for lighting (calculated in Appendix L)	129.7893	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1518.2466	(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	197.2239	(238)

10a. Fuel costs - using BEDF prices (598)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	142.5725	26.0000	37.0688	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1230.8174	26.0000	320.0125	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0000	0.0000	(247a)
Pumps, fans and electric keep-hot	212.2913	26.0000	55.1957	(249)
Energy for lighting	129.7893	26.0000	33.7452	(250)

Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1185.5081	26.0000	-308.2321	
PV Unit electricity exported	-332.7385	5.8100	-19.3321	
Total			-327.5642	(252)
Total energy cost			118.4581	(255)

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	142.5725	0.1607	22.9060	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1230.8174	0.1407	173.1948	(264)
Space and water heating			196.1008	(265)
Pumps, fans and electric keep-hot	212.2913	0.1387	29.4474	(267)
Energy for lighting	129.7893	0.1443	18.7326	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1185.5081	0.1320	-156.4425	
PV Unit electricity exported	-332.7385	0.1182	-39.3329	
Total			-195.7754	(269)
Total CO2, kg/year			48.5054	(272)

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	142.5725	1.5946	227.3458	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1230.8174	1.5203	1871.2175	(278)
Space and water heating			2098.5633	(279)
Pumps, fans and electric keep-hot	212.2913	1.5128	321.1543	(281)
Energy for lighting	129.7893	1.5338	199.0752	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1185.5081	1.4876	-1763.5051	
PV Unit electricity exported	-332.7385	0.4334	-144.2065	
Total			-1907.7116	(283)
Total Primary energy kWh/year			711.0812	(286)

Appendix 5

Early Stage Overheating Tool

EARLY STAGE OVERHEATING RISK TOOL

Version 1.0, July 2019

This tool provides guidance on how to assess overheating risk in residential schemes at the early stages of design. It is specifically a pre-detail design assessment intended to help identify factors that could contribute to or mitigate the likelihood of overheating.

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply. Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

Find out more information and download accompanying guidance at goodhomes.org.uk/overheating-in-new-homes.

Good Homes Alliance

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING | **KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING**

Geographical and local context

#1 Where is the scheme in the UK?
See guidance for map

South east	4	4
Northern England, Scotland & NI	0	
Rest of England and Wales	2	

#2 Is the site likely to see an Urban Heat Island effect?
See guidance for details

Central London (see guidance)	3	3
Grtr London, Manchester, B'ham	2	
Other cities, towns & dense sub-urban areas	1	

#8 Do the site surroundings feature significant blue/green infrastructure?
Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context

1	0

Site characteristics

#3 Does the site have barriers to windows opening?
- Noise/Acoustic risks
- Poor air quality/smells e.g. near factory or car park or very busy road
- Security risks/crime
- Adjacent to heat rejection plant

Day - reasons to keep all windows closed	8	0
Day - barriers some of the time, or for some windows e.g. on quiet side	4	
Night - reasons to keep all windows closed	8	0
Night - bedroom windows OK to open, but other windows are likely to stay closed	4	

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green?
Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme

1	0

#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas?
Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels

1	0

Scheme characteristics and dwelling design

#4 Are the dwellings flats?
Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples

3	3

#5 Does the scheme have community heating?
i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures

3	0

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation?
Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance

1	0

#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future?
Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans

>2.8m and fan installed	2	1
> 2.8m	1	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings?
(as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space

>65%	12	4
>50%	7	
>35%	4	

#7 Are the dwellings single aspect?
Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation

Single-aspect	3	0
Dual aspect	0	

#13 Is there useful external shading?
Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per **#6**

	Full	Part	
>65%	6	3	2
>50%	4	2	
>35%	2	1	

#14 Do windows & openings support effective ventilation?
Larger, effective and secure openings will help dissipate heat - see guidance

	Openings compared to Part F purge rates			
	= Part F	+50%	+100%	4
Single-aspect	minimum required	3	4	
Dual aspect		2	3	

TOTAL SCORE	=	Sum of contributing factors:	*minus*	Sum of mitigating factors:
8		14		6

High 12 **Medium** 8 **Low**

score >12:
Incorporate design changes to reduce risk factors and increase mitigation factors
AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)

score between 8 and 12:
Seek design changes to reduce risk factors and/or increase mitigation factors
AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)

score <8:
Ensure the mitigating measures are retained, and that risk factors do not increase (e.g. in planning conditions)