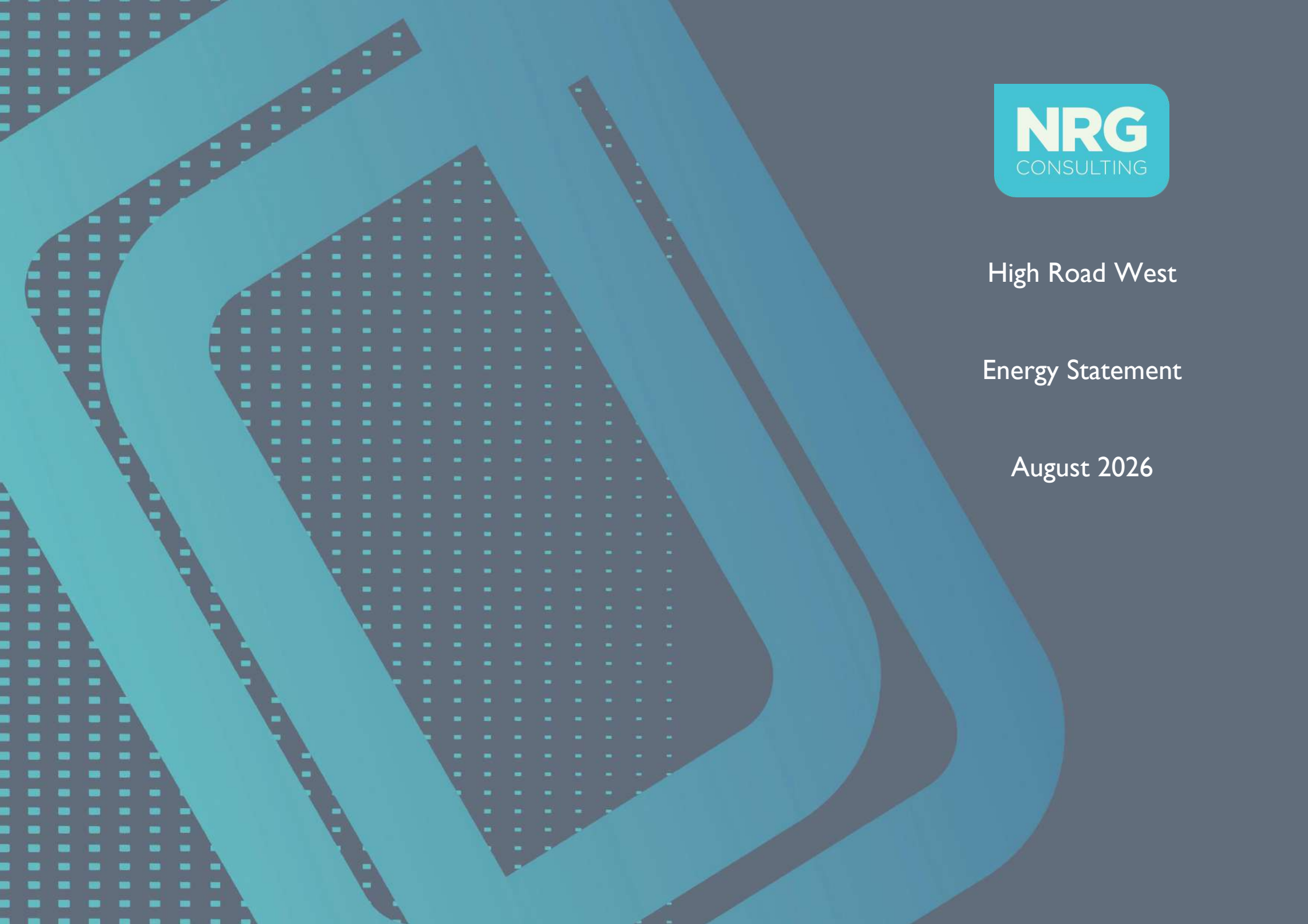


High Road West

Energy Statement

August 2026

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Document Control Sheet	
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Report Revision	-
Issue Purpose	For Planning
Report Prepared For:	Formation Design & Build
Report Author:	Ryan Thrower
Approved By	Neil Rothon
Date of Issue	21st August 2026
Date of Revised Issue	-

Disclaimer

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1 Executive Summary

NRG Consulting have been commissioned to undertake a revised Energy Statement on a proposed development at **High Road West, N17**

The scheme benefits from Planning Permission (Ref**:** HGY/2021/3175). The description of development for the detailed part of the application is:

2) Detailed: Plot A - Demolition of 100 Whitehall Street & Whitehall & Tenterden Community Centre and erection of new buildings of 5-6 storeys containing 61 new affordable homes & open space

.

The report has been written to discharge **Planning Condition 12 & 32a .** Wording of which can be found within Section 2.

This document illustrates a reduction in CO_2 emissions (SAP 10) via:

Energy Efficiency – *Be Lean*

- U-Values have been set to exceed Part L 2021 notional u-values.
- Mechanical Ventilation with Heat Recovery (MVHR) will be installed.
- LED Lighting with a minimum efficacy of 95 lm/W is proposed.

Decentralised Energy – *Be Clean*

The scheme will have on-site communal Air Source Heat Pumps provided with a future connection to the Haringey District Energy Network (HDEN) Phase 1.

Renewable Energy – *Be Green*

The following on-site renewable technologies will be provided:

- Communal Air Source Heat Pump
- PV Panels

	CO_2 Emissions (Tonnes per Annum)
	Residential
Baseline: Part L 2013 (SAP 10)	**67.5**
***Be Lean*: Use Less Energy**	**60.5**
CO_2 Savings at *Be Lean*	**10%**
***Be Clean*: Supply Energy Efficiently**	**60.5**
***Be Green*: Use Renewable Energy**	**25.4**
Total CO_2 Savings – Part L 2013 (SAP 10)	**62%**
Carbon Offset for Zero Carbon	**£72,487**

Table: Carbon Emissions Table

2 Planning Conditions Wording

Planning Condition 32

The development of Plot A hereby approved shall be constructed in accordance with the Energy Statement for Plot A prepared by Aecom (dated October 2021), with SAP10 emission factors, high fabric efficiencies, connection to the Decentralised Energy Network and a minimum 36 kWp solar photovoltaic (PV) array.

(a) Prior to above ground construction on Plot A , details of the Energy Strategy shall be submitted to and approved by the Local Planning Authority. This must include:

- Confirmation of how this development will meet the zero-carbon policy requirement in line with the Energy Hierarchy;
- Confirmation of the necessary fabric efficiencies aiming to achieve a minimum 10% reduction in SAP10 carbon factors, including details to reduce thermal bridging;
- Specification and efficiency of the proposed Mechanical Ventilation and Heat Recovery (MVHR), with plans showing the rigid MVHR ducting and location of the units;
- Details of the PV, demonstrating the roof area has been maximised, with the following details: a roof plan; the number, angle, orientation, type, and efficiency level of the PVs; how overheating of the panels will be minimised; their peak output (kWp);

The development of Plot A shall be carried out strictly in accordance with the details so approved prior to first operation of each building within Plot A and shall be maintained and retained for the lifetime of the development. The solar PV array shall be installed with monitoring equipment prior to completion of each building within Plot A and shall be maintained at least annually thereafter.

(b) Within six months of first occupation of each building within Plot A, evidence that the solar PV installation has been installed correctly shall be submitted to and approved by the Local Planning Authority, including photographs of the solar array, a six-month energy generation statement, and a Microgeneration Certification Scheme certificate.

(c) Within six months of first occupation of each building within Plot A, evidence shall be submitted to the Local Planning Authority that the development has been registered on the GLA's Be Seen energy monitoring platform.

REASON: To ensure the development reduces its impact on climate change by reducing carbon emissions on site in compliance with the Energy Hierarchy, and in line with London Plan (2021) Policy SI2, and Local Plan (2017) Policies SP4 and DM22.

Planning Condition 12

No development shall take place beyond the superstructure in a Phase of the development until a detailed scheme for energy monitoring has been submitted to and approved in writing by the Local Planning Authority for that Phase. The details shall include details of suitable devices for the monitoring of energy use and renewable/ low carbon energy generation. The monitoring mechanisms approved in the monitoring strategy shall be made available for use prior to the first occupation of each building in the relevant Phase.

REASON: To ensure the development can comply with the Energy Hierarchy in line with London Plan 2021 Policy SI 2 and Local Plan Policy SP4 before construction works prohibit compliance.

2.1 Planning Condition Analysis

- The scheme no longer has temporary gas boilers proposed.
- Over 10% fabric efficiencies have been achieved.
- Details of the energy monitoring and metering has been provided.
- Future District Heat Connection infrastructure proposed.
- >36kWp of PV is being installed.
- Communal ASHP is proposed on-site.
- The zero carbon policy will be met via on-site and off-site measures.

3 Energy Calculations – *Be Lean*

3.1 Energy Calculations - Residential

To estimate the CO_2 emissions for the site, SAP calculations have been carried out on all units by an accredited OCDEA Domestic Energy Assessor using Design SAP 10's online platform. The scheme is under Part L 2021 so these have been done for Building Control compliance. Then, a set of sample Part L 2013 SAPs have been undertaken on relevant types (as per the approved planning Energy Statement) and these ran through the now defunct GLA "SAP 10" spreadsheet that was issued in 2019 to bridge the gap between Part L 2013 and Part L 2021.

The baseline CO_2 emissions covered by Part L of the Building Regulations are expressed as the Target Emission Rate (TER) and the proposed actual emissions are the Dwelling Emission Rate (DER). These use the unit of measurement of kilograms of CO_2 per square-metre per annum ($kg/CO_2/m^2$). To calculate the overall proposed emissions, these figures can be multiplied by the size of the dwellings and/or site and this figure is presented in tonnes/annum. This is the figure expressed within this report.

This covers regulated carbon emissions from:

- Heating (and Cooling)
- Hot Water
- Lighting
- Auxiliary (Pumps and Fans)

3.2 Passive Design Measures

Passive measures utilised in the concept and development of the design include:

- Through exemplary detailing & construction, air infiltration will be almost eliminated.
- A high-performance triple glazing system is proposed.

Element	Part L1 Limiting U-Vales	Proposed U-Values (W/m^2K)
Walls		
External Wall	*0.26 W/m²K*	0.12 W/m²K
Sheltered Wall Types	*0.26 W/m²K*	0.21-0.3 W/m²K
Party Wall	*0.26 W/m²K*	0 W/m²K
Floors		
Ground Floor	*0.18 W/m²K*	0.11 W/m²K
Exposed Floor	*0.18 W/m²K*	0.13 W/m²K
Roof		
Roofs	*0.16 W/m²K*	0.12 W/m²K
Openings		
Windows	*1.6 W/m²K*	0.84 W/m²K (avg.)
	G-Value	0.37
Front Doors	*1.6 W/m²K*	1.2 W/m²K
Air Permeability		
3 $m^3/(hm^2)$ @50Pa		
Thermal Bridging		
Manually Calculated Psi Values for Concrete Frame Construction (Haringey Set)		

Table: Proposed Fabric Specification (Key Elements)

3.3 Active Design

The development will incorporate efficient building services to limit carbon emissions, including smart metering and the following measures:

Element		Proposed Details
Ventilation	System	**Mechanical Ventilation with Heat Recovery**
	Details	**Nuaire MRXBOX – ECO5**
Heating	Type	**Communal Air Source Heat Pump**
	Model	**Clade Rowan**
	Details	**SCOP: 2.7**
	Controls	**Programmer & Thermostat – Charging linked to use**
Hot Water		**HIU – SAV Flatstation 7**

Table: Proposed Mechanical and Electrical Specification

3.4 Lighting

In-line with exceeding Part L minimum requirements, all residential light fittings should be Light Emitting Diodes (LEDs) with a luminous efficiency per circuit watt of at least 95 lumens/Watt.

3.5 Metering and Monitoring Strategy

The metering strategy has been designed to provide accurate energy monitoring and fair cost distribution for residents, directly linking charges to individual usage within the communal heating system.

The monitoring system is based on Kamstrup Multical 603 meters (MULTICAL® 603), integrated into the SAV Flatstation 7 Heat Interface Units (HIUs) within each dwelling.

These meters record heat energy consumption at the point of use. The integrated data logger is programmable to deliver yearly, monthly, daily, hourly, and minutely values. The MULTICAL® 603 has a permanent memory (EEPROM) in which the results from various data loggers are saved. This allows users to gain real-time and historical insights into their consumption patterns.

Additionally, a Kamstrup Multical 403 meter (MULTICAL® 403 | The most flexible ultrasonic heat meter available) will be installed in the plantroom to monitor the overall communal heat network, capturing primary system performance.

A Kamstrup data logger will then consolidate and transmit the data to Haringey's metering and billing provider (currently Meter Point). This enables remote monitoring, allowing both residents and management teams to track energy use.

The system will:

- Provide automatic meter reading capabilities
- Allow remote access for billing, reporting, and system performance tracking.
- Support demand-side management, enabling proactive identification of inefficiencies.

A further separate meter and monitor will be installed for the PV system.

Energy Monitoring – *Be Seen*

Applicants are expected to report against the performance indicators at each stage of the process by uploading the evidence to the GLA Webform: Be Seen Planning Stage webform | London City Hall

Before uploading information to the webform, applicants can view the required information in the 'be seen' spreadsheet.

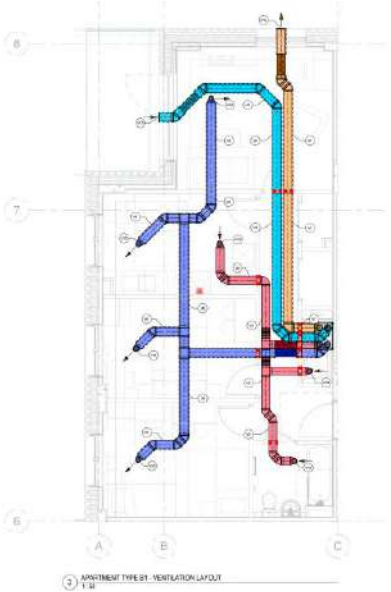
For this scheme the data will be uploaded at the as-built stage as per Planning Condition 32c.

3.6 MVHR

All dwellings will have Mechanical Ventilation with Heat Recovery (MVHR) installed. The details are as per the below table:

Detail	Specification
Model 1	Nuaire MRXBOX – ECO5
Number	All
Dimensions	607mm (W) * 600mm (D) * 378mm (H)
Efficiency	88% (average)
SFP	0.54 W/l/s (average)
Summer Bypass	Yes

A sample ventilation layout drawing can be found in the Appendices. A typical layout is highlighted below.



3.7 Carbon Savings at *Be Lean*

	CO_2 Emissions (Tonnes per Annum)
	Residential
Baseline: Part L 2013 (SAP 10)	**67.5**
***Be Lean*: Use Less Energy**	**60.5**
CO_2 Savings at *Be Lean*	**10%**

4 Decentralised Energy – *Be Clean*

In the context of the London Plan, decentralised energy refers to low- and zero-carbon power and/or heat generated and delivered within London. This includes on-site heat networks and energy centres, through to large-scale district heat networks.

The London Heat Map displays connections to heat networks within London including both operational and future connections as well as displaying areas designated as Heat Network Priority Areas.

4.1 Connection to Existing Heating Networks

There are no local existing district heat networks.

4.2 Connection to Future District Heating Network

The terminus of the Haringey District Energy Network (an Energy from Waste (EfW) system is directly outside the proposed Block A.

The year of proposed operation is unknown.

4.3 Overall Feasibility

While the current status of Haringey District Energy Network – Phase 1 is not known to the author, this phase of the development will provide a future district heating connection so that the scheme has the potential to connect, should that decision be made in the future.

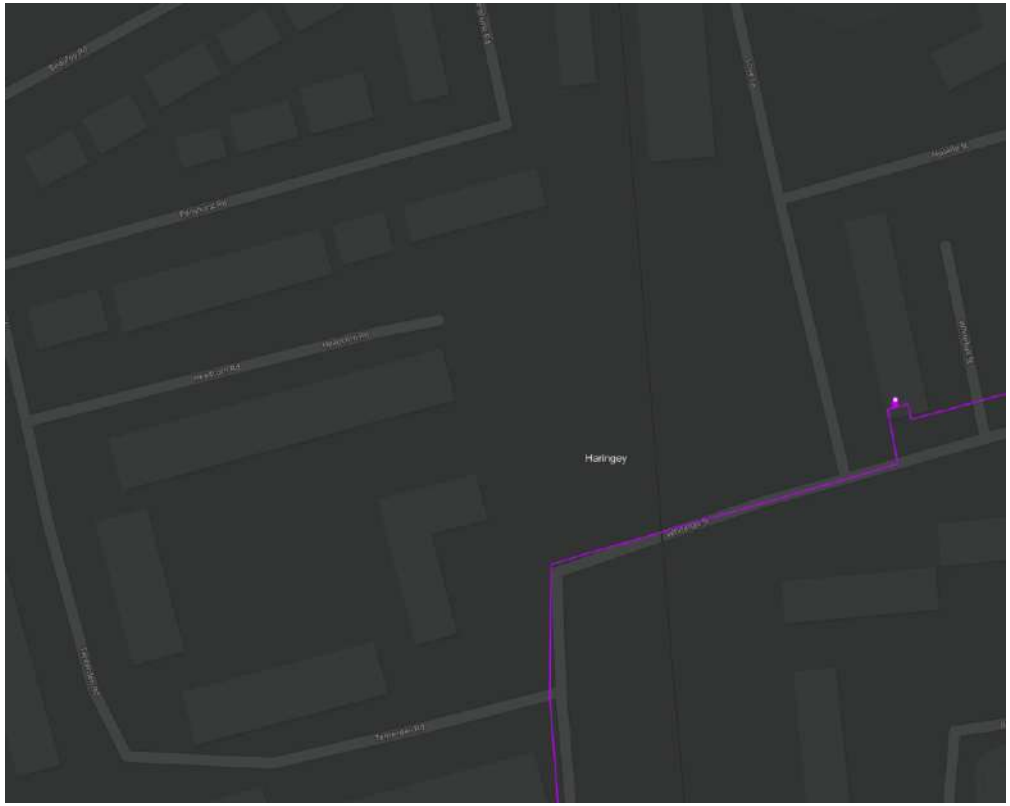


Figure: London Heat Map (2026)

4.4 Comparison Against Consented Scheme

There is no change with the DHN situation and availability since the approved energy statement was issued. There is no fixed date for the on-date for HDEN Phase 1.

4.5 Provision of On-Site Energy Centre and Future DHN Connection

Based on the London Heat Map, there are:

- No existing Heat Networks in the direct vicinity of the development*.
- No new current planned Heat Networks within in direct vicinity of the development
- The site is not in a Heat Network Priority Area

Further to the above, the development proposes to install the infrastructure to facilitate a future connection to a district heat network. This will be specified in-line with the London Heat Network manual and primarily CIBSE's CP1 Heat Networks Code of Practice for the UK (2020).

In terms of requirements to facilitate the future DHN connection, this generally requires space for pipework which is largely determined by the layout and accessibility of the site. Trenches for underground pipes need to consider depth for insulation and frost protection.

It should be noted that the proposed internal risers and plant space have been specifically designed to accommodate a DHN connection when one becomes available.

The London Heat Network Manual specification that has been incorporated and a future DHN drawing can be found on this page. A full-sized drawing can be found in the Appendices and the scenario is subject to approved specialist design.

Item	Specification Requirements
Room Illumination	Minimum light level: 150 lux
Electrical Connection	III 380V to earth / 32 A (See Note 1 below)
Electrical Supply	220 V AC (+/- 5%), 50 Hz (+/- 3%) Thermo-magnetic protection recommended 16 A curve C (the box incorporates a thermomagnetic protection of 10 A curve C in the supply)
Water Supply	DN 25
Water Discharge	Provide wastewater discharge line in the plant room and a sump to collect condensation from heat exchangers
Concrete Bases	Provide concrete bases for heat exchangers and pumps (if present)
Ventilation	Mechanical and continuous, with a minimum of three air changes per hour
Health & Safety	Plan showing evacuation route in case of fire, located in a visible place. The plant room should not have elements of risk to health and safety (sharp metallic objects, holes in roof or floor without protection,…)
Layout & Dimensions	As described for the relevant packaged substation unit

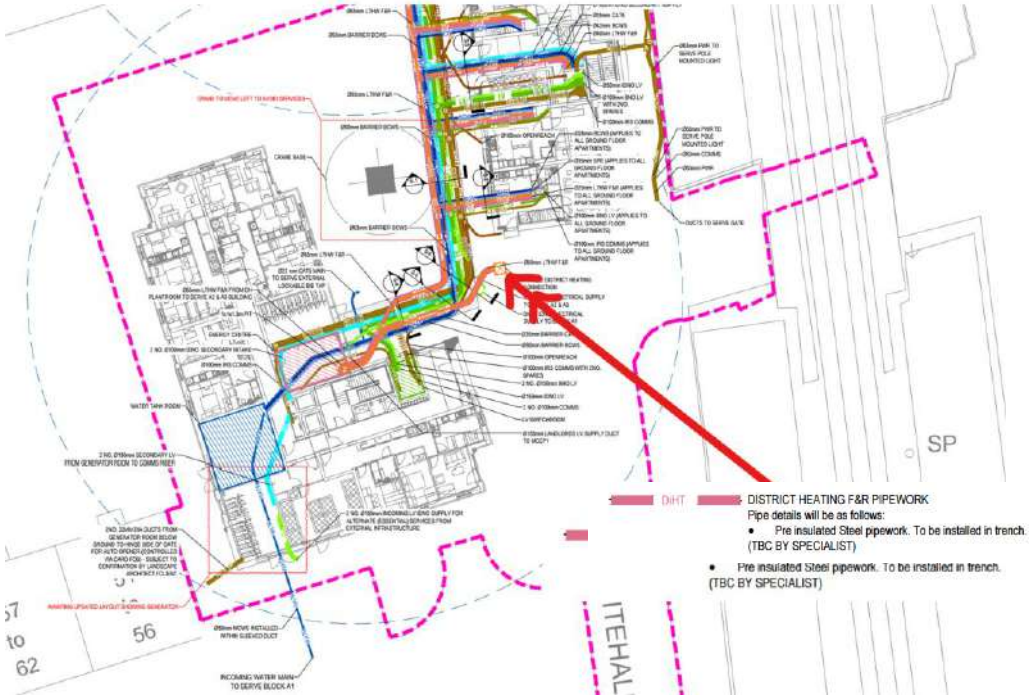


Figure: DHN proposed future connection (full drawing in Appendices

5 Renewable Energy – *Be Green*

5.1 Air Source Heat Pumps (On-Site Energy Centre)

Benefits of this system are:

- The system use air-source heat technology to deliver efficient heating solutions. By extracting heat from the external air, even in colder temperatures, the system ensures a renewable approach to heating with a seasonal coefficient of performance of around 2.7 (SCOP = 2.7 means for 1 every 1 kWh of grid electricity used, 2.7 kWh of produced by the heat pump; averaged over a year). This efficiency will be maximised by minimising flow and return temperatures.

- A central system means that maintenance and servicing are centralised. This reduces the burden on individual residents and with the correct management arrangements will ensure the system is kept working at optimum efficiency.

Details

Roof-mounted air source heat pumps will be installed to provide heating and hot water. These will be located on Block A1 as per the drawing across the page:

Communal ASHP System Details	
Dwellings to be Connected	All
Hot Water	Yes
SCOP	2.7
Fraction of Heat	100%
Energy Centre Location	Roof of Block A1

Table: Proposed ASHP Specification

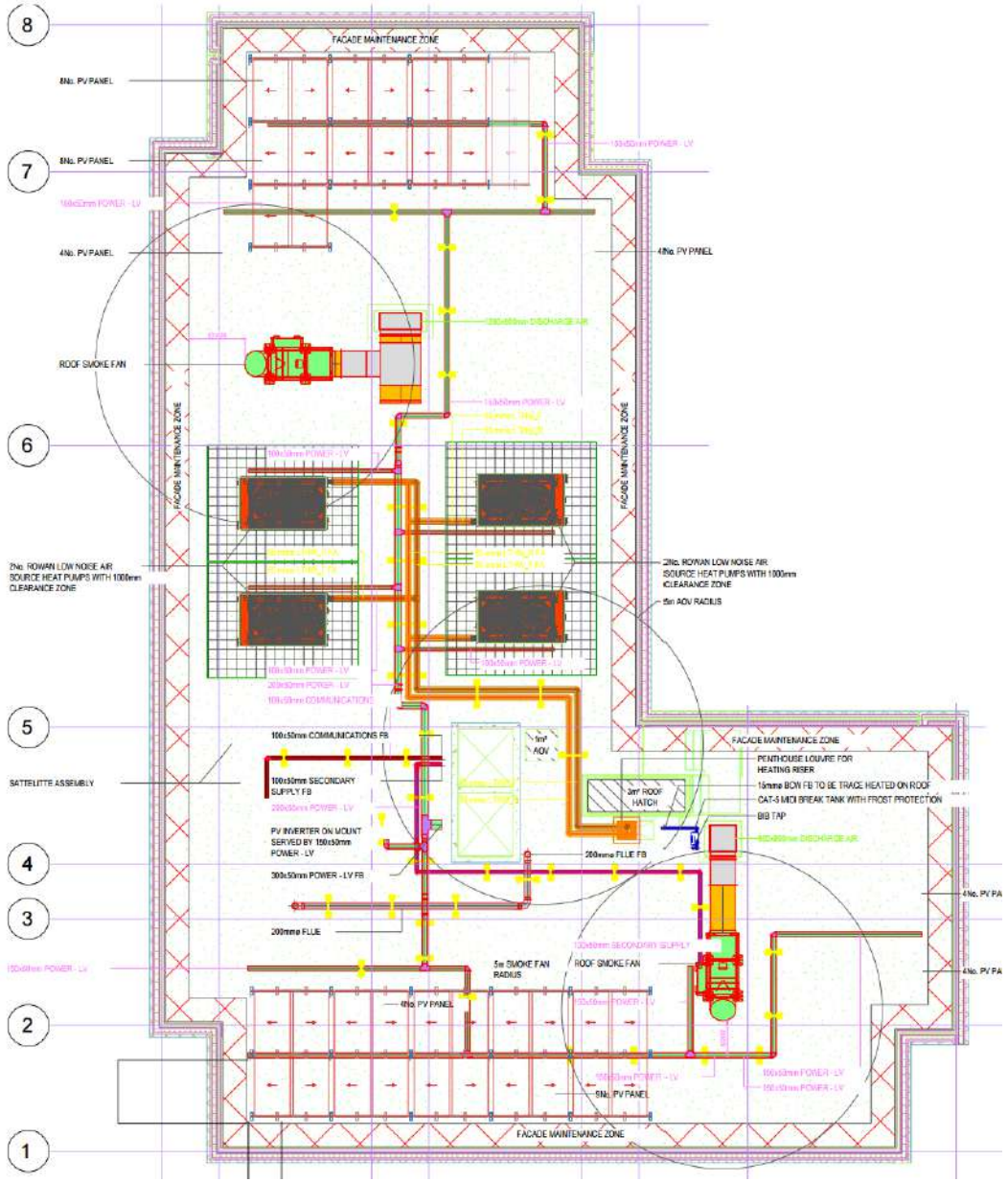


Figure: PV and ASHP Layout for A1 (full drawing in Appendices)

5.2 PV Panels

It is proposed that PV will be installed. This is to maximise on-site renewable energy generation and to have the benefits of:

- A PV system can generate a significant amount of electricity, estimated at around 900 – 1,000 kWh annually (based on average UK solar irradiance).
- Residents can take advantage of the Smart Export Guarantee (SEG) for kWh of energy generated that is not used on-site.

Overheating and Green Roof

To mitigate overheating, a panel with a low temperature coefficient has been chosen. Furthermore, regular maintenance and cleaning of the system will take place. The system will also be installed alongside a green roof and the proposed PV will be installed to co-exist with the sedum roof as per the approved details. This will hopefully lower temperatures on the roof and increase the system performance.

PV Metering and Monitoring

For the PV generation, there is more than one method of monitoring. There is a MID approved meter which can be read. Datasheet for this is in the Appendices. There is also a GPRS dongle that allows for a connection to SolisCloud for AMR and logging. The SolisCloud is fully free, and the client can have the login details for real-time reviewing should they need to check generation or usage for example.

Power Usage from Landlord Supply

The PV will be used for communal lighting, lifts, external lighting as per the connection to the Landlords Supply. Then the surplus will be exported to the grid.

PV System Details	
PV Proposed	36.05 kWp
Module Output	515 watts (monocrystalline)
Number of Panels	70
Tilt of Collectors & Orientation	10 degrees
Inverter Scenario	Landlords Supply

Table: Proposed PV Specification

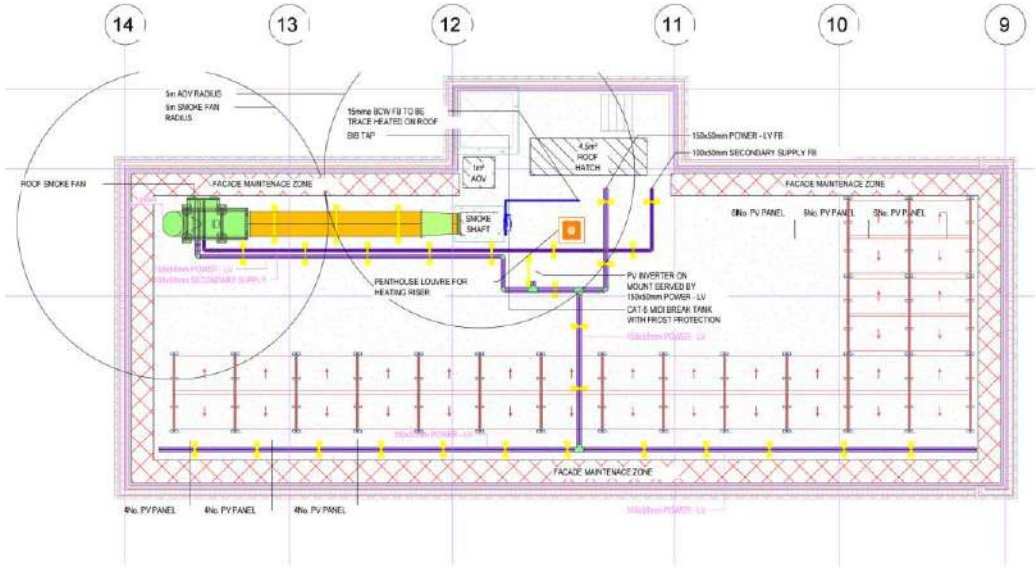


Figure: PV Layout for A2 and A3 (full drawing in Appendices)

6 Carbon Offsetting

In June 2022, the GLA published an update to the *GLA guidance on preparing energy assessments.* This document provides guidance on calculating carbon offset payments once all on-site measures to reduce carbon emissions have been made in order to achieve the policy goal of net zero carbon.

If the net zero carbon target cannot be met on site, then the annual remaining carbon emission figure is multiplied by the assumed lifetime of the development's services (30 years) to provide the cumulative shortfall. The cumulative shortfall is then multiplied by the carbon dioxide offset price to determine the required cash-in-lieu contribution.

6.1 Planning Stage - Carbon Offset

The carbon offset from the Aecom report is not quantified but instead noted as:

Any carbon offset contributions will be subject to viability discussions and detailed design stage calculations.

6.2 Construction Stage – Carbon Offset – ASHP Scenario

A carbon offset has been calculated on the *Be Green* scenario of the communal ASHPs being installed on-site.

Carbon Offsetting	
CO_2 Emissions (a)	**25.4 tonnes per annum**
Price per Tonne (b)	**£95**
Development Lifespan (c)	**30 years**
Calculation	**A x (B x C) = D**
CO_2 Offsetting Contribution (d)	**£72,487**

Table : Carbon Offsetting – **ASHP Scenario**

7 Conclusion

An energy assessment has been undertaken on the proposed scheme in-line with the requirements of the Planning Condition. These calculations illustrate a reduction in CO_2 emissions over the baseline of Part L via:

Energy Efficiency Measures (*Be Lean*)

- Thermal insulation specified to better Part L 2021 notional values.
- LED Lighting with high luminous efficacy (lm/W) will be provided to all fittings.
- Mechanical Ventilation with Heat Recovery will be installed in each apartment.

Decentralised Energy (*Be Clean*)

Infrastructure to allow future connection to a District Heat Network has been provided.

Renewable Technologies (*Be Green*)

The following systems are proposed for the scheme:

- The site will have a communal ASHP system serving all residential units.
- Solar PV will be installed.

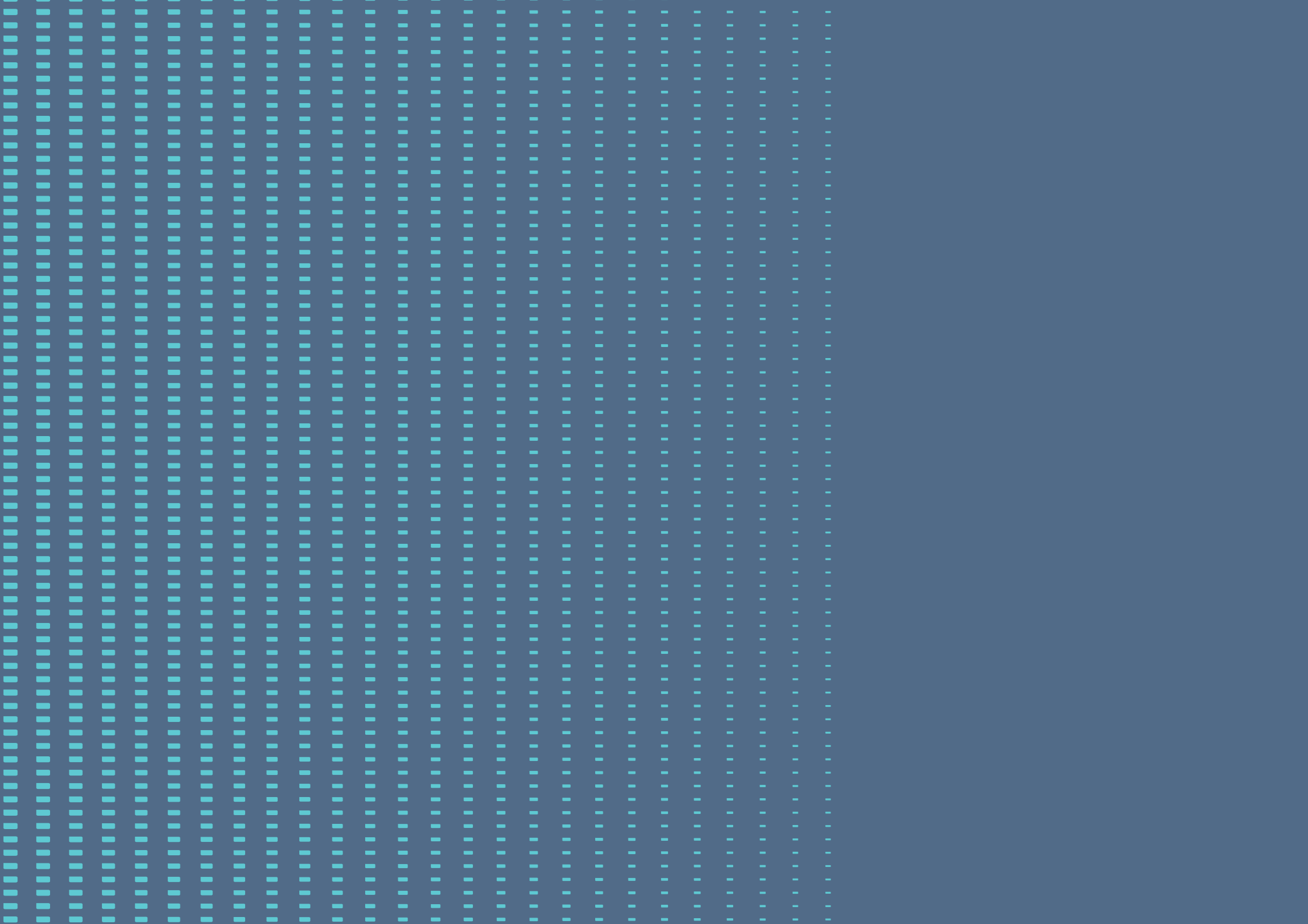
Carbon Offset

A carbon offset has been proposed based on the on-site emissions given the current status of the scheme.

As per the CO_2 emissions shown on this page, the proposed scheme is a highly-sustainable development that complies with the Planning Condition and thus based on this report, the condition should be discharged.

	CO_2 Emissions (Tonnes per Annum)
	Residential
Baseline: Part L 2013 (SAP 10)	67.5
Be Lean: Use Less Energy	60.5
CO_2 Savings at *Be Lean*	10%
Be Clean: Supply Energy Efficiently	60.5
Be Green: Use Renewable Energy	25.4
Total CO_2 Savings – Part L 2013 (SAP 10)	62%
Carbon Offset	£72,487

Table: Carbon Emissions Table



Appendix 1



SAP 10.0 Performance

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013 of the Building Regulations Compliant Development	67.5	
After energy demand reduction (be lean)	60.5	
After heat network connection (be clean)	60.5	
After renewable energy (be green)	25.4	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: Savings from energy demand reduction	7.0	10%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	35.1	52%
Cumulative on site savings	**42.1**	**62%**
Annual savings from off-set payment	25.4	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**763**	-
Cash in-lieu contribution (£)	**72,487**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

Appendix 2



FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A2.02.01	**Issued on Date**	21/08/2026
Assessment Reference	Be Lean	**Prop Type Ref**	Type J
Property	A2.02.01, High Road West Harringey, London		

SAP Rating	87 B	**DER**	11.96	**TER**	14.16
Environmental	91 B	**% DER<TER**	15.53		
CO_2 Emissions (t/year)	0.93	**DFEE**	30.92	**TFEE**	40.21
General Requirements Compliance	Pass	**% DFEE<TFEE**	23.09		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 95 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.16 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.96 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)40.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)30.9 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.85 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing East: 10.20 m², No overhang
Windows facing South: 2.45 m², No overhang
Windows facing West: 8.80 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	95.0000 (1b)	x	2.5000 (2b)	=	237.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.5000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.6500	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			21.4500	0.8127	17.4323			(27)
External Wall 1	72.8000	21.4500	51.3500	0.1200	6.1620			(29a)
P4	3.5000	1.8900	1.6100	0.2100	0.3381			(29a)
s5	6.0000		6.0000	0.2300	1.3800			(29a)
Total net area of external elements Aum(A, m2)			82.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2024			(33)
Party Wall 1			17.7500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	224.7200 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.9240 (36)
Total fabric heat loss (33) + (36) =	38.1264 (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	22.2830	22.0332	21.7834	20.5343	20.2844	19.0353	19.0353	18.7855	19.5350	20.2844	20.7841	21.2837	(38)
Heat transfer coeff	60.4093	60.1595	59.9097	58.6606	58.4108	57.1617	57.1617	56.9119	57.6613	58.4108	58.9104	59.4101	(39)
Average = Sum(39)m / 12 =												58.5982	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6359	0.6333	0.6306	0.6175	0.6149	0.6017	0.6017	0.5991	0.6070	0.6149	0.6201	0.6254	(40)
HLP (average)												0.6168	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6882 (42)
Average daily hot water use (litres/day)	98.0440 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8484	103.9267	100.0049	96.0831	92.1614	88.2396	88.2396	92.1614	96.0831	100.0049	103.9267	107.8484	(44)
Energy conte	159.9361	139.8811	144.3448	125.8433	120.7496	104.1977	96.5545	110.7977	112.1210	130.6662	142.6324	154.8896	(45)
Energy content (annual)										Total = Sum(45)m =		1542.6141	(45)
Distribution loss (46)m = 0.15 x (45)m	23.9904	20.9822	21.6517	18.8765	18.1124	15.6297	14.4832	16.6197	16.8182	19.5999	21.3949	23.2334	(46)

Water storage loss:
Store volume 1.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)
Volume factor from Table 2a 4.9324 (52)
Temperature factor from Table 2b 1.0000 (53)
Enter (49) or (54) in (55) 0.1182 (55)
Total storage loss

3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(56)

If cylinder contains dedicated solar storage

3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(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)

Total heat required for water heating calculated for each month

186.8629	164.2021	171.2716	151.9015	147.6765	130.2560	123.4814	137.7246	138.1793	157.5931	168.6907	181.8164	(62)
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	(63)
							Solar input (sum of months) = Sum(63)m =				0.0000	(63)

Output from w/h

186.8629	164.2021	171.2716	151.9015	147.6765	130.2560	123.4814	137.7246	138.1793	157.5931	168.6907	181.8164	(64)
							Total per year (kWh/year) = Sum(64)m =				1859.6561	(64)

Heat gains from water heating, kWh/month

74.7202	65.9673	69.5361	62.6895	61.6907	55.4923	53.6459	58.3817	58.1268	64.9880	68.2719	73.0423	(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	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	(66)

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

22.4625	19.9510	16.2252	12.2835	9.1821	7.7519	8.3762	10.8877	14.6135	18.5552	21.6566	23.0868	(67)

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

247.9820	250.5553	244.0707	230.2658	212.8396	196.4615	185.5198	182.9466	189.4311	203.2360	220.6622	237.0404	(68)

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

36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	(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)

-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	(71)

Water heating gains (Table 5)

100.4304	98.1656	93.4625	87.0687	82.9177	77.0727	72.1047	78.4701	80.7317	87.3495	94.8220	98.1751	(72)

Total internal gains

434.1975	431.9945	417.0810	392.9407	368.2619	344.6086	329.3232	335.6269	348.0989	372.4632	400.4634	421.6248	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.2000	19.6403	0.3700	0.6600	0.7700	33.9021	(76)
South	2.4500	46.7521	0.3700	0.6600	0.7700	19.3841	(78)
West	8.8000	19.6403	0.3700	0.6600	0.7700	29.2489	(80)

Solar gains 82.5350	155.2828	243.8862	342.4205	411.2635	418.0811	399.1771	347.9098	278.8609	180.8278	101.7186	68.6819	(83)
Total gains 516.7325	587.2773	660.9673	735.3612	779.5254	762.6897	728.5003	683.5367	626.9597	553.2910	502.1820	490.3067	(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	98.1655	98.5731	98.9841	101.0919	101.5242	103.7428	103.7428	104.1982	102.8438	101.5242	100.6632	99.8166	
alpha	7.5444	7.5715	7.5989	7.7395	7.7683	7.9162	7.9162	7.9465	7.8563	7.7683	7.7109	7.6544	
util living area	0.9969	0.9910	0.9669	0.8693	0.6835	0.4789	0.3452	0.3829	0.6280	0.9228	0.9910	0.9978	(86)
MIT	20.4094	20.5373	20.7250	20.9153	20.9875	20.9993	21.0000	20.9999	20.9950	20.8836	20.6144	20.3899	(87)
Th 2	20.3978	20.4002	20.4025	20.4143	20.4167	20.4285	20.4285	20.4308	20.4237	20.4167	20.4119	20.4072	(88)
util rest of house	0.9960	0.9886	0.9587	0.8446	0.6447	0.4365	0.3004	0.3356	0.5781	0.9011	0.9882	0.9972	(89)
MIT 2	19.5957	19.7833	20.0531	20.3186	20.4050	20.4280	20.4284	20.4308	20.4199	20.2850	19.9057	19.5749	(90)
Living area fraction									fLA = Living area / (4) =			0.2274	(91)
MIT	19.7807	19.9547	20.2059	20.4543	20.5375	20.5579	20.5584	20.5602	20.5507	20.4211	20.0668	19.7602	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7807	19.9547	20.2059	20.4543	20.5375	20.5579	20.5584	20.5602	20.5507	20.4211	20.0668	19.7602	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9949	0.9864	0.9556	0.8464	0.6528	0.4461	0.3106	0.3463	0.5892	0.9013	0.9861	0.9963	(94)
Useful gains	514.0834	579.3135	631.6355	622.3770	508.9124	340.2444	226.2534	236.7301	369.4262	498.6808	495.2256	488.5041	(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	935.1812	905.6839	821.1136	677.7815	516.2025	340.5634	226.2683	236.7641	371.9535	573.6558	763.8798	924.4331	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	313.2967	219.3209	140.9717	39.8912	5.4239	0.0000	0.0000	0.0000	0.0000	55.7814	193.4310	324.3312	(98)
Space heating												1292.4480	(98)
Space heating per m2											(98) / (4) =	13.6047	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1292.4480	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1357.0704	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1859.6561	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1952.6389	(310a)
Electricity used for heat distribution	33.0971	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	220.9344	(330a)
Total electricity for the above, kWh/year	220.9344	(331)
Electricity for lighting (calculated in Appendix L)	396.6948	(332)
Total delivered energy for all uses	3927.3385	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367a)
Space heating from Boilers	3697.9993	0.2160	798.7678	(367)
Electrical energy for heat distribution	33.0971	0.5190	17.1774	(372)
Total CO2 associated with community systems			815.9452	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			815.9452	(376)
Pumps and fans	220.9344	0.5190	114.6649	(378)
Energy for lighting	396.6948	0.5190	205.8846	(379)
Total CO2, kg/year			1136.4948	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.9600	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.9600	ZC1
Total Floor Area	TFA	95.0000	
Assumed number of occupants	N	2.6882	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.4683	ZC2
CO2 emissions from cooking, equation (L16)		1.9317	ZC3
Total CO2 emissions		29.3601	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.3601	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	95.0000 (1b)	x	2.5000 (2b)	=	237.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.5000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1263	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3763	(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) =	0.3199	(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	0.4078	0.3998	0.3918	0.3519	0.3439	0.3039	0.3039	0.2959	0.3199	0.3439	0.3599	0.3758	(22b)
Effective ac	0.5832	0.5799	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5512	0.5591	0.5647	0.5706	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			21.4500	1.3258	28.4375			(27)
External Wall 1	72.8000	21.4500	51.3500	0.1800	9.2430			(29a)
P4	3.5000	1.8900	1.6100	0.1800	0.2898			(29a)
s5	6.0000		6.0000	0.1800	1.0800			(29a)
Total net area of external elements Aum(A, m2)			82.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.9403			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4120	(36)
Total fabric heat loss						(33) + (36) =	49.3523	(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	45.7054	45.4523	45.2043	44.0390	43.8210	42.8061	42.8061	42.6181	43.1970	43.8210	44.2620	44.7231	(38)
Heat transfer coeff	95.0577	94.8046	94.5566	93.3913	93.1733	92.1584	92.1584	91.9704	92.5493	93.1733	93.6143	94.0754	(39)
Average = Sum(39)m / 12 =												93.3903	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0006	0.9979	0.9953	0.9831	0.9808	0.9701	0.9701	0.9681	0.9742	0.9808	0.9854	0.9903	(40)
HLP (average)												0.9831	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6882 (42)
Average daily hot water use (litres/day)		98.0440 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8484	103.9267	100.0049	96.0831	92.1614	88.2396	88.2396	92.1614	96.0831	100.0049	103.9267	107.8484	(44)
Energy conte	159.9361	139.8811	144.3448	125.8433	120.7496	104.1977	96.5545	110.7977	112.1210	130.6662	142.6324	154.8896	(45)
Energy content (annual)										Total = Sum(45)m =		1542.6141	(45)
Distribution loss (46)m = 0.15 x (45)m	23.9904	20.9822	21.6517	18.8765	18.1124	15.6297	14.4832	16.6197	16.8182	19.5999	21.3949	23.2334	(46)

Water storage loss:		
Store volume		1.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		0.2134 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.1152 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.5715 3.2259 3.5715 3.4563 3.5715 3.4563 3.5715 3.5715 3.4563 3.5715 3.4563 3.5715 (56)
If cylinder contains dedicated solar storage
3.5715 3.2259 3.5715 3.4563 3.5715 3.4563 3.5715 3.5715 3.4563 3.5715 3.4563 3.5715 (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)
Total heat required for water heating calculated for each month
186.7700 164.1182 171.1787 151.8116 147.5835 130.1660 123.3884 137.6316 138.0893 157.5001 168.6007 181.7234 (62)
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 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
186.7700 164.1182 171.1787 151.8116 147.5835 130.1660 123.3884 137.6316 138.0893 157.5001 168.6007 181.7234 (64)
Total per year (kWh/year) = Sum(64)m = 1858.5614 (64)
Heat gains from water heating, kWh/month
74.6459 65.9001 69.4617 62.6175 61.6164 55.4204 53.5715 58.3074 58.0549 64.9136 68.1999 72.9679 (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	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.1039	19.6325	15.9662	12.0875	9.0355	7.6282	8.2425	10.7139	14.3802	18.2590	21.3109	22.7183	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	247.9820	250.5553	244.0707	230.2658	212.8396	196.4615	185.5198	182.9466	189.4311	203.2360	220.6622	237.0404	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	(71)
Water heating gains (Table 5)													
	100.3304	98.0656	93.3626	86.9688	82.8177	76.9727	72.0047	78.3701	80.6317	87.2495	94.7221	98.0751	(72)
Total internal gains													
	436.7389	434.5760	419.7221	395.6446	371.0154	347.3849	332.0896	338.3531	350.7656	375.0670	403.0178	424.1563	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.2000	19.6403	0.6300	0.7000	0.7700	61.2237	(76)
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057	(78)
West	8.8000	19.6403	0.6300	0.7000	0.7700	52.8204	(80)

Solar gains	149.0498	280.4247	440.4334	618.3761	742.6994	755.0113	720.8726	628.2892	503.5939	326.5564	183.6932	124.0324	(83)
Total gains	585.7887	715.0007	860.1554	1014.0207	1113.7147	1102.3962	1052.9621	966.6423	854.3595	701.6235	586.7110	548.1888	(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	69.4023	69.5875	69.7701	70.6407	70.8059	71.5857	71.5857	71.7320	71.2833	70.8059	70.4724	70.1270	
alpha	5.6268	5.6392	5.6513	5.7094	5.7204	5.7724	5.7724	5.7821	5.7522	5.7204	5.6982	5.6751	
util living area													
	0.9977	0.9926	0.9720	0.8929	0.7276	0.5282	0.3841	0.4356	0.7063	0.9509	0.9941	0.9984	(86)
MIT	19.9807	20.1697	20.4558	20.7710	20.9427	20.9923	20.9990	20.9979	20.9641	20.6921	20.2683	19.9480	(87)
Th 2	20.0828	20.0850	20.0872	20.0975	20.0994	20.1083	20.1083	20.1100	20.1049	20.0994	20.0955	20.0915	(88)
util rest of house													
	0.9969	0.9902	0.9632	0.8637	0.6721	0.4576	0.3068	0.3524	0.6302	0.9305	0.9918	0.9979	(89)
MIT 2	18.7190	18.9955	19.4075	19.8438	20.0484	20.1036	20.1080	20.1092	20.0790	19.7525	19.1482	18.6777	(90)
Living area fraction									fLA = Living area / (4) =			0.2274	(91)
MIT	19.0059	19.2625	19.6458	20.0546	20.2518	20.3057	20.3106	20.3113	20.2802	19.9661	19.4028	18.9665	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0059	19.2625	19.6458	20.0546	20.2518	20.3057	20.3106	20.3113	20.2802	19.9661	19.4028	18.9665	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9956	0.9873	0.9579	0.8622	0.6819	0.4735	0.3244	0.3714	0.6459	0.9268	0.9894	0.9969	(94)
Useful gains	583.2314	705.8931	823.9544	874.2717	759.4738	521.9691	341.6083	358.9758	551.8339	650.2958	580.4769	546.4902	(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													
	1397.9054	1361.6296	1243.0232	1041.7410	796.7967	525.8280	341.9584	359.7207	571.9758	872.6717	1151.7226	1389.1686	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	606.1175	440.6549	311.7872	120.5779	27.7682	0.0000	0.0000	0.0000	0.0000	165.4477	411.2969	626.9527	(98)
Space heating												2710.6030	(98)
Space heating per m2										(98) / (4) =		28.5327	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2899.0406	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	606.1175	440.6549	311.7872	120.5779	27.7682	0.0000	0.0000	0.0000	0.0000	165.4477	411.2969	626.9527	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	648.2540	471.2887	333.4622	128.9603	29.6986	0.0000	0.0000	0.0000	0.0000	176.9494	439.8897	670.5376	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	186.7700	164.1182	171.1787	151.8116	147.5835	130.1660	123.3884	137.6316	138.0893	157.5001	168.6007	181.7234	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.7291	87.3226	86.3942	84.2072	81.3226	79.8000	79.8000	79.8000	79.8000	84.9452	87.1043	87.8529	(217)
Fuel for water heating, kWh/month													
	212.8940	187.9447	198.1368	180.2834	181.4791	163.1153	154.6221	172.4707	173.0442	185.4138	193.5618	206.8497	(219)
Water heating fuel used												2209.8155	(219)
Annual totals kWh/year													
Space heating fuel - main system												2899.0406	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												390.3622	(232)
Total delivered energy for all uses												5574.2183	(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	2899.0406	0.2160	626.1928	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2209.8155	0.2160	477.3201	(264)
Space and water heating			1103.5129	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	390.3622	0.5190	202.5980	(268)
Total CO2, kg/m2/year			1345.0359	(272)
Emissions per m2 for space and water heating			11.6159	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1326	(272b)
Emissions per m2 for pumps and fans			0.4097	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.6159 * 1.00) + 2.1326 + 0.4097, rounded to 2 d.p.			14.1600	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A2.00.02	**Issued on Date**	21/08/2026
Assessment Reference	Be Lean	**Prop Type Ref**	Type G
Property	A2.00.02, High Road West Harringey, London		

SAP Rating	86 B	**DER**	13.07	**TER**	14.27
Environmental	89 B	**% DER<TER**	8.43		
CO_2 Emissions (t/year)	1.23	**DFEE**	40.11	**TFEE**	45.33
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.53		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-Terrace Maisonette, total floor area 121 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.27 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.07 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)45.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.1 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.85 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing East: 11.65 m², No overhang
Windows facing West: 9.05 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.5000 (1b)	x	2.5000 (2b)	=	126.2500	(1b) - (3b)
First floor	70.1000 (1c)	x	3.1000 (2c)	=	217.3100	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	343.5600	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation: 0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.6500 (23c)

Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			20.7000	0.8127	16.8228			(27)
External Wall 1	67.0000	22.5900	44.4100	0.1200	5.3292			(29a)
boh now p9	13.5000		13.5000	0.2300	3.1050			(29a)
shelter bins p3	17.5000		17.5000	0.2100	3.6750			(29a)
shelter p3	15.5000		15.5000	0.2100	3.2550			(29a)
Total net area of external elements Aum(A, m2)			113.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.0770			(33)
Party Wall 1			72.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	267.4400 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.9314 (36)
Total fabric heat loss (33) + (36) =	52.0084 (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	32.2339	31.8725	31.5111	29.7042	29.3428	27.5359	27.5359	27.1745	28.2587	29.3428	30.0656	30.7883	(38)
Heat transfer coeff	84.2423	83.8809	83.5195	81.7126	81.3512	79.5443	79.5443	79.1829	80.2671	81.3512	82.0740	82.7967	(39)
Average = Sum(39)m / 12 =												81.6222	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6985	0.6955	0.6925	0.6776	0.6746	0.6596	0.6596	0.6566	0.6656	0.6746	0.6805	0.6865	(40)
HLP (average)												0.6768	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8656 (42)
Average daily hot water use (litres/day)	102.2581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4839	108.3936	104.3032	100.2129	96.1226	92.0323	92.0323	96.1226	100.2129	104.3032	108.3936	112.4839	(44)
Energy conte	166.8103	145.8934	150.5489	131.2522	125.9396	108.6763	100.7046	115.5600	116.9401	136.2824	148.7629	161.5469	(45)
Energy content (annual)										Total = Sum(45)m =		1608.9177	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

	25.0216	21.8840	22.5823	19.6878	18.8909	16.3014	15.1057	17.3340	17.5410	20.4424	22.3144	24.2320 (46)

Water storage loss:

Store volume 1.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)

Volume factor from Table 2a 4.9324 (52)

Temperature factor from Table 2b 1.0000 (53)

Enter (49) or (54) in (55) 0.1182 (55)

Total storage loss

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (56)

If cylinder contains dedicated solar storage

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (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)

Total heat required for water heating calculated for each month

	193.7372	170.2144	177.4758	157.3104	152.8665	134.7345	127.6314	142.4868	142.9984	163.2093	174.8212	188.4738 (62)
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 (63)

Solar input (sum of months) = Sum(63)m = 0.0000 (63)

Output from w/h

	193.7372	170.2144	177.4758	157.3104	152.8665	134.7345	127.6314	142.4868	142.9984	163.2093	174.8212	188.4738 (64)

Total per year (kWh/year) = Sum(64)m = 1925.9596 (64)

Heat gains from water heating, kWh/month

	77.0059	67.9664	71.5990	64.4879	63.4164	56.9815	55.0257	59.9652	59.7292	66.8554	70.3103	75.2558 (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	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	(66)

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

	27.2854	24.2346	19.7089	14.9209	11.1536	9.4163	10.1747	13.2254	17.7511	22.5391	26.3065	28.0437 (67)

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

	285.9922	288.9599	281.4814	265.5605	245.4633	226.5747	213.9560	210.9883	218.4668	234.3877	254.4849	273.3735 (68)

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

	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280 (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)

	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241 (71)

Water heating gains (Table 5)

	103.5026	101.1404	96.2352	89.5666	85.2371	79.1409	73.9593	80.5983	82.9572	89.8594	97.6532	101.1503 (72)

Total internal gains

	482.7642	480.3191	463.4096	436.0321	407.8380	381.1160	364.0740	370.7961	385.1591	412.7702	444.4286	468.5516 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.6500	19.6403	0.3700	0.6600	0.7700	38.7215	(76)
West	9.0500	19.6403	0.3700	0.6600	0.7700	30.0798	(80)

Solar gains	68.8013	134.5899	221.6504	323.2639	396.1721	405.5526	386.1026	331.6564	257.7886	159.7023	85.7871	56.5788 (83)
Total gains	551.5655	614.9090	685.0600	759.2960	804.0100	786.6686	750.1766	702.4525	642.9477	572.4725	530.2157	525.1304 (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	106.3509	106.8091	107.2712	109.6433	110.1304	112.6321	112.6321	113.1461	111.6179	110.1304	109.1605	108.2076	
alpha	8.0901	8.1206	8.1514	8.3096	8.3420	8.5088	8.5088	8.5431	8.4412	8.3420	8.2774	8.2138	
util living area	0.9997	0.9991	0.9958	0.9717	0.8639	0.6414	0.4662	0.5176	0.8166	0.9872	0.9991	0.9998	(86)
MIT	20.3153	20.4105	20.5762	20.7984	20.9501	20.9964	20.9998	20.9995	20.9768	20.7742	20.5092	20.3053	(87)
Th 2	20.3421	20.3448	20.3474	20.3607	20.3634	20.3767	20.3767	20.3793	20.3714	20.3634	20.3580	20.3527	(88)
util rest of house	0.9996	0.9988	0.9942	0.9614	0.8256	0.5816	0.4004	0.4483	0.7590	0.9809	0.9987	0.9997	(89)
MIT 2	19.4042	19.5455	19.7895	20.1177	20.3151	20.3743	20.3766	20.3791	20.3532	20.0893	19.7009	19.3982	(90)
Living area fraction									fLA = Living area / (4) =			0.1554	(91)
MIT	19.5457	19.6799	19.9117	20.2235	20.4138	20.4710	20.4734	20.4755	20.4501	20.1957	19.8265	19.5391	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5457	19.6799	19.9117	20.2235	20.4138	20.4710	20.4734	20.4755	20.4501	20.1957	19.8265	19.5391	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9994	0.9983	0.9929	0.9588	0.8289	0.5908	0.4106	0.4591	0.7667	0.9788	0.9982	0.9996	(94)
Useful gains	551.2279	613.8641	680.1713	727.9759	666.4616	464.7435	308.0157	322.4851	492.9614	560.3170	529.2603	524.9125	(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	1284.3359	1239.7543	1120.1402	925.2685	708.8795	467.0045	308.1092	322.7122	509.7047	780.6249	1044.5170	1270.0308	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	545.4323	420.5982	327.3369	142.0507	31.5589	0.0000	0.0000	0.0000	0.0000	163.9091	370.9848	554.3680	(98)
Space heating												2556.2390	(98)
Space heating per m2										(98) / (4) =		21.1960	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	2556.2390	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2684.0509	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1925.9596	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2022.2576	(310a)
Electricity used for heat distribution	47.0631	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	319.5967	(330a)
Total electricity for the above, kWh/year	319.5967	(331)
Electricity for lighting (calculated in Appendix L)	481.8685	(332)
Total delivered energy for all uses	5507.7737	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367a)
Space heating from Boilers	5258.4453	0.2160	1135.8242	(367)
Electrical energy for heat distribution	47.0631	0.5190	24.4257	(372)
Total CO2 associated with community systems			1160.2499	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1160.2499	(376)
Pumps and fans	319.5967	0.5190	165.8707	(378)
Energy for lighting	481.8685	0.5190	250.0897	(379)
Total CO2, kg/year			1576.2103	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.0700	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.0700	ZC1
Total Floor Area	TFA	120.6000	
Assumed number of occupants	N	2.8656	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		14.0525	ZC2
CO2 emissions from cooking, equation (L16)		1.5570	ZC3
Total CO2 emissions		28.6795	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		28.6795	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.5000	(1b)	x 2.5000	(2b) =	126.2500	(1b) - (3b)
First floor	70.1000	(1c)	x 3.1000	(2c) =	217.3100	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.6000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	343.5600	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40	=	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20	=	0.0000	(6b)
Number of intermittent fans							4 * 10	=	40.0000	(7a)
Number of passive vents							0 * 10	=	0.0000	(7b)
Number of flueless gas fires							0 * 40	=	0.0000	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000	/ (5) =	0.1164	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.3664	(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) =		0.3115	(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	0.3971	0.3893	0.3815	0.3426	0.3348	0.2959	0.2959	0.2881	0.3115	0.3348	0.3504	0.3660	(22b)
Effective ac	0.5789	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			20.7000	1.3258	27.4432			(27)
External Wall 1	67.0000	22.5900	44.4100	0.1800	7.9938			(29a)
boh now p9	13.5000		13.5000	0.1800	2.4300			(29a)
shelter bins p3	17.5000		17.5000	0.1800	3.1500			(29a)
shelter p3	15.5000		15.5000	0.1800	2.7900			(29a)
Total net area of external elements Aum(A, m2)			113.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.6970			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.7720	(36)
Total fabric heat loss (33) + (36) =	55.4690	(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	65.6271	65.2799	64.9397	63.3415	63.0424	61.6505	61.6505	61.3927	62.1866	63.0424	63.6474	64.2798	(38)
Heat transfer coeff	121.0961	120.7489	120.4087	118.8104	118.5114	117.1194	117.1194	116.8617	117.6556	118.5114	119.1163	119.7488	(39)
Average = Sum(39)m / 12 =												118.8090	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0041	1.0012	0.9984	0.9852	0.9827	0.9711	0.9711	0.9690	0.9756	0.9827	0.9877	0.9929	(40)
HLP (average)												0.9851	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8656 (42)
Average daily hot water use (litres/day)	102.2581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4839	108.3936	104.3032	100.2129	96.1226	92.0323	92.0323	96.1226	100.2129	104.3032	108.3936	112.4839	(44)
Energy conte	166.8103	145.8934	150.5489	131.2522	125.9396	108.6763	100.7046	115.5600	116.9401	136.2824	148.7629	161.5469	(45)
Energy content (annual)										Total = Sum(45)m =		1608.9177	(45)
Distribution loss (46)m = 0.15 x (45)m	25.0216	21.8840	22.5823	19.6878	18.8909	16.3014	15.1057	17.3340	17.5410	20.4424	22.3144	24.2320	(46)

Water storage loss:	
Store volume	1.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2134 (48)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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  Temperature factor from Table 2b                                                                                0.5400 (49)
Enter (49) or (54) in (55)                                                                                        0.1152 (55)
Total storage loss
                3.5715     3.2259     3.5715     3.4563     3.5715     3.4563     3.5715     3.5715     3.4563     3.5715     3.4563     3.5715 (56)
If cylinder contains dedicated solar storage
                3.5715     3.2259     3.5715     3.4563     3.5715     3.4563     3.5715     3.5715     3.4563     3.5715     3.4563     3.5715 (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)
Total heat required for water heating calculated for each month
              193.6442   170.1304   177.3828   157.2205   152.7735   134.6446   127.5384   142.3938   142.9084   163.1163   174.7312   188.3808 (62)
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 (63)
                                                                                  Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
              193.6442   170.1304   177.3828   157.2205   152.7735   134.6446   127.5384   142.3938   142.9084   163.1163   174.7312   188.3808 (64)
                                                                                  Total per year (kWh/year) = Sum(64)m =   1924.8650 (64)
Heat gains from water heating, kWh/month
               76.9315    67.8992    71.5246    64.4160    63.3420    56.9095    54.9514    59.8908    59.6572    66.7810    70.2383    75.1815 (65)


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5. Internal gains (see Table 5 and 5a)
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Metabolic gains (Table 5), Watts
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
(66)m         143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
                26.2509    23.3158    18.9617    14.3552    10.7307     9.0593     9.7889    12.7240    17.0781    21.6846    25.3091    26.9805 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
               285.9922   288.9599   281.4814   265.5605   245.4633   226.5747   213.9560   210.9883   218.4668   234.3877   254.4849   273.3735 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
                37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280 (69)
Pumps, fans      3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
              -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241 (71)
Water heating gains (Table 5)
               103.4026   101.0405    96.1352    89.4666    85.1371    79.0410    73.8594    80.4984    82.8572    89.7594    97.5532   101.0503 (72)
Total internal gains
               484.6298   482.3003   465.5624   438.3664   410.3152   383.6590   366.5883   373.1947   387.3862   414.8157   446.3313   470.3884 (73)


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6. Solar gains
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[Jan]                                    Area          Solar flux              g                FF            Access            Gains
                                          m2           Table 6a       Specific data    Specific data        factor                W
                                                          W/m2         or Table 6b      or Table 6c       Table 6d
-------------------------------------------------------------------------------------------------------------
East                                   11.6500           19.6403            0.6300           0.7000        0.7700          69.9270 (76)
West                                    9.0500           19.6403            0.6300           0.7000        0.7700          54.3210 (80)
-------------------------------------------------------------------------------------------------------------

Solar gains   124.2480   243.0555   400.2778   583.7813   715.4459   732.3861   697.2615   598.9373   465.5396   288.4058   154.9227   102.1755 (83)
Total gains   608.8778   725.3558   865.8402  1022.1477  1125.7610  1116.0451  1063.8497   972.1320   852.9258   703.2215   601.2539   572.5639 (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           69.1600    69.3588    69.5548    70.4904    70.6683    71.5082    71.5082    71.6659    71.1823    70.6683    70.3094    69.9381
alpha          5.6107     5.6239     5.6370     5.6994     5.7112     5.7672     5.7672     5.7777     5.7455     5.7112     5.6873     5.6625
util living area
                0.9992     0.9975     0.9902     0.9539     0.8418     0.6478     0.4805     0.5448     0.8299     0.9822     0.9980     0.9994 (86)

MIT           19.8689    20.0231    20.2884    20.6287    20.8759    20.9786    20.9967    20.9936    20.9164    20.5648    20.1529    19.8460 (87)
Th 2          20.0799    20.0823    20.0847    20.0957    20.0978    20.1075    20.1075    20.1092    20.1037    20.0978    20.0936    20.0892 (88)
util rest of house
                0.9989     0.9967     0.9868     0.9377     0.7939     0.5674     0.3852     0.4436     0.7612     0.9733     0.9972     0.9992 (89)
MIT 2         18.5535    18.7807    19.1682    19.6587    19.9784    20.0935    20.1062    20.1066    20.0365    19.5788    18.9792    18.5269 (90)
Living area fraction                                                                                fLA = Living area / (4) =     0.1554 (91)
MIT           18.7579    18.9737    19.3423    19.8094    20.1179    20.2311    20.2446    20.2444    20.1732    19.7320    19.1615    18.7318 (92)
Temperature adjustment                                                                                          0.0000
adjusted MIT  18.7579    18.9737    19.3423    19.8094    20.1179    20.2311    20.2446    20.2444    20.1732    19.7320    19.1615    18.7318 (93)


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8. Space heating requirement
-------------------------------------------------------------------------------------------------------------

                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation     0.9983     0.9952     0.9829     0.9314     0.7951     0.5790     0.4000     0.4593     0.7672     0.9684     0.9959     0.9988 (94)
Useful gains  607.8169   721.8805   851.0298   952.0506   895.1183   646.1414   425.5310   446.4533   654.3983   680.9965   598.7805   571.8542 (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
             1750.7974  1699.3881  1546.3186  1296.1509   997.6176   659.5058   426.8527   449.2630   714.5465  1082.2487  1436.7267  1740.1706 (97)
Month fracti    1.0000     1.0000     1.0000     1.0000     1.0000     0.0000     0.0000     0.0000     0.0000     1.0000     1.0000     1.0000 (97a)
Space heating kWh
              850.3775   656.8851   517.2948   247.7522    76.2595     0.0000     0.0000     0.0000     0.0000   298.5317   603.3213   869.2275 (98)
Space heating                                                                                                  4119.6495 (98)
Space heating per m2                                                                                (98) / (4) =    34.1596 (99)


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8c. Space cooling requirement
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Not applicable
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4406.0423	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	850.3775	656.8851	517.2948	247.7522	76.2595	0.0000	0.0000	0.0000	0.0000	298.5317	603.3213	869.2275	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	909.4947	702.5509	553.2565	264.9756	81.5609	0.0000	0.0000	0.0000	0.0000	319.2852	645.2634	929.6550	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	193.6442	170.1304	177.3828	157.2205	152.7735	134.6446	127.5384	142.3938	142.9084	163.1163	174.7312	188.3808	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.3039	88.0707	87.5040	86.0221	83.0702	79.8000	79.8000	79.8000	79.8000	86.4063	87.8545	88.3890	(217)
Fuel for water heating, kWh/month													
	219.2930	193.1748	202.7138	182.7675	183.9089	168.7275	159.8226	178.4384	179.0832	188.7782	198.8870	213.1270	(219)
Water heating fuel used												2268.7220	(219)
Annual totals kWh/year													
Space heating fuel - main system												4406.0423	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												463.5993	(232)
Total delivered energy for all uses												7213.3636	(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	4406.0423	0.2160	951.7051	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2268.7220	0.2160	490.0440	(264)
Space and water heating			1441.7491	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	463.5993	0.5190	240.6081	(268)
Total CO2, kg/m2/year			1721.2821	(272)
Emissions per m2 for space and water heating			11.9548	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			1.9951	(272b)
Emissions per m2 for pumps and fans			0.3228	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.9548 * 1.00) + 1.9951 + 0.3228, rounded to 2 d.p.			14.2700	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A1.04.02	**Issued on Date**	21/08/2026
Assessment Reference	Be Lean	**Prop Type Ref**	Type B
Property	A1.04.02, High Road West Harringey, London		

SAP Rating	81 B	**DER**	21.67	**TER**	18.41
Environmental	84 B	**% DER<TER**	-17.69		
CO_2 Emissions (t/year)	1.27	**DFEE**	44.16	**TFEE**	56.02
General Requirements Compliance	Fail	**% DFEE<TFEE**	21.16		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.41 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 21.67 kgCO□/m²Fail
Excess emissions =3.26 kgCO□/m² (17.7%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)56.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.2 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.21 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	0.86 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction
---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK
---
9 Summertime temperature
Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing South: 2.45 m², No overhang
Windows facing West: 13.11 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None
---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.5000 (1b)	x	2.5000 (2b)	=	183.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	183.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			15.5600	0.8127	12.6455			(27)
External Wall 1	48.5000	15.5600	32.9400	0.1200	3.9528			(29a)
P4	14.5000	1.8900	12.6100	0.2100	2.6481			(29a)
External Roof 1	72.5000		72.5000	0.1200	8.7000			(30)
Total net area of external elements Aum(A, m2)			135.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8364			(33)
Party Wall 1			31.5000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	217.9100	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.7641	(36)
Total fabric heat loss (33) + (36) =	47.6005	(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	16.9823	16.7890	16.5957	15.6293	15.4360	14.4696	14.4696	14.2763	14.8562	15.4360	15.8226	16.2092	(38)
Heat transfer coeff	64.5828	64.3895	64.1962	63.2298	63.0365	62.0701	62.0701	61.8769	62.4567	63.0365	63.4231	63.8097	(39)

Average = Sum(39)m / 12 =	63.1815	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8787	0.8760	0.8734	0.8603	0.8576	0.8445	0.8445	0.8419	0.8498	0.8576	0.8629	0.8682	(40)
HLP (average)												0.8596	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3280 (42)
Average daily hot water use (litres/day)	89.4903 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4393	94.8597	91.2801	87.7005	84.1209	80.5413	80.5413	84.1209	87.7005	91.2801	94.8597	98.4393	(44)
Energy conte	145.9827	127.6774	131.7516	114.8643	110.2150	95.1072	88.1308	101.1313	102.3392	119.2664	130.1886	141.3764	(45)
Energy content (annual)										Total = Sum(45)m =		1408.0310	(45)
Distribution loss (46)m = 0.15 x (45)m	21.8974	19.1516	19.7627	17.2296	16.5323	14.2661	13.2196	15.1697	15.3509	17.8900	19.5283	21.2065	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Store volume 1.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)
Volume factor from Table 2a 4.9324 (52)
Temperature factor from Table 2b 1.0000 (53)
Enter (49) or (54) in (55) 0.1182 (55)
Total storage loss

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (56)

If cylinder contains dedicated solar storage

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (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)

Total heat required for water heating calculated for each month

	172.9095	151.9984	158.6785	140.9225	137.1419	121.1654	115.0576	128.0582	128.3974	146.1933	156.2469	168.3033 (62)
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 (63)

Solar input (sum of months) = Sum(63)m = 0.0000 (63)

Output from w/h

	172.9095	151.9984	158.6785	140.9225	137.1419	121.1654	115.0576	128.0582	128.3974	146.1933	156.2469	168.3033 (64)

Total per year (kWh/year) = Sum(64)m = 1725.0729 (64)

Heat gains from water heating, kWh/month

	70.0807	61.9096	65.3489	59.0390	58.1880	52.4697	50.8450	55.1677	54.8744	61.1976	64.1343	68.5491 (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	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	(66)

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

	18.7894	16.6885	13.5720	10.2749	7.6806	6.4843	7.0065	9.1073	12.2238	15.5210	18.1153	19.3116 (67)

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

	205.3242	207.4549	202.0858	190.6556	176.2270	162.6662	153.6068	151.4762	156.8453	168.2754	182.7040	196.2648 (68)

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

	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401 (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)

	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205 (71)

Water heating gains (Table 5)

	94.1945	92.1273	87.8345	81.9986	78.2096	72.8746	68.3400	74.1501	76.2144	82.2548	89.0754	92.1360 (72)

Total internal gains

	376.2283	374.1909	361.4125	340.8492	320.0375	299.9453	286.8735	292.6538	303.2037	323.9714	347.8149	365.6325 (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	
South	2.4500	46.7521	0.3700	0.6600	0.7700	19.3841	(78)
West	13.1100	19.6403	0.3700	0.6600	0.7700	43.5741	(80)

Solar gains	62.9583	116.9864	180.8176	250.4386	298.5362	302.6847	289.3150	253.5399	205.5094	135.3860	77.3086	52.5829 (83)
Total gains	439.1866	491.1774	542.2301	591.2879	618.5737	602.6301	576.1885	546.1937	508.7131	459.3574	425.1235	418.2154 (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	68.8882	69.0950	69.3031	70.3623	70.5780	71.6769	71.6769	71.9008	71.2333	70.5780	70.1479	69.7229	
alpha	5.5925	5.6063	5.6202	5.6908	5.7052	5.7785	5.7785	5.7934	5.7489	5.7052	5.6765	5.6482	
util living area													
	0.9961	0.9920	0.9794	0.9362	0.8271	0.6377	0.4706	0.5153	0.7731	0.9567	0.9917	0.9970	(86)
MIT	20.0353	20.1727	20.3977	20.6804	20.8872	20.9804	20.9971	20.9952	20.9429	20.6733	20.3054	20.0120	(87)
Th 2	20.1857	20.1879	20.1902	20.2014	20.2037	20.2149	20.2149	20.2172	20.2104	20.2037	20.1992	20.1946	(88)
util rest of house													
	0.9950	0.9897	0.9735	0.9183	0.7838	0.5678	0.3884	0.4305	0.7083	0.9407	0.9890	0.9962	(89)
MIT 2	18.8876	19.0891	19.4157	19.8216	20.0903	20.2008	20.2136	20.2149	20.1631	19.8201	19.2917	18.8604	(90)
Living area fraction									fLA = Living area / (4) =			0.2286	(91)
MIT	19.1499	19.3368	19.6402	20.0179	20.2725	20.3790	20.3927	20.3932	20.3414	20.0151	19.5234	19.1236	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1499	19.3368	19.6402	20.0179	20.2725	20.3790	20.3927	20.3932	20.3414	20.0151	19.5234	19.1236	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9866	0.9685	0.9135	0.7879	0.5828	0.4072	0.4499	0.7198	0.9361	0.9859	0.9946	(94)
Useful gains	436.1508	484.5997	525.1547	540.1139	487.3598	351.2375	234.6219	245.7163	366.1737	430.0229	419.1302	415.9580	(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													
	959.0499	929.5785	843.5494	702.9843	540.3784	358.7030	235.4135	247.0889	389.8145	593.4959	787.9290	952.2714	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	389.0369	299.0257	236.8856	117.2667	39.4458	0.0000	0.0000	0.0000	0.0000	121.6239	265.5351	399.0172	(98)
Space heating												1867.8371	(98)
Space heating per m2											(98) / (4) =	25.4127	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Space heating:		
Annual space heating requirement	1867.8371	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50	2801.7556	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1725.0729	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50	2587.6094	(310a)
Electricity used for heat distribution	53.8936	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	176.5378	(330a)
Total electricity for the above, kWh/year	176.5378	(331)
Electricity for lighting (calculated in Appendix L)	331.8261	(332)
Total delivered energy for all uses	5897.7289	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367a)
Space heating from Boilers	6021.6369	0.2160	1300.6736	(367)
Electrical energy for heat distribution	53.8936	0.5190	27.9708	(372)
Total CO2 associated with community systems			1328.6444	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1328.6444	(376)
Pumps and fans	176.5378	0.5190	91.6231	(378)
Energy for lighting	331.8261	0.5190	172.2177	(379)
Total CO2, kg/year			1592.4852	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			21.6700	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		21.6700	ZC1
Total Floor Area	TFA	73.5000	
Assumed number of occupants	N	2.3280	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5539	ZC2
CO2 emissions from cooking, equation (L16)		2.3792	ZC3
Total CO2 emissions		40.6031	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		40.6031	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.5000 (1b)	x	2.5000 (2b)	=	183.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	183.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1633	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4133	(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) =	0.3513	(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	0.4479	0.4391	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3513	0.3776	0.3952	0.4127	(22b)
Effective ac	0.6003	0.5964	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			15.5600	1.3258	20.6288			(27)
External Wall 1	48.5000	15.5600	32.9400	0.1800	5.9292			(29a)
P4	14.5000	1.8900	12.6100	0.1800	2.2698			(29a)
External Roof 1	72.5000		72.5000	0.1300	9.4250			(30)
Total net area of external elements Aum(A, m2)			135.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1428			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.5010	(36)
Total fabric heat loss						(33) + (36) =	57.6438	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.4005	36.1643	35.9328	34.8456	34.6421	33.6952	33.6952	33.5198	34.0599	34.6421	35.0537	35.4839	(38)
Heat transfer coeff	94.0443	93.8081	93.5766	92.4893	92.2859	91.3389	91.3389	91.1636	91.7037	92.2859	92.6975	93.1277	(39)
Average = Sum(39)m / 12 =												92.4884	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2795	1.2763	1.2732	1.2584	1.2556	1.2427	1.2427	1.2403	1.2477	1.2556	1.2612	1.2670	(40)
HLP (average)												1.2583	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.3280 (42)
Average daily hot water use (litres/day)		89.4903 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4393	94.8597	91.2801	87.7005	84.1209	80.5413	80.5413	84.1209	87.7005	91.2801	94.8597	98.4393	(44)
Energy conte	145.9827	127.6774	131.7516	114.8643	110.2150	95.1072	88.1308	101.1313	102.3392	119.2664	130.1886	141.3764	(45)
Energy content (annual)										Total = Sum(45)m =		1408.0310	(45)
Distribution loss (46)m = 0.15 x (45)m	21.8974	19.1516	19.7627	17.2296	16.5323	14.2661	13.2196	15.1697	15.3509	17.8900	19.5283	21.2065	(46)
Water storage loss:													
Store volume												1.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2134	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1152	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

```
Total storage loss
               3.5715    3.2259    3.5715    3.4563    3.5715    3.4563    3.5715    3.5715    3.4563    3.5715    3.4563    3.5715 (56)
If cylinder contains dedicated solar storage
               3.5715    3.2259    3.5715    3.4563    3.5715    3.4563    3.5715    3.5715    3.4563    3.5715    3.4563    3.5715 (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)
Total heat required for water heating calculated for each month
              172.8166  151.9144  158.5855  140.8325  137.0489  121.0754  114.9646  127.9652  128.3074  146.1003  156.1569  168.2103 (62)
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 (63)
                                                                                    Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
              172.8166  151.9144  158.5855  140.8325  137.0489  121.0754  114.9646  127.9652  128.3074  146.1003  156.1569  168.2103 (64)
                                                                                      Total per year (kWh/year) = Sum(64)m =   1723.9783 (64)
Heat gains from water heating, kWh/month
               70.0063   61.8424   65.2745   58.9670   58.1136   52.3977   50.7706   55.0933   54.8024   61.1232   64.0623   68.4748 (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         116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
               18.3451   16.2939   13.2511   10.0320    7.4990    6.3310    6.8408    8.8920   11.9348   15.1540   17.6869   18.8550 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
              205.3242  207.4549  202.0858  190.6556  176.2270  162.6662  153.6068  151.4762  156.8453  168.2754  182.7040  196.2648 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
               34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401 (69)
Pumps, fans     3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
              -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205 (71)
Water heating gains (Table 5)
               94.0946   92.0273   87.7346   81.8986   78.1097   72.7747   68.2400   74.0501   76.1144   82.1548   88.9755   92.0360 (72)
Total internal gains
              378.6841  376.6963  363.9917  343.5063  322.7559  302.6920  289.6078  295.3384  305.8147  326.5044  350.2866  368.0759 (73)


-------------------------------------------------------------------------------------------------------
6. Solar gains
-------------------------------------------------------------------------------------------------------

[Jan]                                  Area          Solar flux              g              FF            Access            Gains
                                       m2            Table 6a      Specific data  Specific data       factor                W
                                                        W/m2        or Table 6b    or Table 6c      Table 6d
-------------------------------------------------------------------------------------------------------
South                                2.4500           46.7521           0.6300           0.7000           0.7700           35.0057 (78)
West                                13.1100           19.6403           0.6300           0.7000           0.7700           78.6904 (80)
-------------------------------------------------------------------------------------------------------

Solar gains    113.6961  211.2655  326.5379  452.2664  539.1256  546.6174  522.4730  457.8669  371.1288  244.4931  139.6114   94.9593 (83)
Total gains    492.3802  587.9618  690.5296  795.7727  861.8815  849.3095  812.0809  753.2054  676.9435  570.9976  489.8980  463.0352 (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           54.2741   54.4107   54.5453   55.1865   55.3082   55.8816   55.8816   55.9891   55.6593   55.3082   55.0626   54.8083
alpha          4.6183    4.6274    4.6364    4.6791    4.6872    4.7254    4.7254    4.7326    4.7106    4.6872    4.6708    4.6539
util living area
               0.9968    0.9922    0.9781    0.9315    0.8224    0.6467    0.4857    0.5408    0.7959    0.9625    0.9932    0.9976 (86)

MIT           19.6521   19.8422   20.1483   20.5266   20.8127   20.9556   20.9906   20.9849   20.8821   20.4858   19.9957   19.6205 (87)
Th 2          19.8569   19.8594   19.8619   19.8736   19.8758   19.8860   19.8860   19.8879   19.8821   19.8758   19.8714   19.8667 (88)
util rest of house
               0.9956    0.9895    0.9704    0.9076    0.7653    0.5508    0.3675    0.4180    0.7119    0.9446    0.9904    0.9967 (89)
MIT 2         18.0783   18.3566   18.7998   19.3364   19.7015   19.8583   19.8828   19.8821   19.7932   19.2943   18.5898   18.0389 (90)
Living area fraction                                                                                 fLA = Living area / (4) =      0.2286 (91)
MIT           18.4380   18.6962   19.1080   19.6085   19.9555   20.1091   20.1360   20.1342   20.0420   19.5666   18.9111   18.4004 (92)
Temperature adjustment                                                                                                      0.0000
adjusted MIT  18.4380   18.6962   19.1080   19.6085   19.9555   20.1091   20.1360   20.1342   20.0420   19.5666   18.9111   18.4004 (93)


-------------------------------------------------------------------------------------------------------
8. Space heating requirement
-------------------------------------------------------------------------------------------------------

                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Utilisation     0.9936    0.9857    0.9636    0.9008    0.7698    0.5711    0.3946    0.4461    0.7254    0.9380    0.9869    0.9951 (94)
Useful gains  489.2132  579.5308  665.4042  716.8040  663.5002  485.0034  320.4718  336.0239  491.0663  535.6123  483.5045  460.7522 (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
             1329.6004 1294.1924 1179.8175  990.4192  761.8646  503.1968  322.9779  340.4210  544.9079  827.4942 1094.8610 1322.4529 (97)
Month fracti    1.0000    1.0000    1.0000    1.0000    1.0000    0.0000    0.0000    0.0000    0.0000    1.0000    1.0000    1.0000 (97a)
Space heating kWh
              625.2481  480.2526  382.7235  197.0030   73.1832    0.0000    0.0000    0.0000    0.0000  217.1601  440.1766  641.1053 (98)
Space heating                                                                                                            3056.8524 (98)
Space heating per m2                                                                                    (98) / (4) =     41.5898 (99)


-------------------------------------------------------------------------------------------------------
8c. Space cooling requirement
-------------------------------------------------------------------------------------------------------
Not applicable
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3269.3609	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	625.2481	480.2526	382.7235	197.0030	73.1832	0.0000	0.0000	0.0000	0.0000	217.1601	440.1766	641.1053	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	668.7145	513.6392	409.3300	210.6984	78.2708	0.0000	0.0000	0.0000	0.0000	232.2568	470.7772	685.6741	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	172.8166	151.9144	158.5855	140.8325	137.0489	121.0754	114.9646	127.9652	128.3074	146.1003	156.1569	168.2103	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.9464	87.6750	87.0793	85.7092	83.2253	79.8000	79.8000	79.8000	79.8000	85.8692	87.4302	88.0463	(217)
Fuel for water heating, kWh/month													
	196.5021	173.2700	182.1162	164.3143	164.6721	151.7236	144.0660	160.3574	160.7863	170.1428	178.6076	191.0476	(219)
Water heating fuel used												2037.6060	(219)
Annual totals kWh/year													
Space heating fuel - main system												3269.3609	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.9800	(232)
Total delivered energy for all uses												5705.9468	(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	3269.3609	0.2160	706.1820	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2037.6060	0.2160	440.1229	(264)
Space and water heating			1146.3048	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	323.9800	0.5190	168.1456	(268)
Total CO2, kg/m2/year			1353.3755	(272)
Emissions per m2 for space and water heating			15.5960	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.2877	(272b)
Emissions per m2 for pumps and fans			0.5296	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5960 * 1.00) + 2.2877 + 0.5296, rounded to 2 d.p.			18.4100	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A1.03.05	**Issued on Date**	21/08/2026
Assessment Reference	Be Lean	**Prop Type Ref**	Type F
Property	A1.03.05, High Road West Harringey, London		

SAP Rating	85 B	**DER**	14.92	**TER**	17.17
Environmental	90 B	**% DER<TER**	13.12		
CO_2 Emissions (t/year)	0.72	**DFEE**	35.57	**TFEE**	44.02
General Requirements Compliance	Pass	**% DFEE<TFEE**	19.19		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 59 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.17 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.92 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)44.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)35.6 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.41 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.86 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 5.76 m², No overhang
Windows facing East: 7.35 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.7000 (1b)	x	2.5000 (2b)	=	146.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			13.1100	0.8127	10.6544			(27)
External Wall 1	44.0000	13.1100	30.8900	0.1200	3.7068			(29a)
P4	4.2500	1.8900	2.3600	0.2100	0.4956			(29a)
P3	10.5000		10.5000	0.4100	4.3050			(29a)
Total net area of external elements Aum(A, m2)			58.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0518			(33)
Party Wall 1			18.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	208.6400	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.2579	(36)
Total fabric heat loss (33) + (36) =	28.3097	(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	13.5627	13.4084	13.2540	12.4822	12.3278	11.5560	11.5560	11.4016	11.8647	12.3278	12.6366	12.9453	(38)
Heat transfer coeff	41.8724	41.7181	41.5637	40.7919	40.6375	39.8657	39.8657	39.7114	40.1744	40.6375	40.9463	41.2550	(39)
Average = Sum(39)m / 12 =												40.7533	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7133	0.7107	0.7081	0.6949	0.6923	0.6791	0.6791	0.6765	0.6844	0.6923	0.6976	0.7028	(40)
HLP (average)												0.6943	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9446 (42)
Average daily hot water use (litres/day)	80.3854 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.4240	85.2085	81.9931	78.7777	75.5623	72.3469	72.3469	75.5623	78.7777	81.9931	85.2085	88.4240	(44)
Energy conte	131.1302	114.6873	118.3470	103.1778	99.0015	85.4308	79.1642	90.8421	91.9270	107.1321	116.9430	126.9926	(45)
Energy content (annual)										Total = Sum(45)m =		1264.7756	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6695	17.2031	17.7521	15.4767	14.8502	12.8146	11.8746	13.6263	13.7891	16.0698	17.5415	19.0489	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Store volume 1.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)
Volume factor from Table 2a 4.9324 (52)
Temperature factor from Table 2b 1.0000 (53)
Enter (49) or (54) in (55) 0.1182 (55)
Total storage loss

3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(56)

If cylinder contains dedicated solar storage

3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(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)

Total heat required for water heating calculated for each month

158.0570	139.0083	145.2739	129.2360	125.9284	111.4891	106.0911	117.7689	117.9853	134.0589	143.0013	153.9194	(62)
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	(63)
							Solar input (sum of months) = Sum(63)m =				0.0000	(63)

Output from w/h

158.0570	139.0083	145.2739	129.2360	125.9284	111.4891	106.0911	117.7689	117.9853	134.0589	143.0013	153.9194	(64)
							Total per year (kWh/year) = Sum(64)m =				1581.8176	(64)

Heat gains from water heating, kWh/month

65.1423	57.5903	60.8919	55.1532	54.4595	49.2523	47.8636	51.7465	51.4123	57.1629	59.7302	63.7665	(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	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	(66)

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

15.3923	13.6713	11.1183	8.4173	6.2920	5.3120	5.7398	7.4608	10.0138	12.7149	14.8401	15.8201	(67)

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

169.6568	171.4173	166.9809	157.5363	145.6141	134.4090	126.9233	125.1628	129.5992	139.0438	150.9660	162.1711	(68)

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

32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	(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)

-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	(71)

Water heating gains (Table 5)

87.5568	85.6999	81.8439	76.6017	73.1982	68.4060	64.3328	69.5517	71.4060	76.8319	82.9586	85.7077	(72)

Total internal gains

324.7757	322.9583	312.1128	294.7249	277.2741	260.2967	249.1656	254.3450	263.1888	280.7603	300.9344	315.8686	(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	
North	5.7600	10.6334	0.3700	0.6600	0.7700	10.3651	(74)
East	7.3500	19.6403	0.3700	0.6600	0.7700	24.4294	(76)

Solar gains 34.7945	67.5974	112.3610	168.8471	213.5003	221.9678	209.8868	175.5135	132.0027	80.2850	43.2473	28.7304	(83)
Total gains 359.5702	390.5557	424.4738	463.5721	490.7744	482.2645	459.0524	429.8585	395.1915	361.0453	344.1817	344.5991	(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	81.2465	81.5472	81.8500	83.3987	83.7155	85.3362	85.3362	85.6680	84.6805	83.7155	83.0843	82.4625	
alpha	6.4164	6.4365	6.4567	6.5599	6.5810	6.6891	6.6891	6.7112	6.6454	6.5810	6.5390	6.4975	
util living area	0.9931	0.9870	0.9668	0.8933	0.7333	0.5255	0.3817	0.4242	0.6802	0.9258	0.9849	0.9946	(86)
MIT	20.3068	20.4198	20.6099	20.8383	20.9632	20.9965	20.9996	20.9993	20.9829	20.8201	20.5320	20.2885	(87)
Th 2	20.3291	20.3314	20.3337	20.3453	20.3476	20.3593	20.3593	20.3616	20.3546	20.3476	20.3430	20.3384	(88)
util rest of house	0.9915	0.9838	0.9588	0.8708	0.6915	0.4743	0.3263	0.3657	0.6240	0.9047	0.9807	0.9933	(89)
MIT 2	19.3953	19.5608	19.8346	20.1570	20.3118	20.3568	20.3591	20.3613	20.3407	20.1405	19.7333	19.3760	(90)
Living area fraction									fLA = Living area / (4) =			0.4140	(91)
MIT	19.7726	19.9164	20.1556	20.4390	20.5814	20.6216	20.6243	20.6254	20.6065	20.4218	20.0639	19.7537	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7726	19.9164	20.1556	20.4390	20.5814	20.6216	20.6243	20.6254	20.6065	20.4218	20.0639	19.7537	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9897	0.9815	0.9564	0.8742	0.7069	0.4954	0.3493	0.3899	0.6464	0.9074	0.9785	0.9918	(94)
Useful gains	355.8638	383.3140	405.9525	405.2769	346.9221	238.9162	160.3387	167.6110	255.4693	327.6045	336.7797	341.7632	(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	647.8755	626.4557	567.5766	470.6984	360.9202	240.0555	160.4308	167.7965	261.3968	399.1345	530.8239	641.6694	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	217.2567	163.3912	120.2484	47.1035	10.4146	0.0000	0.0000	0.0000	0.0000	53.2184	139.7118	223.1302	(98)
Space heating												974.4749	(98)
Space heating per m2											(98) / (4) =	16.6009	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	974.4749	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1023.1986	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1581.8176	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1660.9085	(310a)
Electricity used for heat distribution	26.8411	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	140.9901	(330a)
Total electricity for the above, kWh/year	140.9901	(331)
Electricity for lighting (calculated in Appendix L)	271.8336	(332)
Total delivered energy for all uses	3096.9308	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367a)
Space heating from Boilers	2999.0024	0.2160	647.7845	(367)
Electrical energy for heat distribution	26.8411	0.5190	13.9305	(372)
Total CO2 associated with community systems			661.7150	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			661.7150	(376)
Pumps and fans	140.9901	0.5190	73.1738	(378)
Energy for lighting	271.8336	0.5190	141.0816	(379)
Total CO2, kg/year			875.9705	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.9200	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.9200	ZC1
Total Floor Area	TFA	58.7000	
Assumed number of occupants	N	1.9446	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1269	ZC2
CO2 emissions from cooking, equation (L16)		2.8223	ZC3
Total CO2 emissions		34.8693	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		34.8693	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.7000 (1b)	x	2.5000 (2b)	=	146.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1363	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3863	(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) =	0.3283	(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	0.4186	0.4104	0.4022	0.3612	0.3530	0.3119	0.3119	0.3037	0.3283	0.3530	0.3694	0.3858	(22b)
Effective ac	0.5876	0.5842	0.5809	0.5652	0.5623	0.5486	0.5486	0.5461	0.5539	0.5623	0.5682	0.5744	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			12.7900	1.3258	16.9564			(27)
External Wall 1	44.0000	12.7900	31.2100	0.1800	5.6178			(29a)
P4	4.2500	1.8900	2.3600	0.1800	0.4248			(29a)
P3	10.5000		10.5000	0.1800	1.8900			(29a)
Total net area of external elements Aum(A, m2)			58.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7790			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6570	(36)
Total fabric heat loss					(33) + (36) =		32.4360	(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	28.4574	28.2926	28.1311	27.3724	27.2305	26.5697	26.5697	26.4473	26.8242	27.2305	27.5176	27.8178	(38)
Heat transfer coeff	60.8934	60.7286	60.5671	59.8085	59.6665	59.0057	59.0057	58.8834	59.2603	59.6665	59.9537	60.2539	(39)
Average = Sum(39)m / 12 =												59.8078	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0374	1.0346	1.0318	1.0189	1.0165	1.0052	1.0052	1.0031	1.0095	1.0165	1.0214	1.0265	(40)
HLP (average)												1.0189	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.9446 (42)
Average daily hot water use (litres/day)		80.3854 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.4240	85.2085	81.9931	78.7777	75.5623	72.3469	72.3469	75.5623	78.7777	81.9931	85.2085	88.4240	(44)
Energy conte	131.1302	114.6873	118.3470	103.1778	99.0015	85.4308	79.1642	90.8421	91.9270	107.1321	116.9430	126.9926	(45)
Energy content (annual)										Total = Sum(45)m =		1264.7756	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6695	17.2031	17.7521	15.4767	14.8502	12.8146	11.8746	13.6263	13.7891	16.0698	17.5415	19.0489	(46)
Water storage loss:													
Store volume												1.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2134	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1152	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.5715 3.2259 3.5715 3.4563 3.5715 3.4563 3.5715 3.5715 3.4563 3.5715 3.4563 3.5715 (56)
If cylinder contains dedicated solar storage
3.5715 3.2259 3.5715 3.4563 3.5715 3.4563 3.5715 3.5715 3.4563 3.5715 3.4563 3.5715 (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)
Total heat required for water heating calculated for each month
157.9641 138.9243 145.1809 129.1461 125.8354 111.3991 105.9981 117.6760 117.8953 133.9660 142.9113 153.8265 (62)
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 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
157.9641 138.9243 145.1809 129.1461 125.8354 111.3991 105.9981 117.6760 117.8953 133.9660 142.9113 153.8265 (64)
Total per year (kWh/year) = Sum(64)m = 1580.7229 (64)
Heat gains from water heating, kWh/month
65.0679 57.5232 60.8175 55.0812 54.3851 49.1804 47.7892 51.6721 51.3404 57.0885 59.6582 63.6921 (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	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
15.1355 13.4432 10.9328 8.2768 6.1870 5.2233 5.6440 7.3363 9.8467 12.5027 14.5925 15.5562 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
169.6568 171.4173 166.9809 157.5363 145.6141 134.4090 126.9233 125.1628 129.5992 139.0438 150.9660 162.1711 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 (71)
Water heating gains (Table 5)
87.4568 85.5999 81.7439 76.5017 73.0983 68.3061 64.2328 69.4517 71.3060 76.7319 82.8586 85.6077 (72)
Total internal gains
327.4189 325.6302 314.8273 297.4845 280.0692 263.1081 251.9698 257.1206 265.9217 283.4481 303.5868 318.5047 (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	
North	5.6200	10.6334	0.6300	0.7000	0.7700	18.2633	(74)
East	7.1700	19.6403	0.6300	0.7000	0.7700	43.0366	(76)

Solar gains	61.3000	119.0909	197.9542	297.4710	376.1415	391.0601	369.7756	309.2163	232.5587	141.4435	76.1918	50.6164	(83)
Total gains	388.7188	444.7211	512.7815	594.9555	656.2106	654.1682	621.7454	566.3368	498.4805	424.8917	379.7786	369.1211	(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	66.9430	67.1246	67.3037	68.1574	68.3195	69.0846	69.0846	69.2282	68.7879	68.3195	67.9923	67.6536	
alpha	5.4629	5.4750	5.4869	5.5438	5.5546	5.6056	5.6056	5.6152	5.5859	5.5546	5.5328	5.5102	

util living area
0.9968 0.9927 0.9776 0.9169 0.7685 0.5658 0.4157 0.4743 0.7534 0.9580 0.9929 0.9975 (86)

MIT	19.9718	20.1236	20.3837	20.7079	20.9170	20.9876	20.9981	20.9963	20.9452	20.6499	20.2525	19.9458	(87)
Th 2	20.0523	20.0546	20.0569	20.0676	20.0696	20.0790	20.0790	20.0807	20.0754	20.0696	20.0656	20.0613	(88)

util rest of house
0.9957 0.9903 0.9702 0.8916 0.7131 0.4893 0.3297 0.3816 0.6763 0.9398 0.9902 0.9967 (89)

MIT 2	18.6835	18.9059	19.2820	19.7377	19.9942	20.0714	20.0783	20.0793	20.0346	19.6716	19.1027	18.6522	(90)

Living area fraction fLA = Living area / (4) = 0.4140 (91)

MIT	19.2168	19.4099	19.7380	20.1394	20.3762	20.4507	20.4591	20.4589	20.4116	20.0766	19.5787	19.1878	(92)

Temperature adjustment 0.0000
adjusted MIT 19.2168 19.4099 19.7380 20.1394 20.3762 20.4507 20.4591 20.4589 20.4116 20.0766 19.5787 19.1878 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9881	0.9672	0.8938	0.7323	0.5207	0.3654	0.4201	0.7060	0.9399	0.9883	0.9957	(94)
Useful gains	386.5551	439.4456	495.9468	531.7917	480.5549	340.6236	227.1909	237.9094	351.9228	399.3767	375.3335	367.5391	(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
908.3352 881.1696 801.7895 672.2086 517.6777 345.2223 227.7091 239.0005 374.0252 565.4371 748.1416 903.0704 (97)

Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)

Space heating kWh
388.2044 296.8385 227.5470 101.1002 27.6194 0.0000 0.0000 0.0000 0.0000 123.5490 268.4218 398.4353 (98)
Space heating 1831.7155 (98)
Space heating per m2 (98) / (4) = 31.2047 (99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1959.0540	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	388.2044	296.8385	227.5470	101.1002	27.6194	0.0000	0.0000	0.0000	0.0000	123.5490	268.4218	398.4353	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	415.1918	317.4743	243.3657	108.1285	29.5394	0.0000	0.0000	0.0000	0.0000	132.1379	287.0821	426.1340	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	157.9641	138.9243	145.1809	129.1461	125.8354	111.3991	105.9981	117.6760	117.8953	133.9660	142.9113	153.8265	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1214	86.7900	86.0080	84.1697	81.5351	79.8000	79.8000	79.8000	79.8000	84.5988	86.4716	87.2417	(217)
Fuel for water heating, kWh/month													
	181.3149	160.0696	168.7992	153.4354	154.3329	139.5978	132.8297	147.4636	147.7385	158.3544	165.2696	176.3222	(219)
Water heating fuel used												1885.5277	(219)
Annual totals kWh/year													
Space heating fuel - main system												1959.0540	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												267.2977	(232)
Total delivered energy for all uses												4186.8793	(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	1959.0540	0.2160	423.1557	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1885.5277	0.2160	407.2740	(264)
Space and water heating			830.4296	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	267.2977	0.5190	138.7275	(268)
Total CO2, kg/m2/year			1008.0821	(272)
Emissions per m2 for space and water heating			14.1470	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3633	(272b)
Emissions per m2 for pumps and fans			0.6631	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1470 * 1.00) + 2.3633 + 0.6631, rounded to 2 d.p.			17.1700	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A1.03.01	**Issued on Date**	21/08/2026
Assessment Reference	Be Lean	**Prop Type Ref**	Type D
Property	A1.03.01, High Road West Harringey, London		

SAP Rating	84 B	**DER**	15.98	**TER**	17.93
Environmental	90 B	**% DER<TER**	10.88		
CO_2 Emissions (t/year)	0.70	**DFEE**	38.26	**TFEE**	45.40
General Requirements Compliance	Pass	**% DFEE<TFEE**	15.73		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 53 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.93 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.98 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)45.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.3 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.41 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.86 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 5.76 m², No overhang
Windows facing East: 7.35 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.7000 (1b)	x	2.5000 (2b)	=	131.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			13.1100	0.8127	10.6544			(27)
External Wall 1	44.0000	13.1100	30.8900	0.1200	3.7068			(29a)
P4	4.2500	1.8900	2.3600	0.2100	0.4956			(29a)
P3	10.5000		10.5000	0.4100	4.3050			(29a)
Total net area of external elements Aum(A, m2)			58.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0518			(33)
Party Wall 1			18.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	209.7500 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.8579 (36)
Total fabric heat loss (33) + (36) =	28.9097 (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	12.1764	12.0378	11.8992	11.2063	11.0677	10.3748	10.3748	10.2362	10.6520	11.0677	11.3449	11.6221	(38)
Heat transfer coeff	41.0861	40.9475	40.8090	40.1160	39.9775	39.2845	39.2845	39.1459	39.5617	39.9775	40.2546	40.5318	(39)

Average = Sum(39)m / 12 = 40.0814 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7796	0.7770	0.7744	0.7612	0.7586	0.7454	0.7454	0.7428	0.7507	0.7586	0.7638	0.7691	(40)
HLP (average)												0.7606	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7697 (42)
Average daily hot water use (litres/day)	76.2308 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	83.8539	80.8046	77.7554	74.7062	71.6569	68.6077	68.6077	71.6569	74.7062	77.7554	80.8046	83.8539	(44)
Energy conte	124.3529	108.7598	112.2304	97.8452	93.8848	81.0154	75.0727	86.1470	87.1759	101.5951	110.8990	120.4291	(45)

Energy content (annual)	Total = Sum(45)m =	1199.4071 (45)
Distribution loss (46)m = 0.15 x (45)m		

	18.6529	16.3140	16.8346	14.6768	14.0827	12.1523	11.2609	12.9221	13.0764	15.2393	16.6348	18.0644	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Store volume 1.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)
Volume factor from Table 2a 4.9324 (52)
Temperature factor from Table 2b 1.0000 (53)
Enter (49) or (54) in (55) 0.1182 (55)
Total storage loss

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (56)

If cylinder contains dedicated solar storage

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (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)

Total heat required for water heating calculated for each month

	151.2797	133.0808	139.1572	123.9034	120.8116	107.0737	101.9995	113.0739	113.2341	128.5219	136.9572	147.3560 (62)
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 (63)

Solar input (sum of months) = Sum(63)m = 0.0000 (63)

Output from w/h

	151.2797	133.0808	139.1572	123.9034	120.8116	107.0737	101.9995	113.0739	113.2341	128.5219	136.9572	147.3560 (64)

Total per year (kWh/year) = Sum(64)m = 1516.4491 (64)

Heat gains from water heating, kWh/month

	62.8888	55.6195	58.8581	53.3801	52.7582	47.7842	46.5032	50.1854	49.8326	55.3218	57.7205	61.5842 (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	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	(66)

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

	13.8133	12.2689	9.9777	7.5538	5.6465	4.7670	5.1510	6.6954	8.9866	11.4105	13.3177	14.1972 (67)

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

	154.2407	155.8412	151.8079	143.2215	132.3827	122.1957	115.3902	113.7897	117.8230	126.4094	137.2482	147.4352 (68)

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

	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486 (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)

	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887 (71)

Water heating gains (Table 5)

	84.5280	82.7671	79.1103	74.1390	70.9115	66.3670	62.5042	67.4534	69.2119	74.3573	80.1674	82.7744 (72)

Total internal gains

	302.1277	300.4229	290.4417	274.4601	258.4865	242.8755	232.5912	237.4843	245.5672	261.7230	280.2791	293.9526 (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	
North	5.7600	10.6334	0.3700	0.6600	0.7700	10.3651	(74)
East	7.3500	19.6403	0.3700	0.6600	0.7700	24.4294	(76)

Solar gains	34.7945	67.5974	112.3610	168.8471	213.5003	221.9678	209.8868	175.5135	132.0027	80.2850	43.2473	28.7304 (83)
Total gains	336.9223	368.0203	402.8027	443.3072	471.9868	464.8433	442.4780	412.9978	377.5699	342.0080	323.5264	322.6830 (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	74.7334	74.9864	75.2410	76.5406	76.8060	78.1607	78.1607	78.4374	77.6131	76.8060	76.2771	75.7555	
alpha	5.9822	5.9991	6.0161	6.1027	6.1204	6.2107	6.2107	6.2292	6.1742	6.1204	6.0851	6.0504	
util living area	0.9927	0.9864	0.9661	0.8950	0.7402	0.5353	0.3900	0.4346	0.6930	0.9285	0.9846	0.9942	(86)
MIT	20.2217	20.3440	20.5512	20.8030	20.9501	20.9943	20.9993	20.9987	20.9748	20.7816	20.4648	20.2012	(87)
Th 2	20.2710	20.2733	20.2756	20.2871	20.2894	20.3009	20.3009	20.3032	20.2963	20.2894	20.2848	20.2802	(88)
util rest of house	0.9909	0.9830	0.9578	0.8718	0.6960	0.4791	0.3284	0.3695	0.6327	0.9071	0.9802	0.9928	(89)
MIT 2	19.2262	19.4050	19.7032	20.0581	20.2408	20.2968	20.3006	20.3025	20.2759	20.0382	19.5899	19.2034	(90)
Living area fraction									fLA = Living area / (4) =			0.3169	(91)
MIT	19.5417	19.7026	19.9719	20.2942	20.4656	20.5178	20.5220	20.5231	20.4973	20.2738	19.8671	19.5196	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5417	19.7026	19.9719	20.2942	20.4656	20.5178	20.5220	20.5231	20.4973	20.2738	19.8671	19.5196	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9885	0.9797	0.9536	0.8720	0.7073	0.4967	0.3479	0.3901	0.6505	0.9065	0.9770	0.9908	(94)
Useful gains	333.0541	360.5464	384.1227	386.5694	333.8540	230.8962	153.9298	161.1215	245.6059	310.0411	316.0747	319.6996	(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	626.2224	606.1283	549.7759	457.0887	350.4269	232.4783	154.0732	161.4043	253.0899	386.7322	513.9353	620.9304	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	218.1172	165.0310	123.2459	50.7739	12.3302	0.0000	0.0000	0.0000	0.0000	57.0582	142.4597	224.1157	(98)
Space heating												993.1319	(98)
Space heating per m2											(98) / (4) =	18.8450	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	993.1319	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1042.7885	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1516.4491	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1592.2716	(310a)
Electricity used for heat distribution	26.3506	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	126.5788	(330a)
Total electricity for the above, kWh/year	126.5788	(331)
Electricity for lighting (calculated in Appendix L)	243.9475	(332)
Total delivered energy for all uses	3005.5864	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367a)
Space heating from Boilers	2944.2012	0.2160	635.9475	(367)
Electrical energy for heat distribution	26.3506	0.5190	13.6760	(372)
Total CO2 associated with community systems			649.6234	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			649.6234	(376)
Pumps and fans	126.5788	0.5190	65.6944	(378)
Energy for lighting	243.9475	0.5190	126.6088	(379)
Total CO2, kg/year			841.9266	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.9800	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.9800	ZC1
Total Floor Area	TFA	52.7000	
Assumed number of occupants	N	1.7697	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3434	ZC2
CO2 emissions from cooking, equation (L16)		3.0640	ZC3
Total CO2 emissions		36.3874	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.3874	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.7000 (1b)	x	2.5000 (2b)	=	131.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1518	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4018	(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) =	0.3415	(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	0.4355	0.4269	0.4184	0.3757	0.3671	0.3245	0.3245	0.3159	0.3415	0.3671	0.3842	0.4013	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			11.2900	1.3258	14.9678			(27)
External Wall 1	44.0000	11.2900	32.7100	0.1800	5.8878			(29a)
P4	4.2500	1.8900	2.3600	0.1800	0.4248			(29a)
P3	10.5000		10.5000	0.1800	1.8900			(29a)
Total net area of external elements Aum(A, m2)			58.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.0604			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6570	(36)
Total fabric heat loss						(33) + (36) =	30.7174	(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	25.8608	25.7008	25.5439	24.8069	24.6691	24.0272	24.0272	23.9084	24.2745	24.6691	24.9480	25.2396	(38)
Heat transfer coeff	56.5783	56.4182	56.2613	55.5244	55.3865	54.7446	54.7446	54.6258	54.9919	55.3865	55.6654	55.9570	(39)
Average = Sum(39)m / 12 =												55.5237	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0736	1.0706	1.0676	1.0536	1.0510	1.0388	1.0388	1.0365	1.0435	1.0510	1.0563	1.0618	(40)
HLP (average)												1.0536	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7697	(42)
Average daily hot water use (litres/day)	76.2308	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	83.8539	80.8046	77.7554	74.7062	71.6569	68.6077	68.6077	71.6569	74.7062	77.7554	80.8046	83.8539	(44)
Energy conte	124.3529	108.7598	112.2304	97.8452	93.8848	81.0154	75.0727	86.1470	87.1759	101.5951	110.8990	120.4291	(45)
Energy content (annual)										Total = Sum(45)m =		1199.4071	(45)
Distribution loss (46)m = 0.15 x (45)m	18.6529	16.3140	16.8346	14.6768	14.0827	12.1523	11.2609	12.9221	13.0764	15.2393	16.6348	18.0644	(46)

Water storage loss:		
Store volume	1.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2134	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.1152	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss													
	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715	(56)
If cylinder contains dedicated solar storage													
	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715	(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)
Total heat required for water heating calculated for each month													
	151.1867	132.9969	139.0643	123.8134	120.7186	106.9837	101.9066	112.9809	113.1441	128.4290	136.8672	147.2630	(62)
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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	151.1867	132.9969	139.0643	123.8134	120.7186	106.9837	101.9066	112.9809	113.1441	128.4290	136.8672	147.2630	(64)
									Total per year (kWh/year) = Sum(64)m =			1515.3544	(64)
Heat gains from water heating, kWh/month													
	62.8144	55.5523	58.7837	53.3081	52.6838	47.7122	46.4288	50.1110	49.7606	55.2475	57.6485	61.5098	(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	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.7712	12.2315	9.9473	7.5308	5.6293	4.7525	5.1353	6.6750	8.9592	11.3757	13.2772	14.1540	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	154.2407	155.8412	151.8079	143.2215	132.3827	122.1957	115.3902	113.7897	117.8230	126.4094	137.2482	147.4352	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	(71)
Water heating gains (Table 5)													
	84.4280	82.6671	79.0104	74.0391	70.8115	66.2670	62.4043	67.3535	69.1119	74.2573	80.0674	82.6744	(72)
Total internal gains													
	304.9857	303.2855	293.3113	277.3371	261.3693	245.7610	235.4755	240.3639	248.4399	264.5883	283.1385	296.8093	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9600	10.6334	0.6300	0.7000	0.7700	16.1185	(74)
East	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(76)

Solar gains	54.1132	105.1290	174.7462	262.5939	332.0384	345.2067	326.4183	272.9613	205.2932	124.8610	67.2592	44.6822	(83)
Total gains	359.0989	408.4145	468.0575	539.9310	593.4077	590.9677	561.8939	513.3252	453.7330	389.4493	350.3977	341.4915	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.6843	64.8678	65.0487	65.9120	66.0761	66.8508	66.8508	66.9963	66.5503	66.0761	65.7450	65.4024	
alpha	5.3123	5.3245	5.3366	5.3941	5.4051	5.4567	5.4567	5.4664	5.4367	5.4051	5.3830	5.3602	
util living area													
	0.9964	0.9921	0.9773	0.9198	0.7786	0.5784	0.4263	0.4844	0.7605	0.9575	0.9923	0.9972	(86)
MIT	19.9390	20.0902	20.3517	20.6822	20.9037	20.9845	20.9975	20.9953	20.9375	20.6314	20.2275	19.9141	(87)
Th 2	20.0225	20.0250	20.0274	20.0389	20.0411	20.0511	20.0511	20.0530	20.0473	20.0411	20.0367	20.0321	(88)
util rest of house													
	0.9952	0.9896	0.9699	0.8948	0.7227	0.4989	0.3357	0.3874	0.6822	0.9388	0.9893	0.9963	(89)
MIT 2	18.6138	18.8354	19.2136	19.6794	19.9531	20.0416	20.0503	20.0511	20.0006	19.6230	19.0449	18.5846	(90)
Living area fraction										fLA = Living area / (4) =		0.3169	(91)
MIT	19.0337	19.2330	19.5742	19.9971	20.2543	20.3404	20.3504	20.3503	20.2975	19.9425	19.4197	19.0059	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0337	19.2330	19.5742	19.9971	20.2543	20.3404	20.3504	20.3503	20.2975	19.9425	19.4197	19.0059	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9868	0.9654	0.8936	0.7360	0.5237	0.3644	0.4182	0.7043	0.9365	0.9866	0.9949	(94)
Useful gains	356.7564	403.0204	451.8840	482.4729	436.7442	309.4844	204.7794	214.6887	319.5435	364.7055	345.7190	339.7497	(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													
	833.6091	808.6431	735.5723	616.1610	473.7937	314.2540	205.3161	215.7888	340.8116	517.4504	685.7794	828.4925	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	354.7784	272.5784	211.0641	96.2554	27.5649	0.0000	0.0000	0.0000	0.0000	113.6422	244.8435	363.6246	(98)
Space heating												1684.3517	(98)
Space heating per m2											(98) / (4) =	31.9611	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1801.4456	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	354.7784	272.5784	211.0641	96.2554	27.5649	0.0000	0.0000	0.0000	0.0000	113.6422	244.8435	363.6246	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	379.4422	291.5277	225.7370	102.9470	29.4812	0.0000	0.0000	0.0000	0.0000	121.5425	261.8647	388.9034	(211)
Water heating 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	(215)
Water heating													
Water heating requirement	151.1867	132.9969	139.0643	123.8134	120.7186	106.9837	101.9066	112.9809	113.1441	128.4290	136.8672	147.2630	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0137	86.6884	85.9240	84.1518	81.5933	79.8000	79.8000	79.8000	79.8000	84.4896	86.3485	87.1323	(217)
Fuel for water heating, kWh/month	173.7505	153.4195	161.8456	147.1311	147.9517	134.0648	127.7025	141.5801	141.7846	152.0057	158.5056	169.0107	(219)
Water heating fuel used												1808.7523	(219)
Annual totals kWh/year													
Space heating fuel - main system												1801.4456	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.2043	(232)
Total delivered energy for all uses												3928.4022	(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	1801.4456	0.2160	389.1123	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1808.7523	0.2160	390.6905	(264)
Space and water heating			779.8027	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	243.2043	0.5190	126.2230	(268)
Total CO2, kg/m2/year			944.9508	(272)
Emissions per m2 for space and water heating			14.7970	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.3951	(272b)
Emissions per m2 for pumps and fans			0.7386	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7970 * 1.00) + 2.3951 + 0.7386, rounded to 2 d.p.			17.9300	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A1.02.03	**Issued on Date**	21/08/2026
Assessment Reference	Be Lean	**Prop Type Ref**	Type C
Property	A1.02.03, High Road West Harringey, London		

SAP Rating	85 B	**DER**	15.63	**TER**	14.42
Environmental	88 B	**% DER<TER**	-8.40		
CO_2 Emissions (t/year)	1.12	**DFEE**	30.33	**TFEE**	39.21
General Requirements Compliance	Fail	**% DFEE<TFEE**	22.64		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 89 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.42 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.63 kgCO□/m²Fail
Excess emissions =1.21 kgCO□/m² (8.4%)

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)39.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)30.3 kWh/m²/yrOK
---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.21 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.86 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction
---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK
---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None
---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework
---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK
---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK
---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 4.90 m², No overhang
Windows facing East: 13.11 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None
---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	88.9000 (1b)	x	2.5000 (2b)	=	222.2500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	222.2500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.6500	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			18.0100	0.8127	14.6366			(27)
External Wall 1	53.0000	18.0100	34.9900	0.1200	4.1988			(29a)
P4	15.7500	1.8900	13.8600	0.2100	2.9106			(29a)
Total net area of external elements Aum(A, m2)			68.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.6360			(33)
Party Wall 1			36.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	216.5000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.9226	(36)
Total fabric heat loss (33) + (36) =	32.5586	(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	19.8002	19.5870	19.3739	18.3081	18.0950	17.0292	17.0292	16.8161	17.4555	18.0950	18.5213	18.9476	(38)
Heat transfer coeff	52.3588	52.1456	51.9325	50.8667	50.6536	49.5878	49.5878	49.3747	50.0141	50.6536	51.0799	51.5062	(39)
Average = Sum(39)m / 12 =												50.8134	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5890	0.5866	0.5842	0.5722	0.5698	0.5578	0.5578	0.5554	0.5626	0.5698	0.5746	0.5794	(40)
HLP (average)												0.5716	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6104 (42)
Average daily hot water use (litres/day)	96.1961 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.8157	101.9679	98.1200	94.2722	90.4243	86.5765	86.5765	90.4243	94.2722	98.1200	101.9679	105.8157	(44)
Energy conte	156.9217	137.2447	141.6242	123.4714	118.4738	102.2339	94.7347	108.7095	110.0078	128.2035	139.9441	151.9703	(45)
Energy content (annual)											Total = Sum(45)m =	1513.5394	(45)
Distribution loss (46)m = 0.15 x (45)m	23.5382	20.5867	21.2436	18.5207	17.7711	15.3351	14.2102	16.3064	16.5012	19.2305	20.9916	22.7955	(46)

Water storage loss:

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												1.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0240	(51)
Volume factor from Table 2a												4.9324	(52)
Temperature factor from Table 2b												1.0000	(53)
Enter (49) or (54) in (55)												0.1182	(55)
Total storage loss													
	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(56)
If cylinder contains dedicated solar storage													
	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(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)
Total heat required for water heating calculated for each month													
	183.8485	161.5657	168.5511	149.5297	145.4006	128.2921	121.6616	135.6363	136.0660	155.1303	166.0024	178.8971	(62)
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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	183.8485	161.5657	168.5511	149.5297	145.4006	128.2921	121.6616	135.6363	136.0660	155.1303	166.0024	178.8971	(64)
									Total per year (kWh/year) = Sum(64)m =			1830.5814	(64)
Heat gains from water heating, kWh/month													
	73.7179	65.0907	68.6315	61.9008	60.9340	54.8394	53.0408	57.6874	57.4242	64.1691	67.3780	72.0716	(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	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.8631	19.4186	15.7923	11.9558	8.9371	7.5451	8.1527	10.5972	14.2235	18.0600	21.0787	22.4708	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	237.0394	239.4991	233.3007	220.1050	203.4477	187.7923	177.3335	174.8737	181.0722	194.2679	210.9251	226.5806	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	(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)													
	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	(71)
Water heating gains (Table 5)													
	99.0832	96.8611	92.2467	85.9734	81.9006	76.1658	71.2914	77.5368	79.7558	86.2488	93.5806	96.8704	(72)
Total internal gains													
	420.1412	417.9343	403.4951	380.1896	356.4408	333.6585	318.9330	325.1632	337.2070	360.7322	387.7399	408.0772	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9000	10.6334	0.3700	0.6600	0.7700	8.8175	(74)
East	13.1100	19.6403	0.3700	0.6600	0.7700	43.5741	(76)

Solar gains	52.3917	102.0910	169.0121	250.7266	312.8655	323.1763	306.4557	259.1779	197.6929	121.2034	65.2094	43.1840	(83)
Total gains	472.5329	520.0253	572.5072	630.9162	669.3063	656.8348	625.3887	584.3411	534.8999	481.9356	452.9493	451.2612	(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	102.1098	102.5272	102.9480	105.1050	105.5473	107.8157	107.8157	108.2812	106.8967	105.5473	104.6664	103.8001	
alpha	7.8073	7.8351	7.8632	8.0070	8.0365	8.1877	8.1877	8.2187	8.1264	8.0365	7.9778	7.9200	
util living area													
	0.9962	0.9909	0.9695	0.8777	0.6909	0.4825	0.3488	0.3886	0.6385	0.9246	0.9898	0.9972	(86)
MIT	20.4615	20.5672	20.7356	20.9173	20.9884	20.9994	21.0000	20.9999	20.9952	20.8912	20.6497	20.4447	(87)
Th 2	20.4399	20.4421	20.4443	20.4551	20.4573	20.4681	20.4681	20.4703	20.4638	20.4573	20.4529	20.4486	(88)
util rest of house													
	0.9953	0.9887	0.9623	0.8550	0.6544	0.4427	0.3067	0.3439	0.5914	0.9044	0.9868	0.9965	(89)
MIT 2	19.7077	19.8628	20.1054	20.3603	20.4462	20.4677	20.4681	20.4703	20.4600	20.3328	19.9921	19.6903	(90)
Living area fraction									fLA = Living area / (4) =			0.3521	(91)
MIT	19.9731	20.1108	20.3273	20.5564	20.6371	20.6549	20.6554	20.6567	20.6485	20.5294	20.2236	19.9560	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9731	20.1108	20.3273	20.5564	20.6371	20.6549	20.6554	20.6567	20.6485	20.5294	20.2236	19.9560	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9871	0.9606	0.8595	0.6666	0.4567	0.3215	0.3596	0.6078	0.9074	0.9854	0.9957	(94)
Useful gains	469.8174	513.3101	549.9334	542.2414	446.1810	299.9823	201.0844	210.1455	325.1311	437.2859	446.3146	449.3317	(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													
	820.6232	793.1784	718.0856	592.9234	452.6973	300.2508	201.0970	210.1756	327.5158	502.9592	670.3535	811.5292	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	260.9995	188.0715	125.1053	36.4910	4.8481	0.0000	0.0000	0.0000	0.0000	48.8609	161.3080	269.4749	(98)
Space heating												1095.1593	(98)
Space heating per m2											(98) / (4) =	12.3190	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Space heating:		
Annual space heating requirement	1095.1593	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.50	1642.7389	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1830.5814	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.50	2745.8721	(310a)
Electricity used for heat distribution	43.8861	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	206.7481	(330a)
Total electricity for the above, kWh/year	206.7481	(331)
Electricity for lighting (calculated in Appendix L)	386.1093	(332)
Total delivered energy for all uses	4981.4685	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367a)
Space heating from Boilers	4903.4760	0.2160	1059.1508	(367)
Electrical energy for heat distribution	43.8861	0.5190	22.7769	(372)
Total CO2 associated with community systems			1081.9277	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1081.9277	(376)
Pumps and fans	206.7481	0.5190	107.3022	(378)
Energy for lighting	386.1093	0.5190	200.3908	(379)
Total CO2, kg/year			1389.6207	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6300	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.6300	ZC1
Total Floor Area	TFA	88.9000	
Assumed number of occupants	N	2.6104	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.8003	ZC2
CO2 emissions from cooking, equation (L16)		2.0433	ZC3
Total CO2 emissions		33.4736	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.4736	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	88.9000 (1b)	x	2.5000 (2b)	=	222.2500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	222.2500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1350	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3850	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2984	(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	0.3804	0.3730	0.3655	0.3282	0.3207	0.2834	0.2834	0.2760	0.2984	0.3207	0.3357	0.3506	(22b)
Effective ac	0.5724	0.5695	0.5668	0.5539	0.5514	0.5402	0.5402	0.5381	0.5445	0.5514	0.5563	0.5615	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			18.0100	1.3258	23.8769			(27)
External Wall 1	53.0000	18.0100	34.9900	0.1800	6.2982			(29a)
P4	15.7500	1.8900	13.8600	0.1800	2.4948			(29a)
Total net area of external elements Aum(A, m2)			68.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.5599			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.4730	(36)
Total fabric heat loss					(33) + (36) =		41.0329	(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	41.9781	41.7720	41.5700	40.6213	40.4438	39.6174	39.6174	39.4644	39.9357	40.4438	40.8028	41.1783	(38)
Heat transfer coeff	83.0109	82.8049	82.6029	81.6542	81.4766	80.6503	80.6503	80.4973	80.9686	81.4766	81.8357	82.2112	(39)
Average = Sum(39)m / 12 =												81.6533	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9338	0.9314	0.9292	0.9185	0.9165	0.9072	0.9072	0.9055	0.9108	0.9165	0.9205	0.9248	(40)
HLP (average)												0.9185	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6104 (42)
Average daily hot water use (litres/day)		96.1961 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.8157	101.9679	98.1200	94.2722	90.4243	86.5765	86.5765	90.4243	94.2722	98.1200	101.9679	105.8157	(44)
Energy conte	156.9217	137.2447	141.6242	123.4714	118.4738	102.2339	94.7347	108.7095	110.0078	128.2035	139.9441	151.9703	(45)
Energy content (annual)											Total = Sum(45)m =	1513.5394	(45)
Distribution loss (46)m = 0.15 x (45)m	23.5382	20.5867	21.2436	18.5207	17.7711	15.3351	14.2102	16.3064	16.5012	19.2305	20.9916	22.7955	(46)
Water storage loss:													
Store volume												1.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2134	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1152	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715	(56)
If cylinder contains dedicated solar storage													
	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715	(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)
Total heat required for water heating calculated for each month													
	183.7555	161.4817	168.4581	149.4397	145.3077	128.2021	121.5686	135.5433	135.9761	155.0374	165.9124	178.8041	(62)
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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	183.7555	161.4817	168.4581	149.4397	145.3077	128.2021	121.5686	135.5433	135.9761	155.0374	165.9124	178.8041	(64)
								Total per year (kWh/year) = Sum(64)m =				1829.4867	(64)
Heat gains from water heating, kWh/month													
	73.6436	65.0235	68.5572	61.8289	60.8596	54.7674	52.9664	57.6130	57.3522	64.0948	67.3060	71.9972	(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	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.2537	18.8774	15.3521	11.6225	8.6880	7.3348	7.9255	10.3018	13.8271	17.5567	20.4912	21.8444	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	237.0394	239.4991	233.3007	220.1050	203.4477	187.7923	177.3335	174.8737	181.0722	194.2679	210.9251	226.5806	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	(71)
Water heating gains (Table 5)													
	98.9833	96.7612	92.1467	85.8734	81.8006	76.0658	71.1914	77.4368	79.6558	86.1489	93.4806	96.7704	(72)
Total internal gains													
	422.4318	420.2931	405.9550	382.7564	359.0917	336.3483	321.6058	327.7678	339.7105	363.1289	390.0524	410.3509	(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	
North	4.9000	10.6334	0.6300	0.7000	0.7700	15.9235	(74)
East	13.1100	19.6403	0.6300	0.7000	0.7700	78.6904	(76)

Solar gains	94.6140	184.3659	305.2185	452.7864	565.0028	583.6230	553.4274	468.0486	357.0130	218.8808	117.7614	77.9858	(83)
Total gains	517.0458	604.6589	711.1734	835.5427	924.0945	919.9712	875.0331	795.8164	696.7235	582.0097	507.8138	488.3367	(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	74.3710	74.5561	74.7384	75.6068	75.7715	76.5479	76.5479	76.6934	76.2470	75.7715	75.4391	75.0946	
alpha	5.9581	5.9704	5.9826	6.0405	6.0514	6.1032	6.1032	6.1129	6.0831	6.0514	6.0293	6.0063	
util living area													
	0.9982	0.9951	0.9816	0.9191	0.7610	0.5537	0.4046	0.4630	0.7494	0.9653	0.9957	0.9987	(86)
MIT	20.0431	20.1952	20.4500	20.7572	20.9399	20.9925	20.9991	20.9980	20.9596	20.6849	20.3033	20.0158	(87)
Th 2	20.1389	20.1409	20.1428	20.1518	20.1535	20.1614	20.1614	20.1628	20.1583	20.1535	20.1501	20.1465	(88)
util rest of house													
	0.9977	0.9935	0.9755	0.8953	0.7087	0.4844	0.3280	0.3800	0.6772	0.9502	0.9940	0.9983	(89)
MIT 2	18.8520	19.0753	19.4445	19.8761	20.0987	20.1567	20.1610	20.1620	20.1280	19.7893	19.2407	18.8179	(90)
Living area fraction									fLA = Living area / (4) =			0.3521	(91)
MIT	19.2713	19.4696	19.7985	20.1863	20.3949	20.4510	20.4561	20.4563	20.4208	20.1046	19.6148	19.2396	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2713	19.4696	19.7985	20.1863	20.3949	20.4510	20.4561	20.4563	20.4208	20.1046	19.6148	19.2396	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9919	0.9725	0.8964	0.7243	0.5086	0.3550	0.4093	0.7009	0.9491	0.9926	0.9977	(94)
Useful gains	515.4178	599.7397	691.6306	748.9631	669.3210	467.9422	310.6311	325.6916	488.3510	552.3776	504.0595	487.2201	(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													
	1242.7854	1206.4323	1098.4937	921.5738	708.4307	471.8838	310.9945	326.5238	511.7887	774.4043	1024.1596	1236.4258	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	541.1615	407.6974	302.7061	124.2797	29.0976	0.0000	0.0000	0.0000	0.0000	165.1879	374.4720	557.4090	(98)
Space heating												2502.0113	(98)
Space heating per m2											(98) / (4) =	28.1441	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2675.9479	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	541.1615	407.6974	302.7061	124.2797	29.0976	0.0000	0.0000	0.0000	0.0000	165.1879	374.4720	557.4090	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000		(210)
Space heating fuel (main heating system)													
	578.7823	436.0400	323.7499	132.9195	31.1204	0.0000	0.0000	0.0000	0.0000	176.6715	400.5049	596.1594	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	183.7555	161.4817	168.4581	149.4397	145.3077	128.2021	121.5686	135.5433	135.9761	155.0374	165.9124	178.8041	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.5251	87.1834	86.3599	84.3268	81.4058	79.8000	79.8000	79.8000	79.8000	84.9831	86.9216	87.6458	(217)
Fuel for water heating, kWh/month													
	209.9460	185.2207	195.0652	177.2149	178.4979	160.6543	152.3416	169.8538	170.3961	182.4331	190.8758	204.0077	(219)
Water heating fuel used												2176.5071	(219)
Annual totals kWh/year													
Space heating fuel - main system												2675.9479	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												375.3473	(232)
Total delivered energy for all uses												5302.8024	(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	2675.9479	0.2160	578.0048	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2176.5071	0.2160	470.1255	(264)
Space and water heating			1048.1303	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	375.3473	0.5190	194.8053	(268)
Total CO2, kg/m2/year			1281.8606	(272)
Emissions per m2 for space and water heating			11.7900	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.1913	(272b)
Emissions per m2 for pumps and fans			0.4379	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.7900 * 1.00) + 2.1913 + 0.4379, rounded to 2 d.p.			14.4200	(273)

Appendix 3



FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A2.02.01	**Issued on Date**	21/08/2026
Assessment Reference	Be Green	**Prop Type Ref**	Type J
Property	A2.02.01, High Road West Harringey, London		

SAP Rating	85 B	**DER**	10.80	**TER**	20.55
Environmental	92 A	**% DER<TER**	47.44		
CO_2 Emissions (t/year)	0.76	**DFEE**	30.92	**TFEE**	40.21
General Requirements Compliance	Pass	**% DFEE<TFEE**	23.09		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 95 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.55 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.80 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)40.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)30.9 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.85 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing East: 10.20 m², No overhang
Windows facing South: 2.45 m², No overhang
Windows facing West: 8.80 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.64 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	95.0000 (1b)	x	2.5000 (2b)	=	237.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.5000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.6500	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			21.4500	0.8127	17.4323			(27)
External Wall 1	72.8000	21.4500	51.3500	0.1200	6.1620			(29a)
P4	3.5000	1.8900	1.6100	0.2100	0.3381			(29a)
s5	6.0000		6.0000	0.2300	1.3800			(29a)
Total net area of external elements Aum(A, m2)			82.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2024			(33)
Party Wall 1			17.7500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	224.7200 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.9240 (36)
Total fabric heat loss (33) + (36) =	38.1264 (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	22.2830	22.0332	21.7834	20.5343	20.2844	19.0353	19.0353	18.7855	19.5350	20.2844	20.7841	21.2837	(38)
Heat transfer coeff	60.4093	60.1595	59.9097	58.6606	58.4108	57.1617	57.1617	56.9119	57.6613	58.4108	58.9104	59.4101	(39)
Average = Sum(39)m / 12 =												58.5982	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6359	0.6333	0.6306	0.6175	0.6149	0.6017	0.6017	0.5991	0.6070	0.6149	0.6201	0.6254	(40)
HLP (average)												0.6168	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6882 (42)
Average daily hot water use (litres/day)	98.0440 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8484	103.9267	100.0049	96.0831	92.1614	88.2396	88.2396	92.1614	96.0831	100.0049	103.9267	107.8484	(44)
Energy conte	159.9361	139.8811	144.3448	125.8433	120.7496	104.1977	96.5545	110.7977	112.1210	130.6662	142.6324	154.8896	(45)
Energy content (annual)										Total = Sum(45)m =		1542.6141	(45)
Distribution loss (46)m = 0.15 x (45)m	23.9904	20.9822	21.6517	18.8765	18.1124	15.6297	14.4832	16.6197	16.8182	19.5999	21.3949	23.2334	(46)

Water storage loss:
Store volume 1.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)
Volume factor from Table 2a 4.9324 (52)
Temperature factor from Table 2b 1.0000 (53)
Enter (49) or (54) in (55) 0.1182 (55)
Total storage loss

3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(56)

If cylinder contains dedicated solar storage

3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(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)

Total heat required for water heating calculated for each month

186.8629	164.2021	171.2716	151.9015	147.6765	130.2560	123.4814	137.7246	138.1793	157.5931	168.6907	181.8164	(62)
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	(63)
							Solar input (sum of months) = Sum(63)m =				0.0000	(63)

Output from w/h

186.8629	164.2021	171.2716	151.9015	147.6765	130.2560	123.4814	137.7246	138.1793	157.5931	168.6907	181.8164	(64)
							Total per year (kWh/year) = Sum(64)m =				1859.6561	(64)

Heat gains from water heating, kWh/month

74.7202	65.9673	69.5361	62.6895	61.6907	55.4923	53.6459	58.3817	58.1268	64.9880	68.2719	73.0423	(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	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	(66)

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

22.4625	19.9510	16.2252	12.2835	9.1821	7.7519	8.3762	10.8877	14.6135	18.5552	21.6566	23.0868	(67)

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

247.9820	250.5553	244.0707	230.2658	212.8396	196.4615	185.5198	182.9466	189.4311	203.2360	220.6622	237.0404	(68)

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

36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	(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)

-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	(71)

Water heating gains (Table 5)

100.4304	98.1656	93.4625	87.0687	82.9177	77.0727	72.1047	78.4701	80.7317	87.3495	94.8220	98.1751	(72)

Total internal gains

434.1975	431.9945	417.0810	392.9407	368.2619	344.6086	329.3232	335.6269	348.0989	372.4632	400.4634	421.6248	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.2000	19.6403	0.3700	0.6600	0.7700	33.9021	(76)
South	2.4500	46.7521	0.3700	0.6600	0.7700	19.3841	(78)
West	8.8000	19.6403	0.3700	0.6600	0.7700	29.2489	(80)

Solar gains 82.5350	155.2828	243.8862	342.4205	411.2635	418.0811	399.1771	347.9098	278.8609	180.8278	101.7186	68.6819	(83)
Total gains 516.7325	587.2773	660.9673	735.3612	779.5254	762.6897	728.5003	683.5367	626.9597	553.2910	502.1820	490.3067	(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	98.1655	98.5731	98.9841	101.0919	101.5242	103.7428	103.7428	104.1982	102.8438	101.5242	100.6632	99.8166	
alpha	7.5444	7.5715	7.5989	7.7395	7.7683	7.9162	7.9162	7.9465	7.8563	7.7683	7.7109	7.6544	
util living area	0.9969	0.9910	0.9669	0.8693	0.6835	0.4789	0.3452	0.3829	0.6280	0.9228	0.9910	0.9978	(86)
MIT	20.4094	20.5373	20.7250	20.9153	20.9875	20.9993	21.0000	20.9999	20.9950	20.8836	20.6144	20.3899	(87)
Th 2	20.3978	20.4002	20.4025	20.4143	20.4167	20.4285	20.4285	20.4308	20.4237	20.4167	20.4119	20.4072	(88)
util rest of house	0.9960	0.9886	0.9587	0.8446	0.6447	0.4365	0.3004	0.3356	0.5781	0.9011	0.9882	0.9972	(89)
MIT 2	19.5957	19.7833	20.0531	20.3186	20.4050	20.4280	20.4284	20.4308	20.4199	20.2850	19.9057	19.5749	(90)
Living area fraction									fLA = Living area / (4) =			0.2274	(91)
MIT	19.7807	19.9547	20.2059	20.4543	20.5375	20.5579	20.5584	20.5602	20.5507	20.4211	20.0668	19.7602	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7807	19.9547	20.2059	20.4543	20.5375	20.5579	20.5584	20.5602	20.5507	20.4211	20.0668	19.7602	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9949	0.9864	0.9556	0.8464	0.6528	0.4461	0.3106	0.3463	0.5892	0.9013	0.9861	0.9963	(94)
Useful gains	514.0834	579.3135	631.6355	622.3770	508.9124	340.2444	226.2534	236.7301	369.4262	498.6808	495.2256	488.5041	(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	935.1812	905.6839	821.1136	677.7815	516.2025	340.5634	226.2683	236.7641	371.9535	573.6558	763.8798	924.4331	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	313.2967	219.3209	140.9717	39.8912	5.4239	0.0000	0.0000	0.0000	0.0000	55.7814	193.4310	324.3312	(98)
Space heating												1292.4480	(98)
Space heating per m2											(98) / (4) =	13.6047	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Space heating:		
Annual space heating requirement	1292.4480	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50	1938.6721	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1859.6561	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50	2789.4841	(310a)
Electricity used for heat distribution	47.2816	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	220.9344	(330a)
Total electricity for the above, kWh/year	220.9344	(331)
Electricity for lighting (calculated in Appendix L)	396.6948	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.64 * 951 * 1.00) =	-486.7154	(333)
Total delivered energy for all uses	4859.0699	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			263.0000	(367a)
Space heating from Heat pump	1797.7780	0.5190	933.0468	(367)
Electrical energy for heat distribution	47.2816	0.5190	24.5391	(372)
Total CO2 associated with community systems			957.5859	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			957.5859	(376)
Pumps and fans	220.9344	0.5190	114.6649	(378)
Energy for lighting	396.6948	0.5190	205.8846	(379)
Energy saving/generation technologies				
PV Unit	-486.7154	0.5190	-252.6053	(380)
Total CO2, kg/year			1025.5302	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.8000	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		10.8000	ZC1
Total Floor Area	TFA	95.0000	
Assumed number of occupants	N	2.6882	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.4683	ZC2
CO2 emissions from cooking, equation (L16)		1.9317	ZC3
Total CO2 emissions		28.2001	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		28.2001	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	95.0000 (1b)	x	2.5000 (2b)	=	237.5000	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	95.0000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	237.5000	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1263	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3763	(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) =	0.3199	(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	0.4078	0.3998	0.3918	0.3519	0.3439	0.3039	0.3039	0.2959	0.3199	0.3439	0.3599	0.3758	(22b)
Effective ac	0.5832	0.5799	0.5768	0.5619	0.5591	0.5462	0.5462	0.5438	0.5512	0.5591	0.5647	0.5706	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			21.4500	1.3258	28.4375			(27)
External Wall 1	72.8000	21.4500	51.3500	0.1800	9.2430			(29a)
P4	3.5000	1.8900	1.6100	0.1800	0.2898			(29a)
s5	6.0000		6.0000	0.1800	1.0800			(29a)
Total net area of external elements Aum(A, m2)			82.3000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.9403			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4120	(36)
Total fabric heat loss						(33) + (36) =	49.3523	(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	45.7054	45.4523	45.2043	44.0390	43.8210	42.8061	42.8061	42.6181	43.1970	43.8210	44.2620	44.7231	(38)
Heat transfer coeff	95.0577	94.8046	94.5566	93.3913	93.1733	92.1584	92.1584	91.9704	92.5493	93.1733	93.6143	94.0754	(39)
Average = Sum(39)m / 12 =												93.3903	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0006	0.9979	0.9953	0.9831	0.9808	0.9701	0.9701	0.9681	0.9742	0.9808	0.9854	0.9903	(40)
HLP (average)												0.9831	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6882 (42)
Average daily hot water use (litres/day)		98.0440 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.8484	103.9267	100.0049	96.0831	92.1614	88.2396	88.2396	92.1614	96.0831	100.0049	103.9267	107.8484	(44)
Energy conte	159.9361	139.8811	144.3448	125.8433	120.7496	104.1977	96.5545	110.7977	112.1210	130.6662	142.6324	154.8896	(45)
Energy content (annual)										Total = Sum(45)m =		1542.6141	(45)
Distribution loss (46)m = 0.15 x (45)m	23.9904	20.9822	21.6517	18.8765	18.1124	15.6297	14.4832	16.6197	16.8182	19.5999	21.3949	23.2334	(46)

Water storage loss:		
Store volume		1.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		0.2134 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.1152 (55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.5715 3.2259 3.5715 3.4563 3.5715 3.4563 3.5715 3.5715 3.4563 3.5715 3.4563 3.5715 (56)
If cylinder contains dedicated solar storage
3.5715 3.2259 3.5715 3.4563 3.5715 3.4563 3.5715 3.5715 3.4563 3.5715 3.4563 3.5715 (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)
Total heat required for water heating calculated for each month
186.7700 164.1182 171.1787 151.8116 147.5835 130.1660 123.3884 137.6316 138.0893 157.5001 168.6007 181.7234 (62)
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 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
186.7700 164.1182 171.1787 151.8116 147.5835 130.1660 123.3884 137.6316 138.0893 157.5001 168.6007 181.7234 (64)
Total per year (kWh/year) = Sum(64)m = 1858.5614 (64)
Heat gains from water heating, kWh/month
74.6459 65.9001 69.4617 62.6175 61.6164 55.4204 53.5715 58.3074 58.0549 64.9136 68.1999 72.9679 (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	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	134.4085	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	22.1039	19.6325	15.9662	12.0875	9.0355	7.6282	8.2425	10.7139	14.3802	18.2590	21.3109	22.7183	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	247.9820	250.5553	244.0707	230.2658	212.8396	196.4615	185.5198	182.9466	189.4311	203.2360	220.6622	237.0404	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	36.4408	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	-107.5268	(71)
Water heating gains (Table 5)													
	100.3304	98.0656	93.3626	86.9688	82.8177	76.9727	72.0047	78.3701	80.6317	87.2495	94.7221	98.0751	(72)
Total internal gains													
	436.7389	434.5760	419.7221	395.6446	371.0154	347.3849	332.0896	338.3531	350.7656	375.0670	403.0178	424.1563	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	10.2000	19.6403	0.6300	0.7000	0.7700	61.2237	(76)
South	2.4500	46.7521	0.6300	0.7000	0.7700	35.0057	(78)
West	8.8000	19.6403	0.6300	0.7000	0.7700	52.8204	(80)

Solar gains	149.0498	280.4247	440.4334	618.3761	742.6994	755.0113	720.8726	628.2892	503.5939	326.5564	183.6932	124.0324	(83)
Total gains	585.7887	715.0007	860.1554	1014.0207	1113.7147	1102.3962	1052.9621	966.6423	854.3595	701.6235	586.7110	548.1888	(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	69.4023	69.5875	69.7701	70.6407	70.8059	71.5857	71.5857	71.7320	71.2833	70.8059	70.4724	70.1270	
alpha	5.6268	5.6392	5.6513	5.7094	5.7204	5.7724	5.7724	5.7821	5.7522	5.7204	5.6982	5.6751	
util living area													
	0.9977	0.9926	0.9720	0.8929	0.7276	0.5282	0.3841	0.4356	0.7063	0.9509	0.9941	0.9984	(86)
MIT	19.9807	20.1697	20.4558	20.7710	20.9427	20.9923	20.9990	20.9979	20.9641	20.6921	20.2683	19.9480	(87)
Th 2	20.0828	20.0850	20.0872	20.0975	20.0994	20.1083	20.1083	20.1100	20.1049	20.0994	20.0955	20.0915	(88)
util rest of house													
	0.9969	0.9902	0.9632	0.8637	0.6721	0.4576	0.3068	0.3524	0.6302	0.9305	0.9918	0.9979	(89)
MIT 2	18.7190	18.9955	19.4075	19.8438	20.0484	20.1036	20.1080	20.1092	20.0790	19.7525	19.1482	18.6777	(90)
Living area fraction									fLA = Living area / (4) =			0.2274	(91)
MIT	19.0059	19.2625	19.6458	20.0546	20.2518	20.3057	20.3106	20.3113	20.2802	19.9661	19.4028	18.9665	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0059	19.2625	19.6458	20.0546	20.2518	20.3057	20.3106	20.3113	20.2802	19.9661	19.4028	18.9665	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9956	0.9873	0.9579	0.8622	0.6819	0.4735	0.3244	0.3714	0.6459	0.9268	0.9894	0.9969	(94)
Useful gains	583.2314	705.8931	823.9544	874.2717	759.4738	521.9691	341.6083	358.9758	551.8339	650.2958	580.4769	546.4902	(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													
	1397.9054	1361.6296	1243.0232	1041.7410	796.7967	525.8280	341.9584	359.7207	571.9758	872.6717	1151.7226	1389.1686	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	606.1175	440.6549	311.7872	120.5779	27.7682	0.0000	0.0000	0.0000	0.0000	165.4477	411.2969	626.9527	(98)
Space heating												2710.6030	(98)
Space heating per m2										(98) / (4) =		28.5327	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2899.0406	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	606.1175	440.6549	311.7872	120.5779	27.7682	0.0000	0.0000	0.0000	0.0000	165.4477	411.2969	626.9527	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	648.2540	471.2887	333.4622	128.9603	29.6986	0.0000	0.0000	0.0000	0.0000	176.9494	439.8897	670.5376	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	186.7700	164.1182	171.1787	151.8116	147.5835	130.1660	123.3884	137.6316	138.0893	157.5001	168.6007	181.7234	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.7291	87.3226	86.3942	84.2072	81.3226	79.8000	79.8000	79.8000	79.8000	84.9452	87.1043	87.8529	(217)
Fuel for water heating, kWh/month													
	212.8940	187.9447	198.1368	180.2834	181.4791	163.1153	154.6221	172.4707	173.0442	185.4138	193.5618	206.8497	(219)
Water heating fuel used												2209.8155	(219)
Annual totals kWh/year													
Space heating fuel - main system												2899.0406	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												390.3622	(232)
Total delivered energy for all uses												5574.2183	(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	2899.0406	0.2160	626.1928	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2209.8155	0.2160	477.3201	(264)
Space and water heating			1103.5129	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	390.3622	0.5190	202.5980	(268)
Total CO2, kg/m2/year			1345.0359	(272)
Emissions per m2 for space and water heating			11.6159	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.1326	(272b)
Emissions per m2 for pumps and fans			0.4097	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.6159 * 1.55) + 2.1326 + 0.4097, rounded to 2 d.p.			20.5500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A2.00.02	**Issued on Date**	21/08/2026
Assessment Reference	Be Green	**Prop Type Ref**	Type G
Property	A2.00.02, High Road West Harringey, London		

SAP Rating	84 B	**DER**	12.09	**TER**	20.85
Environmental	90 B	**% DER<TER**	42.01		
CO_2 Emissions (t/year)	1.03	**DFEE**	40.11	**TFEE**	45.33
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.53		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-Terrace Maisonette, total floor area 121 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.85 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.09 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)45.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.1 kWh/m²/yrOK

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2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.85 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing East: 11.65 m², No overhang
Windows facing West: 9.05 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.81 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.5000 (1b)	x	2.5000 (2b)	=	126.2500	(1b) - (3b)
First floor	70.1000 (1c)	x	3.1000 (2c)	=	217.3100	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.6000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	343.5600	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery
If mechanical ventilation: 0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 75.6500 (23c)

Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			20.7000	0.8127	16.8228			(27)
External Wall 1	67.0000	22.5900	44.4100	0.1200	5.3292			(29a)
boh now p9	13.5000		13.5000	0.2300	3.1050			(29a)
shelter bins p3	17.5000		17.5000	0.2100	3.6750			(29a)
shelter p3	15.5000		15.5000	0.2100	3.2550			(29a)
Total net area of external elements Aum(A, m2)			113.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.0770			(33)
Party Wall 1			72.0000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	267.4400 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.9314 (36)
Total fabric heat loss (33) + (36) =	52.0084 (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	32.2339	31.8725	31.5111	29.7042	29.3428	27.5359	27.5359	27.1745	28.2587	29.3428	30.0656	30.7883	(38)
Heat transfer coeff	84.2423	83.8809	83.5195	81.7126	81.3512	79.5443	79.5443	79.1829	80.2671	81.3512	82.0740	82.7967	(39)
Average = Sum(39)m / 12 =												81.6222	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.6985	0.6955	0.6925	0.6776	0.6746	0.6596	0.6596	0.6566	0.6656	0.6746	0.6805	0.6865	(40)
HLP (average)												0.6768	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8656 (42)
Average daily hot water use (litres/day)	102.2581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4839	108.3936	104.3032	100.2129	96.1226	92.0323	92.0323	96.1226	100.2129	104.3032	108.3936	112.4839	(44)
Energy conte	166.8103	145.8934	150.5489	131.2522	125.9396	108.6763	100.7046	115.5600	116.9401	136.2824	148.7629	161.5469	(45)
Energy content (annual)										Total = Sum(45)m =		1608.9177	(45)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

	25.0216	21.8840	22.5823	19.6878	18.8909	16.3014	15.1057	17.3340	17.5410	20.4424	22.3144	24.2320 (46)

Water storage loss:

Store volume 1.0000 (47)

b) If manufacturer declared loss factor is not known :

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)

Volume factor from Table 2a 4.9324 (52)

Temperature factor from Table 2b 1.0000 (53)

Enter (49) or (54) in (55) 0.1182 (55)

Total storage loss

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (56)

If cylinder contains dedicated solar storage

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (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)

Total heat required for water heating calculated for each month

	193.7372	170.2144	177.4758	157.3104	152.8665	134.7345	127.6314	142.4868	142.9984	163.2093	174.8212	188.4738 (62)
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 (63)

Solar input (sum of months) = Sum(63)m = 0.0000 (63)

Output from w/h

	193.7372	170.2144	177.4758	157.3104	152.8665	134.7345	127.6314	142.4868	142.9984	163.2093	174.8212	188.4738 (64)

Total per year (kWh/year) = Sum(64)m = 1925.9596 (64)

Heat gains from water heating, kWh/month

	77.0059	67.9664	71.5990	64.4879	63.4164	56.9815	55.0257	59.9652	59.7292	66.8554	70.3103	75.2558 (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	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	143.2802	(66)

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

	27.2854	24.2346	19.7089	14.9209	11.1536	9.4163	10.1747	13.2254	17.7511	22.5391	26.3065	28.0437 (67)

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

	285.9922	288.9599	281.4814	265.5605	245.4633	226.5747	213.9560	210.9883	218.4668	234.3877	254.4849	273.3735 (68)

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

	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280	37.3280 (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)

	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241	-114.6241 (71)

Water heating gains (Table 5)

	103.5026	101.1404	96.2352	89.5666	85.2371	79.1409	73.9593	80.5983	82.9572	89.8594	97.6532	101.1503 (72)

Total internal gains

	482.7642	480.3191	463.4096	436.0321	407.8380	381.1160	364.0740	370.7961	385.1591	412.7702	444.4286	468.5516 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	11.6500	19.6403	0.3700	0.6600	0.7700	38.7215	(76)
West	9.0500	19.6403	0.3700	0.6600	0.7700	30.0798	(80)

Solar gains	68.8013	134.5899	221.6504	323.2639	396.1721	405.5526	386.1026	331.6564	257.7886	159.7023	85.7871	56.5788 (83)
Total gains	551.5655	614.9090	685.0600	759.2960	804.0100	786.6686	750.1766	702.4525	642.9477	572.4725	530.2157	525.1304 (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	106.3509	106.8091	107.2712	109.6433	110.1304	112.6321	112.6321	113.1461	111.6179	110.1304	109.1605	108.2076	
alpha	8.0901	8.1206	8.1514	8.3096	8.3420	8.5088	8.5088	8.5431	8.4412	8.3420	8.2774	8.2138	
util living area	0.9997	0.9991	0.9958	0.9717	0.8639	0.6414	0.4662	0.5176	0.8166	0.9872	0.9991	0.9998	(86)
MIT	20.3153	20.4105	20.5762	20.7984	20.9501	20.9964	20.9998	20.9995	20.9768	20.7742	20.5092	20.3053	(87)
Th 2	20.3421	20.3448	20.3474	20.3607	20.3634	20.3767	20.3767	20.3793	20.3714	20.3634	20.3580	20.3527	(88)
util rest of house	0.9996	0.9988	0.9942	0.9614	0.8256	0.5816	0.4004	0.4483	0.7590	0.9809	0.9987	0.9997	(89)
MIT 2	19.4042	19.5455	19.7895	20.1177	20.3151	20.3743	20.3766	20.3791	20.3532	20.0893	19.7009	19.3982	(90)
Living area fraction									fLA = Living area / (4) =			0.1554	(91)
MIT	19.5457	19.6799	19.9117	20.2235	20.4138	20.4710	20.4734	20.4755	20.4501	20.1957	19.8265	19.5391	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5457	19.6799	19.9117	20.2235	20.4138	20.4710	20.4734	20.4755	20.4501	20.1957	19.8265	19.5391	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9994	0.9983	0.9929	0.9588	0.8289	0.5908	0.4106	0.4591	0.7667	0.9788	0.9982	0.9996	(94)
Useful gains	551.2279	613.8641	680.1713	727.9759	666.4616	464.7435	308.0157	322.4851	492.9614	560.3170	529.2603	524.9125	(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	1284.3359	1239.7543	1120.1402	925.2685	708.8795	467.0045	308.1092	322.7122	509.7047	780.6249	1044.5170	1270.0308	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	545.4323	420.5982	327.3369	142.0507	31.5589	0.0000	0.0000	0.0000	0.0000	163.9091	370.9848	554.3680	(98)
Space heating												2556.2390	(98)
Space heating per m2										(98) / (4) =		21.1960	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Space heating:		
Annual space heating requirement	2556.2390	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50	3834.3584	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1925.9596	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50	2888.9394	(310a)
Electricity used for heat distribution	67.2330	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	319.5967	(330a)
Total electricity for the above, kWh/year	319.5967	(331)
Electricity for lighting (calculated in Appendix L)	481.8685	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.81 * 951 * 1.00) =	-615.9992	(333)
Total delivered energy for all uses	6908.7639	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			263.0000	(367a)
Space heating from Heat pump	2556.3870	0.5190	1326.7649	(367)
Electrical energy for heat distribution	67.2330	0.5190	34.8939	(372)
Total CO2 associated with community systems			1361.6588	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			1361.6588	(376)
Pumps and fans	319.5967	0.5190	165.8707	(378)
Energy for lighting	481.8685	0.5190	250.0897	(379)
Energy saving/generation technologies				
PV Unit	-615.9992	0.5190	-319.7036	(380)
Total CO2, kg/year			1457.9156	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.0900	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.0900	ZC1
Total Floor Area	TFA	120.6000	
Assumed number of occupants	N	2.8656	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		14.0525	ZC2
CO2 emissions from cooking, equation (L16)		1.5570	ZC3
Total CO2 emissions		27.6995	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		27.6995	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.5000	(1b)	x 2.5000	(2b) =	126.2500	(1b) - (3b)
First floor	70.1000	(1c)	x 3.1000	(2c) =	217.3100	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	120.6000					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	343.5600	(5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40	=	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20	=	0.0000	(6b)
Number of intermittent fans							4 * 10	=	40.0000	(7a)
Number of passive vents							0 * 10	=	0.0000	(7b)
Number of flueless gas fires							0 * 40	=	0.0000	(7c)

			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	40.0000	/ (5) =	0.1164	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.3664	(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) =		0.3115	(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	0.3971	0.3893	0.3815	0.3426	0.3348	0.2959	0.2959	0.2881	0.3115	0.3348	0.3504	0.3660	(22b)
Effective ac	0.5789	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			20.7000	1.3258	27.4432			(27)
External Wall 1	67.0000	22.5900	44.4100	0.1800	7.9938			(29a)
boh now p9	13.5000		13.5000	0.1800	2.4300			(29a)
shelter bins p3	17.5000		17.5000	0.1800	3.1500			(29a)
shelter p3	15.5000		15.5000	0.1800	2.7900			(29a)
Total net area of external elements Aum(A, m2)			113.5000					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.6970			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.7720	(36)
Total fabric heat loss (33) + (36) =	55.4690	(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	65.6271	65.2799	64.9397	63.3415	63.0424	61.6505	61.6505	61.3927	62.1866	63.0424	63.6474	64.2798	(38)
Heat transfer coeff	121.0961	120.7489	120.4087	118.8104	118.5114	117.1194	117.1194	116.8617	117.6556	118.5114	119.1163	119.7488	(39)
Average = Sum(39)m / 12 =												118.8090	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0041	1.0012	0.9984	0.9852	0.9827	0.9711	0.9711	0.9690	0.9756	0.9827	0.9877	0.9929	(40)
HLP (average)												0.9851	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8656 (42)
Average daily hot water use (litres/day)	102.2581 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.4839	108.3936	104.3032	100.2129	96.1226	92.0323	92.0323	96.1226	100.2129	104.3032	108.3936	112.4839	(44)
Energy conte	166.8103	145.8934	150.5489	131.2522	125.9396	108.6763	100.7046	115.5600	116.9401	136.2824	148.7629	161.5469	(45)
Energy content (annual)										Total = Sum(45)m =		1608.9177	(45)
Distribution loss (46)m = 0.15 x (45)m	25.0216	21.8840	22.5823	19.6878	18.8909	16.3014	15.1057	17.3340	17.5410	20.4424	22.3144	24.2320	(46)

Water storage loss:	
Store volume	1.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2134 (48)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

```
  Temperature factor from Table 2b                                                                                0.5400 (49)
Enter (49) or (54) in (55)                                                                                        0.1152 (55)
Total storage loss
                3.5715     3.2259     3.5715     3.4563     3.5715     3.4563     3.5715     3.5715     3.4563     3.5715     3.4563     3.5715 (56)
If cylinder contains dedicated solar storage
                3.5715     3.2259     3.5715     3.4563     3.5715     3.4563     3.5715     3.5715     3.4563     3.5715     3.4563     3.5715 (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)
Total heat required for water heating calculated for each month
              193.6442   170.1304   177.3828   157.2205   152.7735   134.6446   127.5384   142.3938   142.9084   163.1163   174.7312   188.3808 (62)
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 (63)
                                                                                  Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
              193.6442   170.1304   177.3828   157.2205   152.7735   134.6446   127.5384   142.3938   142.9084   163.1163   174.7312   188.3808 (64)
                                                                                  Total per year (kWh/year) = Sum(64)m =   1924.8650 (64)
Heat gains from water heating, kWh/month
               76.9315    67.8992    71.5246    64.4160    63.3420    56.9095    54.9514    59.8908    59.6572    66.7810    70.2383    75.1815 (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         143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802   143.2802 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
                26.2509    23.3158    18.9617    14.3552    10.7307     9.0593     9.7889    12.7240    17.0781    21.6846    25.3091    26.9805 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
               285.9922   288.9599   281.4814   265.5605   245.4633   226.5747   213.9560   210.9883   218.4668   234.3877   254.4849   273.3735 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
                37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280    37.3280 (69)
Pumps, fans      3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000     3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
              -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241  -114.6241 (71)
Water heating gains (Table 5)
               103.4026   101.0405    96.1352    89.4666    85.1371    79.0410    73.8594    80.4984    82.8572    89.7594    97.5532   101.0503 (72)
Total internal gains
               484.6298   482.3003   465.5624   438.3664   410.3152   383.6590   366.5883   373.1947   387.3862   414.8157   446.3313   470.3884 (73)


-------------------------------------------------------------------------------------------------------------
6. Solar gains
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[Jan]                                    Area          Solar flux              g                FF            Access            Gains
                                          m2           Table 6a       Specific data    Specific data        factor                W
                                                          W/m2         or Table 6b      or Table 6c       Table 6d
-------------------------------------------------------------------------------------------------------------
East                                   11.6500           19.6403            0.6300           0.7000        0.7700          69.9270 (76)
West                                    9.0500           19.6403            0.6300           0.7000        0.7700          54.3210 (80)
-------------------------------------------------------------------------------------------------------------

Solar gains   124.2480   243.0555   400.2778   583.7813   715.4459   732.3861   697.2615   598.9373   465.5396   288.4058   154.9227   102.1755 (83)
Total gains   608.8778   725.3558   865.8402  1022.1477  1125.7610  1116.0451  1063.8497   972.1320   852.9258   703.2215   601.2539   572.5639 (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           69.1600    69.3588    69.5548    70.4904    70.6683    71.5082    71.5082    71.6659    71.1823    70.6683    70.3094    69.9381
alpha          5.6107     5.6239     5.6370     5.6994     5.7112     5.7672     5.7672     5.7777     5.7455     5.7112     5.6873     5.6625
util living area
                0.9992     0.9975     0.9902     0.9539     0.8418     0.6478     0.4805     0.5448     0.8299     0.9822     0.9980     0.9994 (86)

MIT           19.8689    20.0231    20.2884    20.6287    20.8759    20.9786    20.9967    20.9936    20.9164    20.5648    20.1529    19.8460 (87)
Th 2          20.0799    20.0823    20.0847    20.0957    20.0978    20.1075    20.1075    20.1092    20.1037    20.0978    20.0936    20.0892 (88)
util rest of house
                0.9989     0.9967     0.9868     0.9377     0.7939     0.5674     0.3852     0.4436     0.7612     0.9733     0.9972     0.9992 (89)
MIT 2         18.5535    18.7807    19.1682    19.6587    19.9784    20.0935    20.1062    20.1066    20.0365    19.5788    18.9792    18.5269 (90)
Living area fraction                                                                                fLA = Living area / (4) =     0.1554 (91)
MIT           18.7579    18.9737    19.3423    19.8094    20.1179    20.2311    20.2446    20.2444    20.1732    19.7320    19.1615    18.7318 (92)
Temperature adjustment                                                                                          0.0000
adjusted MIT  18.7579    18.9737    19.3423    19.8094    20.1179    20.2311    20.2446    20.2444    20.1732    19.7320    19.1615    18.7318 (93)


-------------------------------------------------------------------------------------------------------------
8. Space heating requirement
-------------------------------------------------------------------------------------------------------------

                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation     0.9983     0.9952     0.9829     0.9314     0.7951     0.5790     0.4000     0.4593     0.7672     0.9684     0.9959     0.9988 (94)
Useful gains  607.8169   721.8805   851.0298   952.0506   895.1183   646.1414   425.5310   446.4533   654.3983   680.9965   598.7805   571.8542 (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
             1750.7974  1699.3881  1546.3186  1296.1509   997.6176   659.5058   426.8527   449.2630   714.5465  1082.2487  1436.7267  1740.1706 (97)
Month fracti    1.0000     1.0000     1.0000     1.0000     1.0000     0.0000     0.0000     0.0000     0.0000     1.0000     1.0000     1.0000 (97a)
Space heating kWh
              850.3775   656.8851   517.2948   247.7522    76.2595     0.0000     0.0000     0.0000     0.0000   298.5317   603.3213   869.2275 (98)
Space heating                                                                                                  4119.6495 (98)
Space heating per m2                                                                                (98) / (4) =    34.1596 (99)


-------------------------------------------------------------------------------------------------------------
8c. Space cooling requirement
-------------------------------------------------------------------------------------------------------------
Not applicable
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												4406.0423	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	850.3775	656.8851	517.2948	247.7522	76.2595	0.0000	0.0000	0.0000	0.0000	298.5317	603.3213	869.2275	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	909.4947	702.5509	553.2565	264.9756	81.5609	0.0000	0.0000	0.0000	0.0000	319.2852	645.2634	929.6550	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	193.6442	170.1304	177.3828	157.2205	152.7735	134.6446	127.5384	142.3938	142.9084	163.1163	174.7312	188.3808	(64)
Efficiency of water heater												79.8000	(216)
(217)m	88.3039	88.0707	87.5040	86.0221	83.0702	79.8000	79.8000	79.8000	79.8000	86.4063	87.8545	88.3890	(217)
Fuel for water heating, kWh/month													
	219.2930	193.1748	202.7138	182.7675	183.9089	168.7275	159.8226	178.4384	179.0832	188.7782	198.8870	213.1270	(219)
Water heating fuel used												2268.7220	(219)
Annual totals kWh/year													
Space heating fuel - main system												4406.0423	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												463.5993	(232)
Total delivered energy for all uses												7213.3636	(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	4406.0423	0.2160	951.7051	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2268.7220	0.2160	490.0440	(264)
Space and water heating			1441.7491	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	463.5993	0.5190	240.6081	(268)
Total CO2, kg/m2/year			1721.2821	(272)
Emissions per m2 for space and water heating			11.9548	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			1.9951	(272b)
Emissions per m2 for pumps and fans			0.3228	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.9548 * 1.55) + 1.9951 + 0.3228, rounded to 2 d.p.			20.8500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A1.04.02	**Issued on Date**	21/08/2026
Assessment Reference	Be Green	**Prop Type Ref**	Type B
Property	A1.04.02, High Road West Harringey, London		

SAP Rating	84 B	**DER**	10.98	**TER**	26.99
Environmental	92 A	**% DER<TER**	59.32		
CO_2 Emissions (t/year)	0.61	**DFEE**	44.16	**TFEE**	56.02
General Requirements Compliance	Pass	**% DFEE<TFEE**	21.16		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.99 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.98 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)56.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.2 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.21 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	0.86 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing South: 2.45 m², No overhang
Windows facing West: 13.11 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.56 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.5000 (1b)	x	2.5000 (2b)	=	183.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	183.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			15.5600	0.8127	12.6455			(27)
External Wall 1	48.5000	15.5600	32.9400	0.1200	3.9528			(29a)
P4	14.5000	1.8900	12.6100	0.2100	2.6481			(29a)
External Roof 1	72.5000		72.5000	0.1200	8.7000			(30)
Total net area of external elements Aum(A, m2)			135.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8364			(33)
Party Wall 1			31.5000	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	217.9100	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	17.7641	(36)
Total fabric heat loss (33) + (36) =	47.6005	(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	16.9823	16.7890	16.5957	15.6293	15.4360	14.4696	14.4696	14.2763	14.8562	15.4360	15.8226	16.2092	(38)
Heat transfer coeff	64.5828	64.3895	64.1962	63.2298	63.0365	62.0701	62.0701	61.8769	62.4567	63.0365	63.4231	63.8097	(39)

Average = Sum(39)m / 12 =	63.1815	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8787	0.8760	0.8734	0.8603	0.8576	0.8445	0.8445	0.8419	0.8498	0.8576	0.8629	0.8682	(40)
HLP (average)												0.8596	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.3280 (42)
Average daily hot water use (litres/day)	89.4903 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4393	94.8597	91.2801	87.7005	84.1209	80.5413	80.5413	84.1209	87.7005	91.2801	94.8597	98.4393	(44)
Energy conte	145.9827	127.6774	131.7516	114.8643	110.2150	95.1072	88.1308	101.1313	102.3392	119.2664	130.1886	141.3764	(45)
Energy content (annual)										Total = Sum(45)m =		1408.0310	(45)
Distribution loss (46)m = 0.15 x (45)m	21.8974	19.1516	19.7627	17.2296	16.5323	14.2661	13.2196	15.1697	15.3509	17.8900	19.5283	21.2065	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Store volume 1.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)
Volume factor from Table 2a 4.9324 (52)
Temperature factor from Table 2b 1.0000 (53)
Enter (49) or (54) in (55) 0.1182 (55)
Total storage loss

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (56)

If cylinder contains dedicated solar storage

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (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)

Total heat required for water heating calculated for each month

	172.9095	151.9984	158.6785	140.9225	137.1419	121.1654	115.0576	128.0582	128.3974	146.1933	156.2469	168.3033 (62)
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 (63)

Solar input (sum of months) = Sum(63)m = 0.0000 (63)

Output from w/h

	172.9095	151.9984	158.6785	140.9225	137.1419	121.1654	115.0576	128.0582	128.3974	146.1933	156.2469	168.3033 (64)

Total per year (kWh/year) = Sum(64)m = 1725.0729 (64)

Heat gains from water heating, kWh/month

	70.0807	61.9096	65.3489	59.0390	58.1880	52.4697	50.8450	55.1677	54.8744	61.1976	64.1343	68.5491 (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	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	116.4006	(66)

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

	18.7894	16.6885	13.5720	10.2749	7.6806	6.4843	7.0065	9.1073	12.2238	15.5210	18.1153	19.3116 (67)

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

	205.3242	207.4549	202.0858	190.6556	176.2270	162.6662	153.6068	151.4762	156.8453	168.2754	182.7040	196.2648 (68)

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

	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401	34.6401 (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)

	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205	-93.1205 (71)

Water heating gains (Table 5)

	94.1945	92.1273	87.8345	81.9986	78.2096	72.8746	68.3400	74.1501	76.2144	82.2548	89.0754	92.1360 (72)

Total internal gains

	376.2283	374.1909	361.4125	340.8492	320.0375	299.9453	286.8735	292.6538	303.2037	323.9714	347.8149	365.6325 (73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	2.4500	46.7521	0.3700	0.6600	0.7700	19.3841	(78)
West	13.1100	19.6403	0.3700	0.6600	0.7700	43.5741	(80)

Solar gains	62.9583	116.9864	180.8176	250.4386	298.5362	302.6847	289.3150	253.5399	205.5094	135.3860	77.3086	52.5829 (83)
Total gains	439.1866	491.1774	542.2301	591.2879	618.5737	602.6301	576.1885	546.1937	508.7131	459.3574	425.1235	418.2154 (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	68.8882	69.0950	69.3031	70.3623	70.5780	71.6769	71.6769	71.9008	71.2333	70.5780	70.1479	69.7229	
alpha	5.5925	5.6063	5.6202	5.6908	5.7052	5.7785	5.7785	5.7934	5.7489	5.7052	5.6765	5.6482	
util living area													
	0.9961	0.9920	0.9794	0.9362	0.8271	0.6377	0.4706	0.5153	0.7731	0.9567	0.9917	0.9970	(86)
MIT	20.0353	20.1727	20.3977	20.6804	20.8872	20.9804	20.9971	20.9952	20.9429	20.6733	20.3054	20.0120	(87)
Th 2	20.1857	20.1879	20.1902	20.2014	20.2037	20.2149	20.2149	20.2172	20.2104	20.2037	20.1992	20.1946	(88)
util rest of house													
	0.9950	0.9897	0.9735	0.9183	0.7838	0.5678	0.3884	0.4305	0.7083	0.9407	0.9890	0.9962	(89)
MIT 2	18.8876	19.0891	19.4157	19.8216	20.0903	20.2008	20.2136	20.2149	20.1631	19.8201	19.2917	18.8604	(90)
Living area fraction									fLA = Living area / (4) =			0.2286	(91)
MIT	19.1499	19.3368	19.6402	20.0179	20.2725	20.3790	20.3927	20.3932	20.3414	20.0151	19.5234	19.1236	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1499	19.3368	19.6402	20.0179	20.2725	20.3790	20.3927	20.3932	20.3414	20.0151	19.5234	19.1236	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9931	0.9866	0.9685	0.9135	0.7879	0.5828	0.4072	0.4499	0.7198	0.9361	0.9859	0.9946	(94)
Useful gains	436.1508	484.5997	525.1547	540.1139	487.3598	351.2375	234.6219	245.7163	366.1737	430.0229	419.1302	415.9580	(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													
	959.0499	929.5785	843.5494	702.9843	540.3784	358.7030	235.4135	247.0889	389.8145	593.4959	787.9290	952.2714	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	389.0369	299.0257	236.8856	117.2667	39.4458	0.0000	0.0000	0.0000	0.0000	121.6239	265.5351	399.0172	(98)
Space heating												1867.8371	(98)
Space heating per m2											(98) / (4) =	25.4127	(99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1867.8371	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1961.2289	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1725.0729	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1811.3266	(310a)
Electricity used for heat distribution	37.7256	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	176.5378	(330a)
Total electricity for the above, kWh/year	176.5378	(331)
Electricity for lighting (calculated in Appendix L)	331.8261	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.56 * 951 * 1.00) =	-425.8760	(333)
Total delivered energy for all uses	3855.0434	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			263.0000	(367a)
Space heating from Heat pump	1434.4317	0.5190	744.4701	(367)
Electrical energy for heat distribution	37.7256	0.5190	19.5796	(372)
Total CO2 associated with community systems			764.0496	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			764.0496	(376)
Pumps and fans	176.5378	0.5190	91.6231	(378)
Energy for lighting	331.8261	0.5190	172.2177	(379)
Energy saving/generation technologies				
PV Unit	-425.8760	0.5190	-221.0296	(380)
Total CO2, kg/year			806.8609	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.9800	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		10.9800	ZC1
Total Floor Area	TFA	73.5000	
Assumed number of occupants	N	2.3280	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5539	ZC2
CO2 emissions from cooking, equation (L16)		2.3792	ZC3
Total CO2 emissions		29.9131	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.9131	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	73.5000 (1b)	x	2.5000 (2b)	=	183.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	183.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1633	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4133	(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) =	0.3513	(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	0.4479	0.4391	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3513	0.3776	0.3952	0.4127	(22b)
Effective ac	0.6003	0.5964	0.5926	0.5747	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			15.5600	1.3258	20.6288			(27)
External Wall 1	48.5000	15.5600	32.9400	0.1800	5.9292			(29a)
P4	14.5000	1.8900	12.6100	0.1800	2.2698			(29a)
External Roof 1	72.5000		72.5000	0.1300	9.4250			(30)
Total net area of external elements Aum(A, m2)			135.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.1428			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.5010	(36)
Total fabric heat loss						(33) + (36) =	57.6438	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.4005	36.1643	35.9328	34.8456	34.6421	33.6952	33.6952	33.5198	34.0599	34.6421	35.0537	35.4839	(38)
Heat transfer coeff	94.0443	93.8081	93.5766	92.4893	92.2859	91.3389	91.3389	91.1636	91.7037	92.2859	92.6975	93.1277	(39)
Average = Sum(39)m / 12 =												92.4884	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2795	1.2763	1.2732	1.2584	1.2556	1.2427	1.2427	1.2403	1.2477	1.2556	1.2612	1.2670	(40)
HLP (average)												1.2583	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.3280 (42)
Average daily hot water use (litres/day)		89.4903 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4393	94.8597	91.2801	87.7005	84.1209	80.5413	80.5413	84.1209	87.7005	91.2801	94.8597	98.4393	(44)
Energy conte	145.9827	127.6774	131.7516	114.8643	110.2150	95.1072	88.1308	101.1313	102.3392	119.2664	130.1886	141.3764	(45)
Energy content (annual)										Total = Sum(45)m =		1408.0310	(45)
Distribution loss (46)m = 0.15 x (45)m	21.8974	19.1516	19.7627	17.2296	16.5323	14.2661	13.2196	15.1697	15.3509	17.8900	19.5283	21.2065	(46)
Water storage loss:													
Store volume												1.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2134	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1152	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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Total storage loss
               3.5715    3.2259    3.5715    3.4563    3.5715    3.4563    3.5715    3.5715    3.4563    3.5715    3.4563    3.5715 (56)
If cylinder contains dedicated solar storage
               3.5715    3.2259    3.5715    3.4563    3.5715    3.4563    3.5715    3.5715    3.4563    3.5715    3.4563    3.5715 (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)
Total heat required for water heating calculated for each month
              172.8166  151.9144  158.5855  140.8325  137.0489  121.0754  114.9646  127.9652  128.3074  146.1003  156.1569  168.2103 (62)
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 (63)
                                                                                    Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
              172.8166  151.9144  158.5855  140.8325  137.0489  121.0754  114.9646  127.9652  128.3074  146.1003  156.1569  168.2103 (64)
                                                                                      Total per year (kWh/year) = Sum(64)m =   1723.9783 (64)
Heat gains from water heating, kWh/month
               70.0063   61.8424   65.2745   58.9670   58.1136   52.3977   50.7706   55.0933   54.8024   61.1232   64.0623   68.4748 (65)


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5. Internal gains (see Table 5 and 5a)
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Metabolic gains (Table 5), Watts
                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
(66)m         116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006  116.4006 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
               18.3451   16.2939   13.2511   10.0320    7.4990    6.3310    6.8408    8.8920   11.9348   15.1540   17.6869   18.8550 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
              205.3242  207.4549  202.0858  190.6556  176.2270  162.6662  153.6068  151.4762  156.8453  168.2754  182.7040  196.2648 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
               34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401   34.6401 (69)
Pumps, fans     3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000    3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
              -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205  -93.1205 (71)
Water heating gains (Table 5)
               94.0946   92.0273   87.7346   81.8986   78.1097   72.7747   68.2400   74.0501   76.1144   82.1548   88.9755   92.0360 (72)
Total internal gains
              378.6841  376.6963  363.9917  343.5063  322.7559  302.6920  289.6078  295.3384  305.8147  326.5044  350.2866  368.0759 (73)


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6. Solar gains
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[Jan]                                  Area          Solar flux              g              FF            Access            Gains
                                       m2            Table 6a      Specific data  Specific data       factor                W
                                                        W/m2        or Table 6b    or Table 6c      Table 6d
-------------------------------------------------------------------------------------------------------
South                                2.4500           46.7521           0.6300           0.7000           0.7700           35.0057 (78)
West                                13.1100           19.6403           0.6300           0.7000           0.7700           78.6904 (80)
-------------------------------------------------------------------------------------------------------

Solar gains    113.6961  211.2655  326.5379  452.2664  539.1256  546.6174  522.4730  457.8669  371.1288  244.4931  139.6114   94.9593 (83)
Total gains    492.3802  587.9618  690.5296  795.7727  861.8815  849.3095  812.0809  753.2054  676.9435  570.9976  489.8980  463.0352 (84)


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7. Mean internal temperature (heating season)
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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           54.2741   54.4107   54.5453   55.1865   55.3082   55.8816   55.8816   55.9891   55.6593   55.3082   55.0626   54.8083
alpha          4.6183    4.6274    4.6364    4.6791    4.6872    4.7254    4.7254    4.7326    4.7106    4.6872    4.6708    4.6539
util living area
               0.9968    0.9922    0.9781    0.9315    0.8224    0.6467    0.4857    0.5408    0.7959    0.9625    0.9932    0.9976 (86)

MIT           19.6521   19.8422   20.1483   20.5266   20.8127   20.9556   20.9906   20.9849   20.8821   20.4858   19.9957   19.6205 (87)
Th 2          19.8569   19.8594   19.8619   19.8736   19.8758   19.8860   19.8860   19.8879   19.8821   19.8758   19.8714   19.8667 (88)
util rest of house
               0.9956    0.9895    0.9704    0.9076    0.7653    0.5508    0.3675    0.4180    0.7119    0.9446    0.9904    0.9967 (89)
MIT 2         18.0783   18.3566   18.7998   19.3364   19.7015   19.8583   19.8828   19.8821   19.7932   19.2943   18.5898   18.0389 (90)
Living area fraction                                                                                 fLA = Living area / (4) =      0.2286 (91)
MIT           18.4380   18.6962   19.1080   19.6085   19.9555   20.1091   20.1360   20.1342   20.0420   19.5666   18.9111   18.4004 (92)
Temperature adjustment                                                                                                      0.0000
adjusted MIT  18.4380   18.6962   19.1080   19.6085   19.9555   20.1091   20.1360   20.1342   20.0420   19.5666   18.9111   18.4004 (93)


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8. Space heating requirement
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                Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec
Utilisation     0.9936    0.9857    0.9636    0.9008    0.7698    0.5711    0.3946    0.4461    0.7254    0.9380    0.9869    0.9951 (94)
Useful gains  489.2132  579.5308  665.4042  716.8040  663.5002  485.0034  320.4718  336.0239  491.0663  535.6123  483.5045  460.7522 (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
             1329.6004 1294.1924 1179.8175  990.4192  761.8646  503.1968  322.9779  340.4210  544.9079  827.4942 1094.8610 1322.4529 (97)
Month fracti    1.0000    1.0000    1.0000    1.0000    1.0000    0.0000    0.0000    0.0000    0.0000    1.0000    1.0000    1.0000 (97a)
Space heating kWh
              625.2481  480.2526  382.7235  197.0030   73.1832    0.0000    0.0000    0.0000    0.0000  217.1601  440.1766  641.1053 (98)
Space heating                                                                                                            3056.8524 (98)
Space heating per m2                                                                                    (98) / (4) =     41.5898 (99)


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8c. Space cooling requirement
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Not applicable
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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												3269.3609	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	625.2481	480.2526	382.7235	197.0030	73.1832	0.0000	0.0000	0.0000	0.0000	217.1601	440.1766	641.1053	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	668.7145	513.6392	409.3300	210.6984	78.2708	0.0000	0.0000	0.0000	0.0000	232.2568	470.7772	685.6741	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	172.8166	151.9144	158.5855	140.8325	137.0489	121.0754	114.9646	127.9652	128.3074	146.1003	156.1569	168.2103	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.9464	87.6750	87.0793	85.7092	83.2253	79.8000	79.8000	79.8000	79.8000	85.8692	87.4302	88.0463	(217)
Fuel for water heating, kWh/month													
	196.5021	173.2700	182.1162	164.3143	164.6721	151.7236	144.0660	160.3574	160.7863	170.1428	178.6076	191.0476	(219)
Water heating fuel used												2037.6060	(219)
Annual totals kWh/year													
Space heating fuel - main system												3269.3609	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.9800	(232)
Total delivered energy for all uses												5705.9468	(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	3269.3609	0.2160	706.1820	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2037.6060	0.2160	440.1229	(264)
Space and water heating			1146.3048	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	323.9800	0.5190	168.1456	(268)
Total CO2, kg/m2/year			1353.3755	(272)
Emissions per m2 for space and water heating			15.5960	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.2877	(272b)
Emissions per m2 for pumps and fans			0.5296	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.5960 * 1.55) + 2.2877 + 0.5296, rounded to 2 d.p.			26.9900	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A1.03.05	**Issued on Date**	21/08/2026
Assessment Reference	Be Green	**Prop Type Ref**	Type F
Property	A1.03.05, High Road West Harringey, London		

SAP Rating	82 B	**DER**	13.85	**TER**	24.95
Environmental	91 B	**% DER<TER**	44.50		
CO_2 Emissions (t/year)	0.62	**DFEE**	35.57	**TFEE**	44.02
General Requirements Compliance	Pass	**% DFEE<TFEE**	19.19		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 59 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.95 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.85 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)44.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)35.6 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.41 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.86 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 5.76 m², No overhang
Windows facing East: 7.35 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.45 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.7000 (1b)	x	2.5000 (2b)	=	146.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			13.1100	0.8127	10.6544			(27)
External Wall 1	44.0000	13.1100	30.8900	0.1200	3.7068			(29a)
P4	4.2500	1.8900	2.3600	0.2100	0.4956			(29a)
P3	10.5000		10.5000	0.4100	4.3050			(29a)
Total net area of external elements Aum(A, m2)			58.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0518			(33)
Party Wall 1			18.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	208.6400	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.2579	(36)
Total fabric heat loss (33) + (36) =	28.3097	(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	13.5627	13.4084	13.2540	12.4822	12.3278	11.5560	11.5560	11.4016	11.8647	12.3278	12.6366	12.9453	(38)
Heat transfer coeff	41.8724	41.7181	41.5637	40.7919	40.6375	39.8657	39.8657	39.7114	40.1744	40.6375	40.9463	41.2550	(39)
Average = Sum(39)m / 12 =												40.7533	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7133	0.7107	0.7081	0.6949	0.6923	0.6791	0.6791	0.6765	0.6844	0.6923	0.6976	0.7028	(40)
HLP (average)												0.6943	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.9446 (42)
Average daily hot water use (litres/day)	80.3854 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.4240	85.2085	81.9931	78.7777	75.5623	72.3469	72.3469	75.5623	78.7777	81.9931	85.2085	88.4240	(44)
Energy conte	131.1302	114.6873	118.3470	103.1778	99.0015	85.4308	79.1642	90.8421	91.9270	107.1321	116.9430	126.9926	(45)
Energy content (annual)										Total = Sum(45)m =		1264.7756	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6695	17.2031	17.7521	15.4767	14.8502	12.8146	11.8746	13.6263	13.7891	16.0698	17.5415	19.0489	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Store volume 1.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)
Volume factor from Table 2a 4.9324 (52)
Temperature factor from Table 2b 1.0000 (53)
Enter (49) or (54) in (55) 0.1182 (55)
Total storage loss

3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(56)

If cylinder contains dedicated solar storage

3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(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)

Total heat required for water heating calculated for each month

158.0570	139.0083	145.2739	129.2360	125.9284	111.4891	106.0911	117.7689	117.9853	134.0589	143.0013	153.9194	(62)
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	(63)
							Solar input (sum of months) = Sum(63)m =				0.0000	(63)

Output from w/h

158.0570	139.0083	145.2739	129.2360	125.9284	111.4891	106.0911	117.7689	117.9853	134.0589	143.0013	153.9194	(64)
							Total per year (kWh/year) = Sum(64)m =				1581.8176	(64)

Heat gains from water heating, kWh/month

65.1423	57.5903	60.8919	55.1532	54.4595	49.2523	47.8636	51.7465	51.4123	57.1629	59.7302	63.7665	(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	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	(66)

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

15.3923	13.6713	11.1183	8.4173	6.2920	5.3120	5.7398	7.4608	10.0138	12.7149	14.8401	15.8201	(67)

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

169.6568	171.4173	166.9809	157.5363	145.6141	134.4090	126.9233	125.1628	129.5992	139.0438	150.9660	162.1711	(68)

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

32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	32.7232	(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)

-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	-77.7860	(71)

Water heating gains (Table 5)

87.5568	85.6999	81.8439	76.6017	73.1982	68.4060	64.3328	69.5517	71.4060	76.8319	82.9586	85.7077	(72)

Total internal gains

324.7757	322.9583	312.1128	294.7249	277.2741	260.2967	249.1656	254.3450	263.1888	280.7603	300.9344	315.8686	(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	
North	5.7600	10.6334	0.3700	0.6600	0.7700	10.3651	(74)
East	7.3500	19.6403	0.3700	0.6600	0.7700	24.4294	(76)

Solar gains 34.7945	67.5974	112.3610	168.8471	213.5003	221.9678	209.8868	175.5135	132.0027	80.2850	43.2473	28.7304	(83)
Total gains 359.5702	390.5557	424.4738	463.5721	490.7744	482.2645	459.0524	429.8585	395.1915	361.0453	344.1817	344.5991	(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	81.2465	81.5472	81.8500	83.3987	83.7155	85.3362	85.3362	85.6680	84.6805	83.7155	83.0843	82.4625	
alpha	6.4164	6.4365	6.4567	6.5599	6.5810	6.6891	6.6891	6.7112	6.6454	6.5810	6.5390	6.4975	
util living area	0.9931	0.9870	0.9668	0.8933	0.7333	0.5255	0.3817	0.4242	0.6802	0.9258	0.9849	0.9946	(86)
MIT	20.3068	20.4198	20.6099	20.8383	20.9632	20.9965	20.9996	20.9993	20.9829	20.8201	20.5320	20.2885	(87)
Th 2	20.3291	20.3314	20.3337	20.3453	20.3476	20.3593	20.3593	20.3616	20.3546	20.3476	20.3430	20.3384	(88)
util rest of house	0.9915	0.9838	0.9588	0.8708	0.6915	0.4743	0.3263	0.3657	0.6240	0.9047	0.9807	0.9933	(89)
MIT 2	19.3953	19.5608	19.8346	20.1570	20.3118	20.3568	20.3591	20.3613	20.3407	20.1405	19.7333	19.3760	(90)
Living area fraction									fLA = Living area / (4) =			0.4140	(91)
MIT	19.7726	19.9164	20.1556	20.4390	20.5814	20.6216	20.6243	20.6254	20.6065	20.4218	20.0639	19.7537	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7726	19.9164	20.1556	20.4390	20.5814	20.6216	20.6243	20.6254	20.6065	20.4218	20.0639	19.7537	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9897	0.9815	0.9564	0.8742	0.7069	0.4954	0.3493	0.3899	0.6464	0.9074	0.9785	0.9918	(94)
Useful gains	355.8638	383.3140	405.9525	405.2769	346.9221	238.9162	160.3387	167.6110	255.4693	327.6045	336.7797	341.7632	(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	647.8755	626.4557	567.5766	470.6984	360.9202	240.0555	160.4308	167.7965	261.3968	399.1345	530.8239	641.6694	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	217.2567	163.3912	120.2484	47.1035	10.4146	0.0000	0.0000	0.0000	0.0000	53.2184	139.7118	223.1302	(98)
Space heating												974.4749	(98)
Space heating per m2											(98) / (4) =	16.6009	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.5000	(306)
Space heating:		
Annual space heating requirement	974.4749	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50	1461.7124	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1581.8176	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50	2372.7264	(310a)
Electricity used for heat distribution	38.3444	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	140.9901	(330a)
Total electricity for the above, kWh/year	140.9901	(331)
Electricity for lighting (calculated in Appendix L)	271.8336	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.45 * 951 * 1.00) =	-342.2218	(333)
Total delivered energy for all uses	3905.0406	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			263.0000	(367a)
Space heating from Heat pump	1457.9615	0.5190	756.6820	(367)
Electrical energy for heat distribution	38.3444	0.5190	19.9007	(372)
Total CO2 associated with community systems			776.5828	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			776.5828	(376)
Pumps and fans	140.9901	0.5190	73.1738	(378)
Energy for lighting	271.8336	0.5190	141.0816	(379)
Energy saving/generation technologies				
PV Unit	-342.2218	0.5190	-177.6131	(380)
Total CO2, kg/year			813.2251	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8500	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.8500	ZC1
Total Floor Area	TFA	58.7000	
Assumed number of occupants	N	1.9446	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.1269	ZC2
CO2 emissions from cooking, equation (L16)		2.8223	ZC3
Total CO2 emissions		33.7993	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.7993	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	58.7000 (1b)	x	2.5000 (2b)	=	146.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	146.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1363	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3863	(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) =	0.3283	(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	0.4186	0.4104	0.4022	0.3612	0.3530	0.3119	0.3119	0.3037	0.3283	0.3530	0.3694	0.3858	(22b)
Effective ac	0.5876	0.5842	0.5809	0.5652	0.5623	0.5486	0.5486	0.5461	0.5539	0.5623	0.5682	0.5744	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			12.7900	1.3258	16.9564			(27)
External Wall 1	44.0000	12.7900	31.2100	0.1800	5.6178			(29a)
P4	4.2500	1.8900	2.3600	0.1800	0.4248			(29a)
P3	10.5000		10.5000	0.1800	1.8900			(29a)
Total net area of external elements Aum(A, m2)			58.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.7790			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6570	(36)
Total fabric heat loss					(33) + (36) =		32.4360	(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	28.4574	28.2926	28.1311	27.3724	27.2305	26.5697	26.5697	26.4473	26.8242	27.2305	27.5176	27.8178	(38)
Heat transfer coeff	60.8934	60.7286	60.5671	59.8085	59.6665	59.0057	59.0057	58.8834	59.2603	59.6665	59.9537	60.2539	(39)
Average = Sum(39)m / 12 =												59.8078	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0374	1.0346	1.0318	1.0189	1.0165	1.0052	1.0052	1.0031	1.0095	1.0165	1.0214	1.0265	(40)
HLP (average)												1.0189	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		1.9446 (42)
Average daily hot water use (litres/day)		80.3854 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	88.4240	85.2085	81.9931	78.7777	75.5623	72.3469	72.3469	75.5623	78.7777	81.9931	85.2085	88.4240	(44)
Energy conte	131.1302	114.6873	118.3470	103.1778	99.0015	85.4308	79.1642	90.8421	91.9270	107.1321	116.9430	126.9926	(45)
Energy content (annual)										Total = Sum(45)m =		1264.7756	(45)
Distribution loss (46)m = 0.15 x (45)m	19.6695	17.2031	17.7521	15.4767	14.8502	12.8146	11.8746	13.6263	13.7891	16.0698	17.5415	19.0489	(46)
Water storage loss:													
Store volume												1.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2134	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1152	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss
3.5715 3.2259 3.5715 3.4563 3.5715 3.4563 3.5715 3.5715 3.4563 3.5715 3.4563 3.5715 (56)
If cylinder contains dedicated solar storage
3.5715 3.2259 3.5715 3.4563 3.5715 3.4563 3.5715 3.5715 3.4563 3.5715 3.4563 3.5715 (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)
Total heat required for water heating calculated for each month
157.9641 138.9243 145.1809 129.1461 125.8354 111.3991 105.9981 117.6760 117.8953 133.9660 142.9113 153.8265 (62)
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 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
157.9641 138.9243 145.1809 129.1461 125.8354 111.3991 105.9981 117.6760 117.8953 133.9660 142.9113 153.8265 (64)
Total per year (kWh/year) = Sum(64)m = 1580.7229 (64)
Heat gains from water heating, kWh/month
65.0679 57.5232 60.8175 55.0812 54.3851 49.1804 47.7892 51.6721 51.3404 57.0885 59.6582 63.6921 (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	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	97.2325	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
15.1355 13.4432 10.9328 8.2768 6.1870 5.2233 5.6440 7.3363 9.8467 12.5027 14.5925 15.5562 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
169.6568 171.4173 166.9809 157.5363 145.6141 134.4090 126.9233 125.1628 129.5992 139.0438 150.9660 162.1711 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 32.7232 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)
-77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 -77.7860 (71)
Water heating gains (Table 5)
87.4568 85.5999 81.7439 76.5017 73.0983 68.3061 64.2328 69.4517 71.3060 76.7319 82.8586 85.6077 (72)
Total internal gains
327.4189 325.6302 314.8273 297.4845 280.0692 263.1081 251.9698 257.1206 265.9217 283.4481 303.5868 318.5047 (73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	5.6200	10.6334	0.6300	0.7000	0.7700	18.2633	(74)
East	7.1700	19.6403	0.6300	0.7000	0.7700	43.0366	(76)

Solar gains	61.3000	119.0909	197.9542	297.4710	376.1415	391.0601	369.7756	309.2163	232.5587	141.4435	76.1918	50.6164	(83)
Total gains	388.7188	444.7211	512.7815	594.9555	656.2106	654.1682	621.7454	566.3368	498.4805	424.8917	379.7786	369.1211	(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	66.9430	67.1246	67.3037	68.1574	68.3195	69.0846	69.0846	69.2282	68.7879	68.3195	67.9923	67.6536	
alpha	5.4629	5.4750	5.4869	5.5438	5.5546	5.6056	5.6056	5.6152	5.5859	5.5546	5.5328	5.5102	

util living area
0.9968 0.9927 0.9776 0.9169 0.7685 0.5658 0.4157 0.4743 0.7534 0.9580 0.9929 0.9975 (86)

MIT	19.9718	20.1236	20.3837	20.7079	20.9170	20.9876	20.9981	20.9963	20.9452	20.6499	20.2525	19.9458	(87)
Th 2	20.0523	20.0546	20.0569	20.0676	20.0696	20.0790	20.0790	20.0807	20.0754	20.0696	20.0656	20.0613	(88)

util rest of house
0.9957 0.9903 0.9702 0.8916 0.7131 0.4893 0.3297 0.3816 0.6763 0.9398 0.9902 0.9967 (89)

MIT 2	18.6835	18.9059	19.2820	19.7377	19.9942	20.0714	20.0783	20.0793	20.0346	19.6716	19.1027	18.6522	(90)

Living area fraction fLA = Living area / (4) = 0.4140 (91)

MIT	19.2168	19.4099	19.7380	20.1394	20.3762	20.4507	20.4591	20.4589	20.4116	20.0766	19.5787	19.1878	(92)

Temperature adjustment 0.0000
adjusted MIT 19.2168 19.4099 19.7380 20.1394 20.3762 20.4507 20.4591 20.4589 20.4116 20.0766 19.5787 19.1878 (93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9881	0.9672	0.8938	0.7323	0.5207	0.3654	0.4201	0.7060	0.9399	0.9883	0.9957	(94)
Useful gains	386.5551	439.4456	495.9468	531.7917	480.5549	340.6236	227.1909	237.9094	351.9228	399.3767	375.3335	367.5391	(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
908.3352 881.1696 801.7895 672.2086 517.6777 345.2223 227.7091 239.0005 374.0252 565.4371 748.1416 903.0704 (97)

Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)

Space heating kWh
388.2044 296.8385 227.5470 101.1002 27.6194 0.0000 0.0000 0.0000 0.0000 123.5490 268.4218 398.4353 (98)
Space heating 1831.7155 (98)
Space heating per m2 (98) / (4) = 31.2047 (99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1959.0540	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	388.2044	296.8385	227.5470	101.1002	27.6194	0.0000	0.0000	0.0000	0.0000	123.5490	268.4218	398.4353	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	415.1918	317.4743	243.3657	108.1285	29.5394	0.0000	0.0000	0.0000	0.0000	132.1379	287.0821	426.1340	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	157.9641	138.9243	145.1809	129.1461	125.8354	111.3991	105.9981	117.6760	117.8953	133.9660	142.9113	153.8265	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.1214	86.7900	86.0080	84.1697	81.5351	79.8000	79.8000	79.8000	79.8000	84.5988	86.4716	87.2417	(217)
Fuel for water heating, kWh/month													
	181.3149	160.0696	168.7992	153.4354	154.3329	139.5978	132.8297	147.4636	147.7385	158.3544	165.2696	176.3222	(219)
Water heating fuel used												1885.5277	(219)
Annual totals kWh/year													
Space heating fuel - main system												1959.0540	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												267.2977	(232)
Total delivered energy for all uses												4186.8793	(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	1959.0540	0.2160	423.1557	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1885.5277	0.2160	407.2740	(264)
Space and water heating			830.4296	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	267.2977	0.5190	138.7275	(268)
Total CO2, kg/m2/year			1008.0821	(272)
Emissions per m2 for space and water heating			14.1470	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3633	(272b)
Emissions per m2 for pumps and fans			0.6631	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1470 * 1.55) + 2.3633 + 0.6631, rounded to 2 d.p.			24.9500	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A1.03.01	**Issued on Date**	21/08/2026
Assessment Reference	Be Green	**Prop Type Ref**	Type D
Property	A1.03.01, High Road West Harringey, London		

SAP Rating	82 B	**DER**	15.12	**TER**	26.07
Environmental	91 B	**% DER<TER**	42.00		
CO_2 Emissions (t/year)	0.62	**DFEE**	38.26	**TFEE**	45.40
General Requirements Compliance	Pass	**% DFEE<TFEE**	15.73		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 53 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.07 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.12 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)45.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.3 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.41 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.86 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 5.76 m², No overhang
Windows facing East: 7.35 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.40 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.7000 (1b)	x	2.5000 (2b)	=	131.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(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) =	0.1275	(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	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5000	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			13.1100	0.8127	10.6544			(27)
External Wall 1	44.0000	13.1100	30.8900	0.1200	3.7068			(29a)
P4	4.2500	1.8900	2.3600	0.2100	0.4956			(29a)
P3	10.5000		10.5000	0.4100	4.3050			(29a)
Total net area of external elements Aum(A, m2)			58.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.0518			(33)
Party Wall 1			18.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	209.7500 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.8579 (36)
Total fabric heat loss (33) + (36) =	28.9097 (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	12.1764	12.0378	11.8992	11.2063	11.0677	10.3748	10.3748	10.2362	10.6520	11.0677	11.3449	11.6221	(38)
Heat transfer coeff	41.0861	40.9475	40.8090	40.1160	39.9775	39.2845	39.2845	39.1459	39.5617	39.9775	40.2546	40.5318	(39)

Average = Sum(39)m / 12 = 40.0814 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7796	0.7770	0.7744	0.7612	0.7586	0.7454	0.7454	0.7428	0.7507	0.7586	0.7638	0.7691	(40)
HLP (average)												0.7606	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7697 (42)
Average daily hot water use (litres/day)	76.2308 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	83.8539	80.8046	77.7554	74.7062	71.6569	68.6077	68.6077	71.6569	74.7062	77.7554	80.8046	83.8539	(44)
Energy conte	124.3529	108.7598	112.2304	97.8452	93.8848	81.0154	75.0727	86.1470	87.1759	101.5951	110.8990	120.4291	(45)

Energy content (annual)	Total = Sum(45)m =	1199.4071 (45)
Distribution loss (46)m = 0.15 x (45)m		

	18.6529	16.3140	16.8346	14.6768	14.0827	12.1523	11.2609	12.9221	13.0764	15.2393	16.6348	18.0644	(46)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:
Store volume 1.0000 (47)
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.0240 (51)
Volume factor from Table 2a 4.9324 (52)
Temperature factor from Table 2b 1.0000 (53)
Enter (49) or (54) in (55) 0.1182 (55)
Total storage loss

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (56)

If cylinder contains dedicated solar storage

	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645 (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)

Total heat required for water heating calculated for each month

	151.2797	133.0808	139.1572	123.9034	120.8116	107.0737	101.9995	113.0739	113.2341	128.5219	136.9572	147.3560 (62)
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 (63)

Solar input (sum of months) = Sum(63)m = 0.0000 (63)

Output from w/h

	151.2797	133.0808	139.1572	123.9034	120.8116	107.0737	101.9995	113.0739	113.2341	128.5219	136.9572	147.3560 (64)

Total per year (kWh/year) = Sum(64)m = 1516.4491 (64)

Heat gains from water heating, kWh/month

	62.8888	55.6195	58.8581	53.3801	52.7582	47.7842	46.5032	50.1854	49.8326	55.3218	57.7205	61.5842 (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	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	(66)

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

	13.8133	12.2689	9.9777	7.5538	5.6465	4.7670	5.1510	6.6954	8.9866	11.4105	13.3177	14.1972 (67)

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

	154.2407	155.8412	151.8079	143.2215	132.3827	122.1957	115.3902	113.7897	117.8230	126.4094	137.2482	147.4352 (68)

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

	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486 (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)

	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887 (71)

Water heating gains (Table 5)

	84.5280	82.7671	79.1103	74.1390	70.9115	66.3670	62.5042	67.4534	69.2119	74.3573	80.1674	82.7744 (72)

Total internal gains

	302.1277	300.4229	290.4417	274.4601	258.4865	242.8755	232.5912	237.4843	245.5672	261.7230	280.2791	293.9526 (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	
North	5.7600	10.6334	0.3700	0.6600	0.7700	10.3651	(74)
East	7.3500	19.6403	0.3700	0.6600	0.7700	24.4294	(76)

Solar gains	34.7945	67.5974	112.3610	168.8471	213.5003	221.9678	209.8868	175.5135	132.0027	80.2850	43.2473	28.7304 (83)
Total gains	336.9223	368.0203	402.8027	443.3072	471.9868	464.8433	442.4780	412.9978	377.5699	342.0080	323.5264	322.6830 (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	74.7334	74.9864	75.2410	76.5406	76.8060	78.1607	78.1607	78.4374	77.6131	76.8060	76.2771	75.7555	
alpha	5.9822	5.9991	6.0161	6.1027	6.1204	6.2107	6.2107	6.2292	6.1742	6.1204	6.0851	6.0504	
util living area	0.9927	0.9864	0.9661	0.8950	0.7402	0.5353	0.3900	0.4346	0.6930	0.9285	0.9846	0.9942	(86)
MIT	20.2217	20.3440	20.5512	20.8030	20.9501	20.9943	20.9993	20.9987	20.9748	20.7816	20.4648	20.2012	(87)
Th 2	20.2710	20.2733	20.2756	20.2871	20.2894	20.3009	20.3009	20.3032	20.2963	20.2894	20.2848	20.2802	(88)
util rest of house	0.9909	0.9830	0.9578	0.8718	0.6960	0.4791	0.3284	0.3695	0.6327	0.9071	0.9802	0.9928	(89)
MIT 2	19.2262	19.4050	19.7032	20.0581	20.2408	20.2968	20.3006	20.3025	20.2759	20.0382	19.5899	19.2034	(90)
Living area fraction									fLA = Living area / (4) =			0.3169	(91)
MIT	19.5417	19.7026	19.9719	20.2942	20.4656	20.5178	20.5220	20.5231	20.4973	20.2738	19.8671	19.5196	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5417	19.7026	19.9719	20.2942	20.4656	20.5178	20.5220	20.5231	20.4973	20.2738	19.8671	19.5196	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9885	0.9797	0.9536	0.8720	0.7073	0.4967	0.3479	0.3901	0.6505	0.9065	0.9770	0.9908	(94)
Useful gains	333.0541	360.5464	384.1227	386.5694	333.8540	230.8962	153.9298	161.1215	245.6059	310.0411	316.0747	319.6996	(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	626.2224	606.1283	549.7759	457.0887	350.4269	232.4783	154.0732	161.4043	253.0899	386.7322	513.9353	620.9304	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	218.1172	165.0310	123.2459	50.7739	12.3302	0.0000	0.0000	0.0000	0.0000	57.0582	142.4597	224.1157	(98)
Space heating												993.1319	(98)
Space heating per m2											(98) / (4) =	18.8450	(99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Heat pump		1.0000 (303a)
Fraction of total space heat from community Heat pump		1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.5000 (306)
Space heating:		
Annual space heating requirement		993.1319 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.50		1489.6979 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)
Water heating		
Annual water heating requirement		1516.4491 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.50		2274.6736 (310a)
Electricity used for heat distribution		37.6437 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)		126.5788 (330a)
Total electricity for the above, kWh/year		126.5788 (331)
Electricity for lighting (calculated in Appendix L)		243.9475 (332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.40 * 951 * 1.00) =		-304.1971 (333)
Total delivered energy for all uses		3830.7007 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			263.0000	(367a)
Space heating from Heat pump	1431.3200	0.5190	742.8551	(367)
Electrical energy for heat distribution	37.6437	0.5190	19.5371	(372)
Total CO2 associated with community systems			762.3922	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			762.3922	(376)
Pumps and fans	126.5788	0.5190	65.6944	(378)
Energy for lighting	243.9475	0.5190	126.6088	(379)
Energy saving/generation technologies				
PV Unit	-304.1971	0.5190	-157.8783	(380)
Total CO2, kg/year			796.8170	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.1200	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.1200	ZC1
Total Floor Area	TFA	52.7000	
Assumed number of occupants	N	1.7697	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3434	ZC2
CO2 emissions from cooking, equation (L16)		3.0640	ZC3
Total CO2 emissions		35.5274	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		35.5274	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	52.7000 (1b)	x	2.5000 (2b)	=	131.7500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	131.7500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1518	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4018	(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) =	0.3415	(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	0.4355	0.4269	0.4184	0.3757	0.3671	0.3245	0.3245	0.3159	0.3415	0.3671	0.3842	0.4013	(22b)
Effective ac	0.5948	0.5911	0.5875	0.5706	0.5674	0.5526	0.5526	0.5499	0.5583	0.5674	0.5738	0.5805	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			11.2900	1.3258	14.9678			(27)
External Wall 1	44.0000	11.2900	32.7100	0.1800	5.8878			(29a)
P4	4.2500	1.8900	2.3600	0.1800	0.4248			(29a)
P3	10.5000		10.5000	0.1800	1.8900			(29a)
Total net area of external elements Aum(A, m2)			58.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.0604			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6570	(36)
Total fabric heat loss						(33) + (36) =	30.7174	(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	25.8608	25.7008	25.5439	24.8069	24.6691	24.0272	24.0272	23.9084	24.2745	24.6691	24.9480	25.2396	(38)
Heat transfer coeff	56.5783	56.4182	56.2613	55.5244	55.3865	54.7446	54.7446	54.6258	54.9919	55.3865	55.6654	55.9570	(39)
Average = Sum(39)m / 12 =												55.5237	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0736	1.0706	1.0676	1.0536	1.0510	1.0388	1.0388	1.0365	1.0435	1.0510	1.0563	1.0618	(40)
HLP (average)												1.0536	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7697	(42)
Average daily hot water use (litres/day)	76.2308	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	83.8539	80.8046	77.7554	74.7062	71.6569	68.6077	68.6077	71.6569	74.7062	77.7554	80.8046	83.8539	(44)
Energy conte	124.3529	108.7598	112.2304	97.8452	93.8848	81.0154	75.0727	86.1470	87.1759	101.5951	110.8990	120.4291	(45)
Energy content (annual)										Total = Sum(45)m =		1199.4071	(45)
Distribution loss (46)m = 0.15 x (45)m	18.6529	16.3140	16.8346	14.6768	14.0827	12.1523	11.2609	12.9221	13.0764	15.2393	16.6348	18.0644	(46)

Water storage loss:		
Store volume	1.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2134	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.1152	(55)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss													
	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715	(56)
If cylinder contains dedicated solar storage													
	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715	(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)
Total heat required for water heating calculated for each month													
	151.1867	132.9969	139.0643	123.8134	120.7186	106.9837	101.9066	112.9809	113.1441	128.4290	136.8672	147.2630	(62)
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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	151.1867	132.9969	139.0643	123.8134	120.7186	106.9837	101.9066	112.9809	113.1441	128.4290	136.8672	147.2630	(64)
									Total per year (kWh/year) = Sum(64)m =			1515.3544	(64)
Heat gains from water heating, kWh/month													
	62.8144	55.5523	58.7837	53.3081	52.6838	47.7122	46.4288	50.1110	49.7606	55.2475	57.6485	61.5098	(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	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	88.4859	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	13.7712	12.2315	9.9473	7.5308	5.6293	4.7525	5.1353	6.6750	8.9592	11.3757	13.2772	14.1540	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	154.2407	155.8412	151.8079	143.2215	132.3827	122.1957	115.3902	113.7897	117.8230	126.4094	137.2482	147.4352	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	31.8486	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	-70.7887	(71)
Water heating gains (Table 5)													
	84.4280	82.6671	79.0104	74.0391	70.8115	66.2670	62.4043	67.3535	69.1119	74.2573	80.0674	82.6744	(72)
Total internal gains													
	304.9857	303.2855	293.3113	277.3371	261.3693	245.7610	235.4755	240.3639	248.4399	264.5883	283.1385	296.8093	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9600	10.6334	0.6300	0.7000	0.7700	16.1185	(74)
East	6.3300	19.6403	0.6300	0.7000	0.7700	37.9947	(76)

Solar gains	54.1132	105.1290	174.7462	262.5939	332.0384	345.2067	326.4183	272.9613	205.2932	124.8610	67.2592	44.6822	(83)
Total gains	359.0989	408.4145	468.0575	539.9310	593.4077	590.9677	561.8939	513.3252	453.7330	389.4493	350.3977	341.4915	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.6843	64.8678	65.0487	65.9120	66.0761	66.8508	66.8508	66.9963	66.5503	66.0761	65.7450	65.4024	
alpha	5.3123	5.3245	5.3366	5.3941	5.4051	5.4567	5.4567	5.4664	5.4367	5.4051	5.3830	5.3602	
util living area													
	0.9964	0.9921	0.9773	0.9198	0.7786	0.5784	0.4263	0.4844	0.7605	0.9575	0.9923	0.9972	(86)
MIT	19.9390	20.0902	20.3517	20.6822	20.9037	20.9845	20.9975	20.9953	20.9375	20.6314	20.2275	19.9141	(87)
Th 2	20.0225	20.0250	20.0274	20.0389	20.0411	20.0511	20.0511	20.0530	20.0473	20.0411	20.0367	20.0321	(88)
util rest of house													
	0.9952	0.9896	0.9699	0.8948	0.7227	0.4989	0.3357	0.3874	0.6822	0.9388	0.9893	0.9963	(89)
MIT 2	18.6138	18.8354	19.2136	19.6794	19.9531	20.0416	20.0503	20.0511	20.0006	19.6230	19.0449	18.5846	(90)
Living area fraction										fLA = Living area / (4) =		0.3169	(91)
MIT	19.0337	19.2330	19.5742	19.9971	20.2543	20.3404	20.3504	20.3503	20.2975	19.9425	19.4197	19.0059	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0337	19.2330	19.5742	19.9971	20.2543	20.3404	20.3504	20.3503	20.2975	19.9425	19.4197	19.0059	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9868	0.9654	0.8936	0.7360	0.5237	0.3644	0.4182	0.7043	0.9365	0.9866	0.9949	(94)
Useful gains	356.7564	403.0204	451.8840	482.4729	436.7442	309.4844	204.7794	214.6887	319.5435	364.7055	345.7190	339.7497	(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													
	833.6091	808.6431	735.5723	616.1610	473.7937	314.2540	205.3161	215.7888	340.8116	517.4504	685.7794	828.4925	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	354.7784	272.5784	211.0641	96.2554	27.5649	0.0000	0.0000	0.0000	0.0000	113.6422	244.8435	363.6246	(98)
Space heating												1684.3517	(98)
Space heating per m2											(98) / (4) =	31.9611	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1801.4456	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	354.7784	272.5784	211.0641	96.2554	27.5649	0.0000	0.0000	0.0000	0.0000	113.6422	244.8435	363.6246	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	379.4422	291.5277	225.7370	102.9470	29.4812	0.0000	0.0000	0.0000	0.0000	121.5425	261.8647	388.9034	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	151.1867	132.9969	139.0643	123.8134	120.7186	106.9837	101.9066	112.9809	113.1441	128.4290	136.8672	147.2630	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0137	86.6884	85.9240	84.1518	81.5933	79.8000	79.8000	79.8000	79.8000	84.4896	86.3485	87.1323	(217)
Fuel for water heating, kWh/month													
	173.7505	153.4195	161.8456	147.1311	147.9517	134.0648	127.7025	141.5801	141.7846	152.0057	158.5056	169.0107	(219)
Water heating fuel used												1808.7523	(219)
Annual totals kWh/year													
Space heating fuel - main system												1801.4456	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.2043	(232)
Total delivered energy for all uses												3928.4022	(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	1801.4456	0.2160	389.1123	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1808.7523	0.2160	390.6905	(264)
Space and water heating			779.8027	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	243.2043	0.5190	126.2230	(268)
Total CO2, kg/m2/year			944.9508	(272)
Emissions per m2 for space and water heating			14.7970	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3951	(272b)
Emissions per m2 for pumps and fans			0.7386	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7970 * 1.55) + 2.3951 + 0.7386, rounded to 2 d.p.			26.0700	(273)

FULL SAP CALCULATION PRINTOUT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	A1.02.03	**Issued on Date**	21/08/2026
Assessment Reference	Be Green	**Prop Type Ref**	Type C
Property	A1.02.03, High Road West Harringey, London		

SAP Rating	87 B	**DER**	7.44	**TER**	20.90
Environmental	95 A	**% DER<TER**	64.41		
CO_2 Emissions (t/year)	0.48	**DFEE**	30.33	**TFEE**	39.21
General Requirements Compliance	Pass	**% DFEE<TFEE**	22.64		

Assessor Details	Mr. Neil Rothon, Neil Rothon, Tel: 02037358169, neil@nrgconsulting.org	**Assessor ID**	L759-0001
Client			

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England
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DWELLING AS DESIGNED

Mid-floor flat, total floor area 89 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER
Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.90 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 7.44 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)39.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)30.3 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.21 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.86 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging
Thermal bridging calculated from linear thermal transmittances for each junction

---
3 Air permeability
Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.12 kWh/day
Permitted by DBSCG 0.29 OK
Primary pipework insulated: No primary pipework

---
6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

---
7 Low energy lights
Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

---
8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 4.90 m², No overhang
Windows facing East: 13.11 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

---
10 Key features
External wall U-value 0.12 W/m²K
Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.84 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.68 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	88.9000 (1b)	x	2.5000 (2b)	=	222.2500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	222.2500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent 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)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		3.0000	
Infiltration rate		0.1500	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1163	(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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366	(22b)

Balanced mechanical ventilation with heat recovery

If mechanical ventilation:	0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	75.6500	(23c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Effective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583	(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	
Front door			1.8900	1.0000	1.8900			(26)
window (Uw = 0.84)			18.0100	0.8127	14.6366			(27)
External Wall 1	53.0000	18.0100	34.9900	0.1200	4.1988			(29a)
P4	15.7500	1.8900	13.8600	0.2100	2.9106			(29a)
Total net area of external elements Aum(A, m2)			68.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.6360			(33)
Party Wall 1			36.2500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	216.5000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.9226	(36)
Total fabric heat loss (33) + (36) =	32.5586	(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	19.8002	19.5870	19.3739	18.3081	18.0950	17.0292	17.0292	16.8161	17.4555	18.0950	18.5213	18.9476	(38)
Heat transfer coeff	52.3588	52.1456	51.9325	50.8667	50.6536	49.5878	49.5878	49.3747	50.0141	50.6536	51.0799	51.5062	(39)
Average = Sum(39)m / 12 =												50.8134	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.5890	0.5866	0.5842	0.5722	0.5698	0.5578	0.5578	0.5554	0.5626	0.5698	0.5746	0.5794	(40)
HLP (average)												0.5716	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.6104 (42)
Average daily hot water use (litres/day)	96.1961 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.8157	101.9679	98.1200	94.2722	90.4243	86.5765	86.5765	90.4243	94.2722	98.1200	101.9679	105.8157	(44)
Energy conte	156.9217	137.2447	141.6242	123.4714	118.4738	102.2339	94.7347	108.7095	110.0078	128.2035	139.9441	151.9703	(45)
Energy content (annual)											Total = Sum(45)m =	1513.5394	(45)
Distribution loss (46)m = 0.15 x (45)m	23.5382	20.5867	21.2436	18.5207	17.7711	15.3351	14.2102	16.3064	16.5012	19.2305	20.9916	22.7955	(46)

Water storage loss:

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												1.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0240	(51)
Volume factor from Table 2a												4.9324	(52)
Temperature factor from Table 2b												1.0000	(53)
Enter (49) or (54) in (55)												0.1182	(55)
Total storage loss													
	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(56)
If cylinder contains dedicated solar storage													
	3.6645	3.3098	3.6645	3.5462	3.6645	3.5462	3.6645	3.6645	3.5462	3.6645	3.5462	3.6645	(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)
Total heat required for water heating calculated for each month													
	183.8485	161.5657	168.5511	149.5297	145.4006	128.2921	121.6616	135.6363	136.0660	155.1303	166.0024	178.8971	(62)
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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	183.8485	161.5657	168.5511	149.5297	145.4006	128.2921	121.6616	135.6363	136.0660	155.1303	166.0024	178.8971	(64)
									Total per year (kWh/year) = Sum(64)m =			1830.5814	(64)
Heat gains from water heating, kWh/month													
	73.7179	65.0907	68.6315	61.9008	60.9340	54.8394	53.0408	57.6874	57.4242	64.1691	67.3780	72.0716	(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	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.8631	19.4186	15.7923	11.9558	8.9371	7.5451	8.1527	10.5972	14.2235	18.0600	21.0787	22.4708	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	237.0394	239.4991	233.3007	220.1050	203.4477	187.7923	177.3335	174.8737	181.0722	194.2679	210.9251	226.5806	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	(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)													
	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	(71)
Water heating gains (Table 5)													
	99.0832	96.8611	92.2467	85.9734	81.9006	76.1658	71.2914	77.5368	79.7558	86.2488	93.5806	96.8704	(72)
Total internal gains													
	420.1412	417.9343	403.4951	380.1896	356.4408	333.6585	318.9330	325.1632	337.2070	360.7322	387.7399	408.0772	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9000	10.6334	0.3700	0.6600	0.7700	8.8175	(74)
East	13.1100	19.6403	0.3700	0.6600	0.7700	43.5741	(76)

Solar gains	52.3917	102.0910	169.0121	250.7266	312.8655	323.1763	306.4557	259.1779	197.6929	121.2034	65.2094	43.1840	(83)
Total gains	472.5329	520.0253	572.5072	630.9162	669.3063	656.8348	625.3887	584.3411	534.8999	481.9356	452.9493	451.2612	(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	102.1098	102.5272	102.9480	105.1050	105.5473	107.8157	107.8157	108.2812	106.8967	105.5473	104.6664	103.8001	
alpha	7.8073	7.8351	7.8632	8.0070	8.0365	8.1877	8.1877	8.2187	8.1264	8.0365	7.9778	7.9200	
util living area													
	0.9962	0.9909	0.9695	0.8777	0.6909	0.4825	0.3488	0.3886	0.6385	0.9246	0.9898	0.9972	(86)
MIT	20.4615	20.5672	20.7356	20.9173	20.9884	20.9994	21.0000	20.9999	20.9952	20.8912	20.6497	20.4447	(87)
Th 2	20.4399	20.4421	20.4443	20.4551	20.4573	20.4681	20.4681	20.4703	20.4638	20.4573	20.4529	20.4486	(88)
util rest of house													
	0.9953	0.9887	0.9623	0.8550	0.6544	0.4427	0.3067	0.3439	0.5914	0.9044	0.9868	0.9965	(89)
MIT 2	19.7077	19.8628	20.1054	20.3603	20.4462	20.4677	20.4681	20.4703	20.4600	20.3328	19.9921	19.6903	(90)
Living area fraction									fLA = Living area / (4) =			0.3521	(91)
MIT	19.9731	20.1108	20.3273	20.5564	20.6371	20.6549	20.6554	20.6567	20.6485	20.5294	20.2236	19.9560	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9731	20.1108	20.3273	20.5564	20.6371	20.6549	20.6554	20.6567	20.6485	20.5294	20.2236	19.9560	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9871	0.9606	0.8595	0.6666	0.4567	0.3215	0.3596	0.6078	0.9074	0.9854	0.9957	(94)
Useful gains	469.8174	513.3101	549.9334	542.2414	446.1810	299.9823	201.0844	210.1455	325.1311	437.2859	446.3146	449.3317	(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													
	820.6232	793.1784	718.0856	592.9234	452.6973	300.2508	201.0970	210.1756	327.5158	502.9592	670.3535	811.5292	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	260.9995	188.0715	125.1053	36.4910	4.8481	0.0000	0.0000	0.0000	0.0000	48.8609	161.3080	269.4749	(98)
Space heating												1095.1593	(98)
Space heating per m2											(98) / (4) =	12.3190	(99)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1095.1593	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1149.9173	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1830.5814	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1922.1105	(310a)
Electricity used for heat distribution	30.7203	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	206.7481	(330a)
Total electricity for the above, kWh/year	206.7481	(331)
Electricity for lighting (calculated in Appendix L)	386.1093	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =	-517.1351	(333)
Total delivered energy for all uses	3147.7500	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			263.0000	(367a)
Space heating from Heat pump	1168.0714	0.5190	606.2290	(367)
Electrical energy for heat distribution	30.7203	0.5190	15.9438	(372)
Total CO2 associated with community systems			622.1729	(373)
(negative value allowed since DFEE <= TFEE)				
Space and water heating			622.1729	(376)
Pumps and fans	206.7481	0.5190	107.3022	(378)
Energy for lighting	386.1093	0.5190	200.3908	(379)
Energy saving/generation technologies				
PV Unit	-517.1351	0.5190	-268.3931	(380)
Total CO2, kg/year			661.4727	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			7.4400	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		7.4400	ZC1
Total Floor Area	TFA	88.9000	
Assumed number of occupants	N	2.6104	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.8003	ZC2
CO2 emissions from cooking, equation (L16)		2.0433	ZC3
Total CO2 emissions		25.2836	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		25.2836	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	88.9000 (1b)	x	2.5000 (2b)	=	222.2500	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	88.9000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	222.2500	(5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour	
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)
Number of intermittent fans							3 * 10 =	30.0000	(7a)
Number of passive vents							0 * 10 =	0.0000	(7b)
Number of flueless gas fires							0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1350	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3850	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2984	(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	0.3804	0.3730	0.3655	0.3282	0.3207	0.2834	0.2834	0.2760	0.2984	0.3207	0.3357	0.3506	(22b)
Effective ac	0.5724	0.5695	0.5668	0.5539	0.5514	0.5402	0.5402	0.5381	0.5445	0.5514	0.5563	0.5615	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			1.8900	1.0000	1.8900			(26)
TER Opening Type (Uw = 1.40)			18.0100	1.3258	23.8769			(27)
External Wall 1	53.0000	18.0100	34.9900	0.1800	6.2982			(29a)
P4	15.7500	1.8900	13.8600	0.1800	2.4948			(29a)
Total net area of external elements Aum(A, m2)			68.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.5599			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.4730	(36)
Total fabric heat loss					(33) + (36) =		41.0329	(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	41.9781	41.7720	41.5700	40.6213	40.4438	39.6174	39.6174	39.4644	39.9357	40.4438	40.8028	41.1783	(38)
Heat transfer coeff	83.0109	82.8049	82.6029	81.6542	81.4766	80.6503	80.6503	80.4973	80.9686	81.4766	81.8357	82.2112	(39)
Average = Sum(39)m / 12 =												81.6533	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9338	0.9314	0.9292	0.9185	0.9165	0.9072	0.9072	0.9055	0.9108	0.9165	0.9205	0.9248	(40)
HLP (average)												0.9185	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.6104 (42)
Average daily hot water use (litres/day)		96.1961 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	105.8157	101.9679	98.1200	94.2722	90.4243	86.5765	86.5765	90.4243	94.2722	98.1200	101.9679	105.8157	(44)
Energy conte	156.9217	137.2447	141.6242	123.4714	118.4738	102.2339	94.7347	108.7095	110.0078	128.2035	139.9441	151.9703	(45)
Energy content (annual)											Total = Sum(45)m =	1513.5394	(45)
Distribution loss (46)m = 0.15 x (45)m	23.5382	20.5867	21.2436	18.5207	17.7711	15.3351	14.2102	16.3064	16.5012	19.2305	20.9916	22.7955	(46)
Water storage loss:													
Store volume												1.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2134	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.1152	(55)
Total storage loss													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715	(56)
If cylinder contains dedicated solar storage													
	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715	(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)
Total heat required for water heating calculated for each month													
	183.7555	161.4817	168.4581	149.4397	145.3077	128.2021	121.5686	135.5433	135.9761	155.0374	165.9124	178.8041	(62)
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	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	183.7555	161.4817	168.4581	149.4397	145.3077	128.2021	121.5686	135.5433	135.9761	155.0374	165.9124	178.8041	(64)
								Total per year (kWh/year) = Sum(64)m =				1829.4867	(64)
Heat gains from water heating, kWh/month													
	73.6436	65.0235	68.5572	61.8289	60.8596	54.7674	52.9664	57.6130	57.3522	64.0948	67.3060	71.9972	(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	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	130.5181	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	21.2537	18.8774	15.3521	11.6225	8.6880	7.3348	7.9255	10.3018	13.8271	17.5567	20.4912	21.8444	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	237.0394	239.4991	233.3007	220.1050	203.4477	187.7923	177.3335	174.8737	181.0722	194.2679	210.9251	226.5806	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	36.0518	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	-104.4145	(71)
Water heating gains (Table 5)													
	98.9833	96.7612	92.1467	85.8734	81.8006	76.0658	71.1914	77.4368	79.6558	86.1489	93.4806	96.7704	(72)
Total internal gains													
	422.4318	420.2931	405.9550	382.7564	359.0917	336.3483	321.6058	327.7678	339.7105	363.1289	390.0524	410.3509	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.9000	10.6334	0.6300	0.7000	0.7700	15.9235	(74)
East	13.1100	19.6403	0.6300	0.7000	0.7700	78.6904	(76)

Solar gains	94.6140	184.3659	305.2185	452.7864	565.0028	583.6230	553.4274	468.0486	357.0130	218.8808	117.7614	77.9858	(83)
Total gains	517.0458	604.6589	711.1734	835.5427	924.0945	919.9712	875.0331	795.8164	696.7235	582.0097	507.8138	488.3367	(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	74.3710	74.5561	74.7384	75.6068	75.7715	76.5479	76.5479	76.6934	76.2470	75.7715	75.4391	75.0946	
alpha	5.9581	5.9704	5.9826	6.0405	6.0514	6.1032	6.1032	6.1129	6.0831	6.0514	6.0293	6.0063	
util living area													
	0.9982	0.9951	0.9816	0.9191	0.7610	0.5537	0.4046	0.4630	0.7494	0.9653	0.9957	0.9987	(86)
MIT	20.0431	20.1952	20.4500	20.7572	20.9399	20.9925	20.9991	20.9980	20.9596	20.6849	20.3033	20.0158	(87)
Th 2	20.1389	20.1409	20.1428	20.1518	20.1535	20.1614	20.1614	20.1628	20.1583	20.1535	20.1501	20.1465	(88)
util rest of house													
	0.9977	0.9935	0.9755	0.8953	0.7087	0.4844	0.3280	0.3800	0.6772	0.9502	0.9940	0.9983	(89)
MIT 2	18.8520	19.0753	19.4445	19.8761	20.0987	20.1567	20.1610	20.1620	20.1280	19.7893	19.2407	18.8179	(90)
Living area fraction									fLA = Living area / (4) =			0.3521	(91)
MIT	19.2713	19.4696	19.7985	20.1863	20.3949	20.4510	20.4561	20.4563	20.4208	20.1046	19.6148	19.2396	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2713	19.4696	19.7985	20.1863	20.3949	20.4510	20.4561	20.4563	20.4208	20.1046	19.6148	19.2396	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9919	0.9725	0.8964	0.7243	0.5086	0.3550	0.4093	0.7009	0.9491	0.9926	0.9977	(94)
Useful gains	515.4178	599.7397	691.6306	748.9631	669.3210	467.9422	310.6311	325.6916	488.3510	552.3776	504.0595	487.2201	(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													
	1242.7854	1206.4323	1098.4937	921.5738	708.4307	471.8838	310.9945	326.5238	511.7887	774.4043	1024.1596	1236.4258	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	541.1615	407.6974	302.7061	124.2797	29.0976	0.0000	0.0000	0.0000	0.0000	165.1879	374.4720	557.4090	(98)
Space heating												2502.0113	(98)
Space heating per m2											(98) / (4) =	28.1441	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

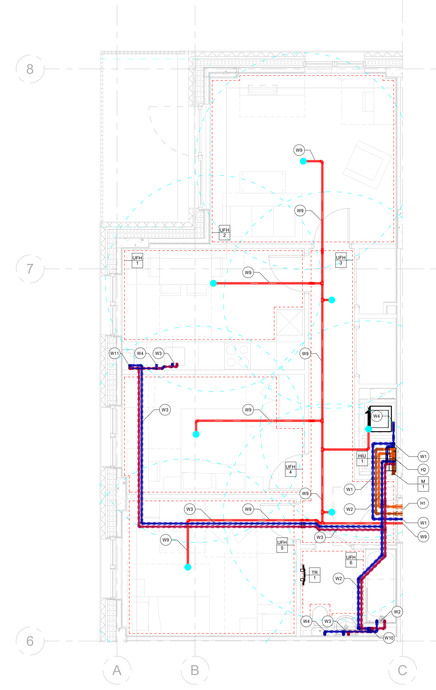
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2675.9479	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	541.1615	407.6974	302.7061	124.2797	29.0976	0.0000	0.0000	0.0000	0.0000	165.1879	374.4720	557.4090	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000		(210)
Space heating fuel (main heating system)													
	578.7823	436.0400	323.7499	132.9195	31.1204	0.0000	0.0000	0.0000	0.0000	176.6715	400.5049	596.1594	(211)
Water heating 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	(215)
Water heating													
Water heating requirement													
	183.7555	161.4817	168.4581	149.4397	145.3077	128.2021	121.5686	135.5433	135.9761	155.0374	165.9124	178.8041	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.5251	87.1834	86.3599	84.3268	81.4058	79.8000	79.8000	79.8000	79.8000	84.9831	86.9216	87.6458	(217)
Fuel for water heating, kWh/month													
	209.9460	185.2207	195.0652	177.2149	178.4979	160.6543	152.3416	169.8538	170.3961	182.4331	190.8758	204.0077	(219)
Water heating fuel used												2176.5071	(219)
Annual totals kWh/year													
Space heating fuel - main system												2675.9479	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												375.3473	(232)
Total delivered energy for all uses												5302.8024	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

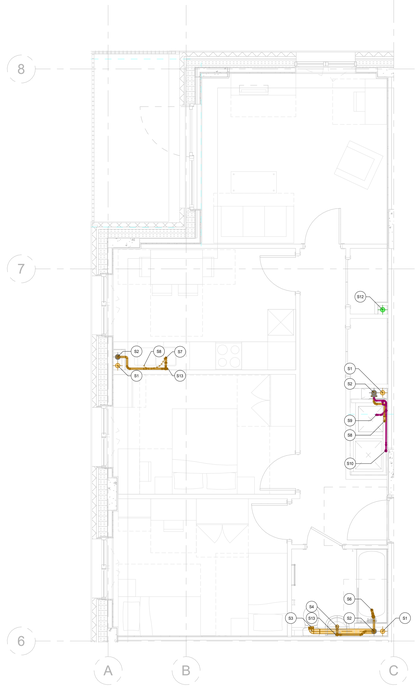
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2675.9479	0.2160	578.0048	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2176.5071	0.2160	470.1255	(264)
Space and water heating			1048.1303	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	375.3473	0.5190	194.8053	(268)
Total CO2, kg/m2/year			1281.8606	(272)
Emissions per m2 for space and water heating			11.7900	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.1913	(272b)
Emissions per m2 for pumps and fans			0.4379	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.7900 * 1.55) + 2.1913 + 0.4379, rounded to 2 d.p.			20.9000	(273)

Appendix 4

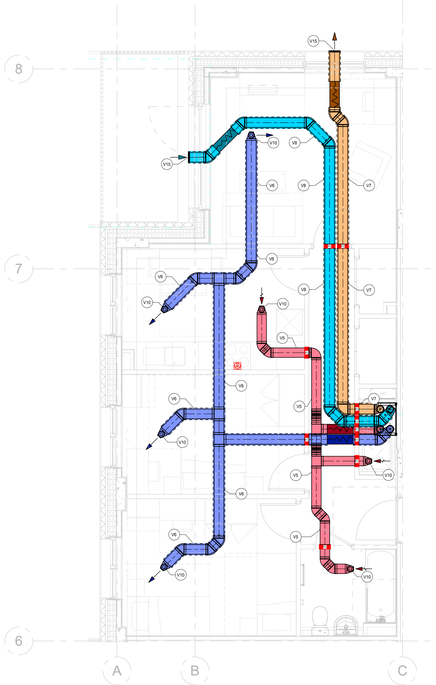
BASED ON THE BELOW BACKGROUND MODELS			
Originator	Model Number	Revision	Received on:
FAR	HRW-FAR-A1-ZZ-M3-AR-0001_Architecture Model A1_P04_For Informat_2026.08.17.rvt	P04	2026.08.17
MWP	HRW-MWP-A1-ZZ-M3-ST-0003_BLOCK A1 MODEL_P02_For Informat_2026.07.28.rvt	P02	2026.07.28



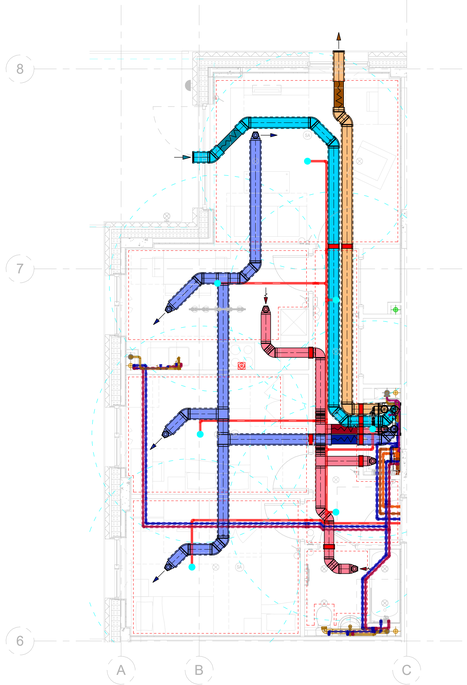
1 APARTMENT TYPE B1 - WATER AND HEATING LAYOUT
1 : 50



2 APARTMENT TYPE B1 - SOILS AND WASTE LAYOUT
1 : 50



3 APARTMENT TYPE B1 - VENTILATION LAYOUT
1 : 50



4 APARTMENT TYPE B1 - COORDINATED SERVICES LAYOUT
1 : 50

GENERAL SERVICES NOTES

- Electrical services shown for coordination purposes only. Refer to Electrical drawings for Electrical services information.
- Before commencing work on site, please read Design Risk Management Information.
- All manufacturer's instructions to be reviewed prior to installation.
- This drawing is to be read in conjunction with all schematics, details and specification documents.
- Dimensioned setting out details to be confirmed by architect.
- All discrepancies are to be queried with Whitecode before works commence.

GENERAL WATER NOTES

- Drawing to be read in conjunction with internal water schematic.
- The incoming water stopcock is to be at a level of 1200mm from FFL.
- This drawing must be read in conjunction with approved sanitaryware schedule by others.
- Positions of sprinkler heads (if applicable) are indicative and to be verified by specialist subcontractor.

GENERAL SOILS NOTES

- Where waste pipe passes behind cooker, it shall be suitably protected against heat distortion by being lagged in foil backed 25mm thick fibreglass or to be run in copper
- 40Ø basin waste and 40Ø bath or shower waste can be combined to run in 50Ø float to collar boss on SVP/SS.
- 40Ø sink waste and 40Ø standpipe waste can be combined to run in 50Ø float to collar boss on SVP/SS.
- Where a waste run exceeds lengths shown in BS EN 12056-2 (table 6) a HepVo trap is to be fitted to the waste run.

GENERAL VENTILATION NOTES

- Where non-fire rated ductwork passes through a fire compartment element (such as protected hallway) the duct is to be fitted with a fire collar with a rating to match the wall being penetrated. The fire collar must be installed in line with manufacturer's requirements.
- Doors within dwellings need to be cut short by 10mm to allow air to pass under the door and to satisfy Part F1 of the Building Regulations.
- Where flexible duct work must be used, it must be installed at 90% of its maximum length, be no longer than 300mm in each instance and follow a slow radius bend.
- Where ductwork passes through an unheated space it shall be insulated.
- Where ducts need to drop/rise within the ceiling void, this must be done in a manner that does not form low points where condense can collect.
- Duct work shall be insulated wherever there is a risk of condensation forming.
- Where duct work is insulated, it shall be with 25mm of 0.04w/mk or equivalent.
- Ventilation unit to be installed with Anti-vibration mounts.
- Where flexible duct work is used it is to be tough PVC coated glass cloth fabric (or vinyl) supported by encapsulated high tensile steal wire helix. Traditional domestic PVC flexible duct work is acceptable.

LAYOUT HEATING NOTES

H1. Incoming Heating F&R within ceiling void/joist space.
Refer to schematic for valve arrangement and sizing.
H2. Heating primary F&R to serve manifold/cylinder. Refer to schematic for sizing.

LAYOUT WATER NOTES

W1. Incoming boosted water main within ceiling void/joist space.
Refer to schematic for valve arrangement and sizing.
W2. 22Ø BCWS & HWS.
W3. 15Ø BCWS & HWS.
W4. 15Ø BCWS.
W5. 22Ø BCWS.
W6. Separate 15Ø BCWS to bib tap with labelled isolation valve & DCV, located internally (if required).
W7. 28Ø BCWS & HWS.
W8. Heat maintenance Tape provided to HWS.
W9. Sprinkler main within ceiling void/joist space (if required).
Refer to schematic for valve arrangement and sizing.
W10. 22Ø BCWS & HWS drop to below.
W11. 15Ø BCWS & HWS drop to below.
W12. Combined Hot and Cold water supply.

LAYOUT SOILS NOTES

S1. 100Ø SVP with rodding access.
Refer to drainage and BWH layouts for latest SVP positions.
S2. 100Ø SS with rodding access. SS only required where shown on Soil schematic / Drainage and BWH Layout.
S3. 100Ø soil pipe from pan to SVP/SS.
S4. 32Ø basin waste with anti-syphon to drop in 40Ø to SVP/SS.
S5. 40Ø shower waste to run to SVP/SS.
S6. 40Ø bath waste to run to SVP/SS.
S7. 40Ø sink waste to drop in 40Ø to run to SVP/SS . To be fitted with capped connection if adjacent to Washing Machine/Dishwasher.
S8. 40Ø standpipe for Washing Machine/Dishwasher waste to run to SVP/SS.
S9. MVHR waste in line with manufacturers literature with Hepvo trap.
S10. 35Ø copper waste pipe for HIU waste to run to SVP/SS via Tundish and Hepvo Trap
S11. Refer to MEP Cupboard detail drawing and Internal Water/Heating schematics for MEP Cupboard drainage requirements.
S12. RWP position. Refer to drainage and BWH layouts for latest RWP positions.
S13. Rodding eye and end of line AAV.
S14. 40Ø Bath waste to drain into gully before running into SVP/SS.
Refer to part m4(3) gully detail drawing. Refer to drainage and BWH layouts for further detail.

LAYOUT VENTILATION NOTES

V1. 204x60 Extract duct.
V2. 204x60 Supply duct (Insulated).
V3. 204x60 Exhaust duct (Insulated).
V4. 204x60 Intake duct (Insulated).
V5. 220x90 Extract duct.
V6. 220x90 Supply duct (Insulated).
V7. 220x90 Exhaust duct (Insulated).
V8. 220x90 Intake duct (Insulated).
V9. 150Ø diffuser.
V10. 150Ø diffuser.
V11. 125Ø Extract duct.
V12. 125Ø Supply duct.
V13. 125Ø Exhaust duct (Insulated).
V14. 125Ø Intake duct (Insulated).
V15. Exhaust/Intake duct to connect to external termination (free area >19,800mm²). Duct connection through facade to be in non-combustible material. Refer to Architects details.

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All copies are only for information about the application, they may not be used for any other purpose or copied without the express written permission of Whitecode Consulting Ltd.

Conflicts of Information

It still remains the responsibility of the Installer/contractor to ensure that there are no conflicts with information provided by ourselves & that of any manufacturers information or relevant requirements of statuary Bodies or Client requirements. Any conflicts found it is the responsibility of the Installer/Contractor to inform The Consultant/Client immediately if unfully & in writing.

WARNING TO HOUSE PURCHASERS - Consumer Protection from Unfair Trading Regulations 2008

Buyers are warned that this is a working drawing and is not intended to be treated as descriptive material describing, in relation to any descriptive material describing, in relation to any descriptive particular property or development, any of the Specific Matters prescribed by an Order made under the above Regulation. The contents of this drawing may be subject to change at any time & alterations and variations can occur during the progress of the works without revision of the drawing. The dimensions, areas & layouts may be approximate dimensions and may vary slightly or substantially from those shown. Nor do the contents of this drawing constitute a contract, part of any contract or a warranty.

GENERAL NOTES

- Before commencing any work on site refer to the risk management drawings and/or registers.
- This drawing shall be read in conjunction with the distribution schematics/schedules and internal schematics.
- This drawing is for design intent only. It is the contactors responsibility to produce working drawings of all services.
- This drawing shall be read in conjunction with the architectural, structural and civil engineering services specifications and schedules.
- Do not scale from these drawings. Refer to architectural drawings for setting out and dimensional data. Any dimensions indicated on these drawings are indicative.
- No installation shall occur before co-ordination has been discussed and agreed between the installing contractors.
- Any discrepancies found must be reported to Whitecode for clarification.

LEGEND

- Boosted Cold Water
- Domestic Hot Water
- Condensate
- Fire Sprinkler Wet Pipe
- Low Temperature Hot Water Flow
- Low Temperature Hot Water Return
- Discharge Air
- Intake Air
- Extract Air
- Supply Air
- Soil Vent Pipe
- Stub Stack
- Rain Water Pipe
- Supply Diffuser
- Extract Diffuser
- Attenuator
- Cookerhood
- Sprinkler Head - Location And Number TBC By Specialist
- MVHR - Mechanical Ventilation Heat Recovery Unit
- HIU
- Fire Collar



KEY PLAN

APARTMENT TYPE PLOT SCHEDULE: FLAT TYPE B1 - 2B4P	
BLOCK:	A1
PLOT:	A1.00.05

REV	DATE	DESCRIPTION	DRWN	CHKD
P01	20.08.2026	PRELIMINARY ISSUE	JJN	DCL

ORIGINAL ISSUE DATE: 20.08.2026 DRWN: JJN CHKD: DCL

DRAWING STATUS: S3 - FOR REVIEW & COMMENT
RIBA STAGE: 4

WHITECODE CONSULTING
26-27 The Hill, Northfleet, Gravesend, Kent, DA11 9EU
www.whitecode.co.uk - T: 01322 289977 - E: design@whitecode.co.uk

CLIENT: FORMATION DESIGN & BUILD

PROJECT: HIGH ROAD WEST

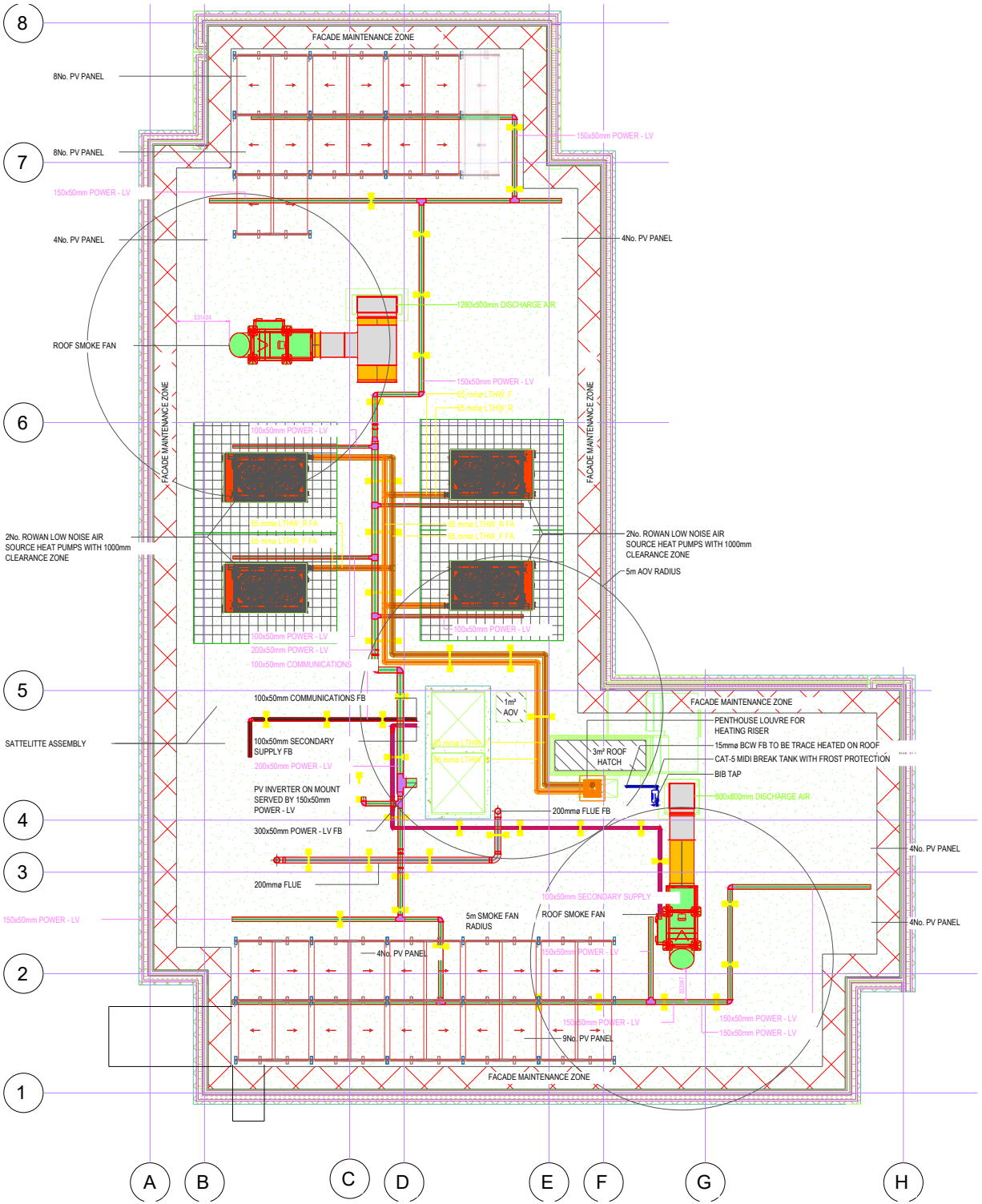
TITLE: MECHANICAL SERVICES LAYOUT
APARTMENT TYPE B1 - 2B4P

DWG NUMBER: HRW-WCL-A1-XX-DR-ME-5900
REV: P01

SCALE @A0: As indicated

Autodesk Docs://Hwg Road West/HRW-WCL-A1-ZZ-M3-MP-0001.rvt

Appendix 5

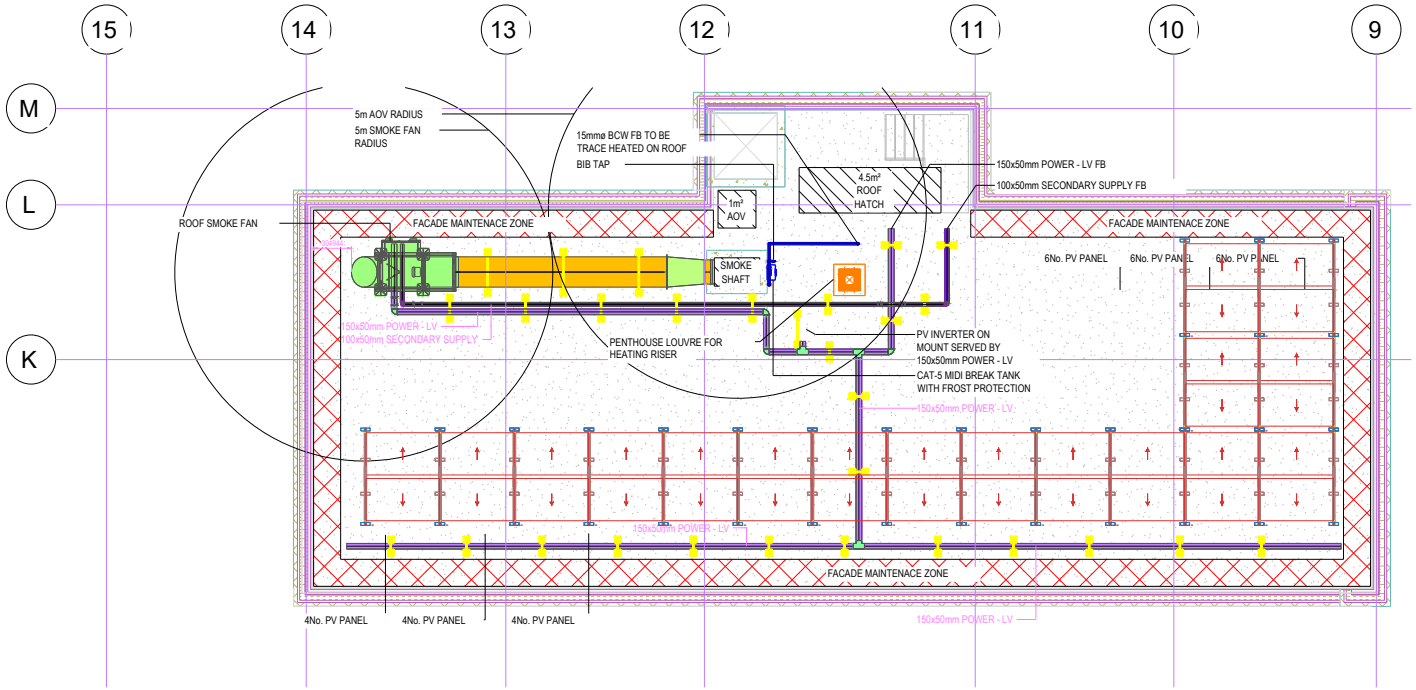


PV Orientation (from South)	
0°	
Module	SUNGROW 515Wp
Module Dims	1961 x 1134 x 30 mm
Module Wp	515 Wp
Module Qty	36
System Size	18.54 kWp
Target	
Inverter	Solis 20kW
Drawing Type	A1 PV Layout
Scale	1:200
Date	20-Aug-26
Project Ref	1423 HRW
Revision	1
Site Address	High Road West Tottenham, London N17

Notes

Designer	NN
E:	noah@arclinedesign.com
T:	07795 290277
W:	www.arclinedesign.com

Arc Line Design



PV Orientation (from South)	
0°	
Module	SUNGROW 515Wp
Module Dims	1961 x 1134 x 30 mm
Module Wp	515 Wp
Module Qty	34
System Size	17.51 kWp
Target	
Inverter	Solis 20kW
Drawing Type	A2 & A3 PV Layout
Scale	1:200
Date	20-Aug-26
Project Ref	1423 HRW
Revision	1
Site Address	High Road West Tottenham, London N17

Notes

Designer	NN
E:	noah@arclinedesign.com
T:	07795 290277
W:	www.arclinedesign.com

Arc Line Design

SUNGROW

More power More friendly



SG-54TG4D
500-520W

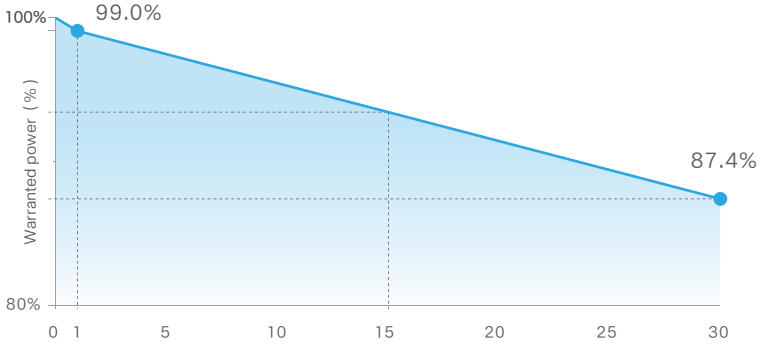
N-type TOPCon Solar Double Glass Bifacial Module

Maximum Efficiency 23.4%

Quality Certification

- IEC61215:2021 / IEC61730:2023
- IEC61701 / IEC62716 / IEC60068 / IEC62804
- ISO9001:2015: Quality Management System
- ISO14001:2015: Environment Management System
  ISO45001:2018: Occupational health and safety management systems

Product Warranty



25 Year
Warranty for Materials and Processing

30 Year
Warranty for Extra Linear Power Output

First Year Power Degradation<1%

Year 2-30 Power Degradation<0.4%

Product Performance

Higher Efficiency
Excellent MBB technology and leading process technology, conversion efficiency up to 23.4%

Smaller Size
A lightweighted design for convenient transportation and installation

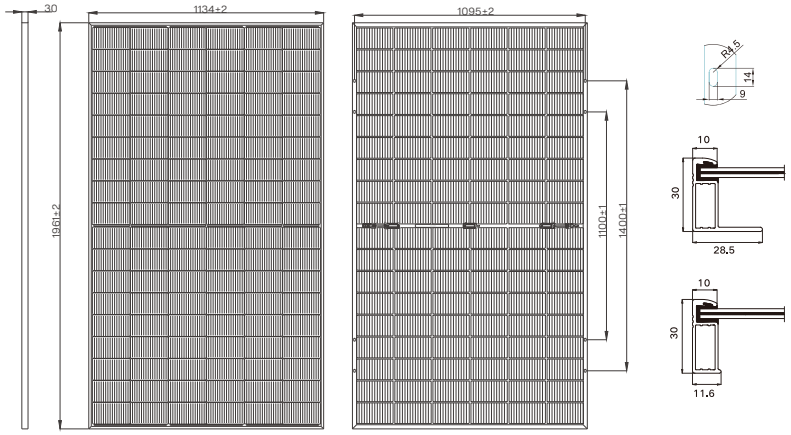
Higher Bifacial Factor
The rear power output and generation capacity are 20% and 3.5% higher than P-type, respectively

Superior Temperature Coefficient
Generating 1%-2% more power than P-type modules in high temperature regions

Anti-PID Guarantee
Minimizes the chance of degradation caused by PID phenomena through optimization of cell production technology and material control

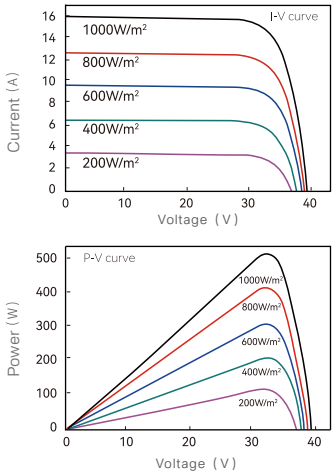
Superior Mechanical Load Capacity
Heavy snow load up to 5400 Pa
wind load up to 2400 Pa

Engineering Drawings



Unit: mm

I-V and P-V Curves



Specifications (STC)

Maximum Power Pmax (W)	500	505	510	515	520
Voltage at Maximum Power (Vmp/V)	33.70	33.94	34.19	34.43	34.67
Current at Maximum Power (Imp/A)	14.84	14.88	14.92	14.96	15.00
Open Circuit Voltage (Voc/V)	40.06	40.24	40.42	40.60	40.78
Short Circuit Current (Isc/A)	15.89	15.92	15.95	15.98	16.01
Module Efficiency (%)	22.5	22.7	22.9	23.2	23.4
Power Tolerance	0~+3%		Maximum System Voltage	DC1500V	
Maximum Series Fuse Rating	30A		Operating Temperature	-40°C~+70°C	
Bifacial Factor	80±5%				

STC: Irradiance 1000W/m², Cell Temperature 25°C, AM=1.5

Specifications (BNPI)

Maximum Power Pmax (W)	550	556	561	567	572
Voltage at Maximum Power (Vmp/V)	33.70	33.94	34.19	34.43	34.67
Current at Maximum Power (Imp/A)	16.32	16.37	16.41	16.46	16.50
Open Circuit Voltage (Voc/V)	40.06	40.24	40.42	40.60	40.78
Short Circuit Current (Isc/A)	17.48	17.51	17.55	17.58	17.61

BNPI: Irradiance Front 1000W/m², Rear 135W/m², Cell Temperature 25°C, AM=1.5

Mechanical Characteristics

Cell Type	N- type mono-crystalline
Cell Orientation	108（2 x 54）
Dimension	1961 x 1134 x 30mm
Weight	26.5kg
Glass	Dual glass, 2.0mm+2.0mm semi-tempered glass
Frame	Anodized aluminum alloy
Junction Box	IP68 rated
Output Cables	4mm², (+): 1200mm, (-): 1200mm or customized length
Connector Type	MC4-EVO2A/others
Mechanical Load	5400Pa（Front side）/2400Pa（Rear side）

Temperature Characteristics

Temperature Coefficients of Pmax	-0.29%/°C
Temperature Coefficients of Voc	-0.25%/°C
Temperature Coefficients of Isc	0.045%/°C

Packaging Configuration

Packing Detail	36 pcs/pallets, 72 pcs/stack, 864 pcs/ 40'HQ container

SUNGROW

Sungrow Renewables

NO.2, Tianhu Road, High-tech Industry, Development Zone, Hefei, P.R. China

modulesales@sungrowpower.com www.sungrowplant.com

*Specifications included in this datasheet are subject to change without notice. Sungrow Renewables reserves the right of final interpretation.

Appendix 6

CLADE

ROWAN RANGE

R290 HEAT PUMP // FOR HEATING AND HOT WATER

Oct 2025 //



ROWAN //

CLADE

The **Rowan R290 Heat Pump** is the ultimate, future-proof heating solution, combining the low Global Warming Potential of **R290 refrigerant** with a **strong and robust build** engineered for UK conditions.

Designed for maximum flexibility, it features **no horizontal ATEX zone**, a **space-efficient** design, and a **low noise option** for quiet operation. Offering exceptional versatility, the Rowan can be **cascaded** for high demand projects, and every unit is **fully supported by our expert UK engineers** with comprehensive pre- and post-sale technical guidance, ensuring a powerful, sustainable, and entirely reliable heating investment.

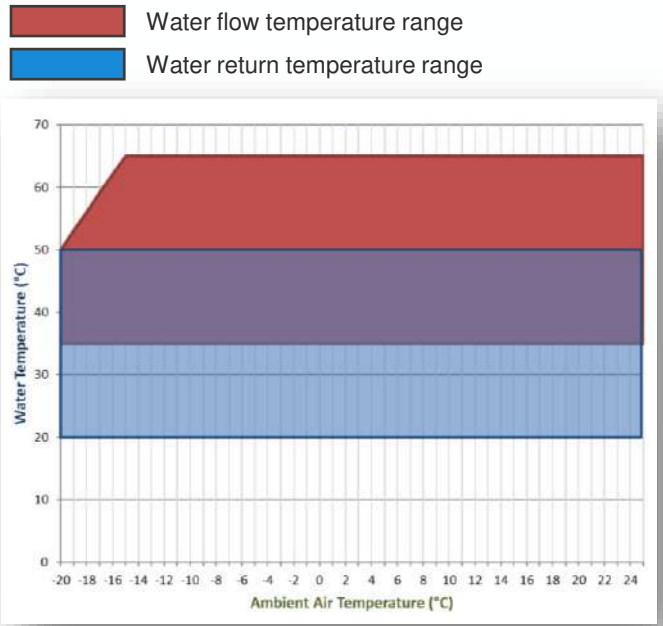


Model	-5°C capacity	+7°C capacity
Rowan 240/160	160kW	240kW
Rowan 360/240	240kW	360kW
Rowan 480/320	320kW	480kW
Rowan 600/400	400kW	600kW

- SCOP - Achieves a high Seasonal Coefficient of Performance of 4.8
- Full performance from -15°C to +40°C ambient temperature
- Future proof refrigerant which is non-toxic with a GWP of 3
- Low and standard noise models
- Up to 65°C water temperature
- Modular design for resilience
- Can be multiplexed using Clade Multi Controller
- Built in BMS interface
- Leak detection and vent fan included
- Inverter controlled compressor and fans for maximum efficiency
- PIC Valve for LTHW flow rate control included
- Electronic expansion valve ensures accurate control of refrigerant
- Hydrophilic coil reduces ice build up

R290 – PROPANE PERFORMANCE //

Rowan r290 operating envelope



Clade is a leading manufacturer of r290 propane heat pumps being one of the first to bring a large capacity heat pump to market. We continue to innovate with this exciting refrigerant.

R290 propane is an increasingly popular refrigerant for heat pumps due to its excellent thermodynamic properties, environmental benefits, and efficiency.

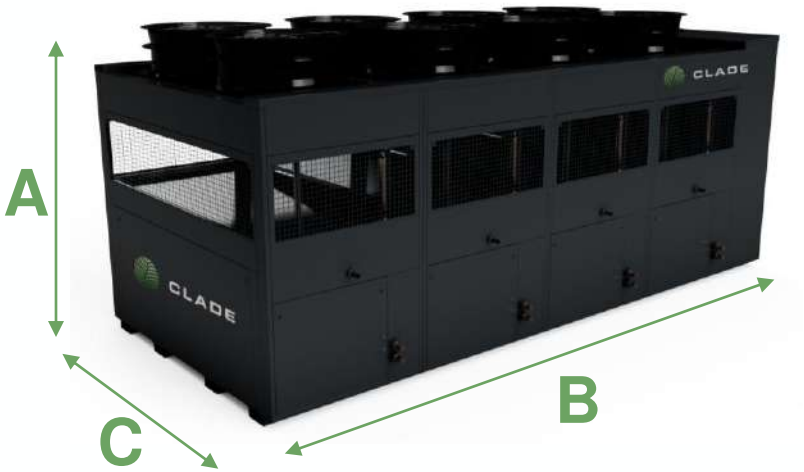
As a natural hydrocarbon, R290 has an ultra-low Global Warming Potential (GWP) of just 0.02*, making it a sustainable alternative to synthetic refrigerants with high GWP values.

Its high latent heat and superior thermal conductivity enable efficient heat transfer, enhancing the energy efficiency of heat pump systems. R290 operates effectively across a wide range of temperatures, making it suitable for both heating and cooling applications.

While its flammability require safety consideration, modern system designs and proper handling mitigate these risks. Overall, R290 propane represents a future-proof choice for heat pumps, balancing performance, cost-effectiveness, and sustainability in decarbonizing heating solutions.

* Propane's GWP, as defined by the IPCC, is approximately 3 and represents propane's inherent ability to absorb infrared radiation, assuming it behaves like long-lived greenhouse gases such as CO_2. However, in real-world applications, propane breaks down rapidly in the atmosphere. This short atmospheric lifetime means it does not accumulate and has a negligible long-term climate impact. As a result, its adjusted GWP over a 100-year timeframe is approximately 0.02.

DIMENSIONAL INFORMATION //



STANDARD NOISE MODELS

Unit	Height 'A' (mm)	Length 'B' (mm)	Depth 'C' (mm)	Operating Weight (kg)	Shipping Weight (kg)
240/160 kW SN	2640	3315	2400	4018	3950
360/240 kW SN	2640	4715	2400	5742	5640
480/320 kW SN	2640	6115	2400	7475	7340
600/400 kW SN	2640	7515	2400	9200	9030

LOW NOISE MODELS

Unit	Height 'A' (mm)	Length 'B' (mm)	Depth 'C' (mm)	Operating Weight (kg)	Shipping Weight (kg)
240/160 kW LN	2840	3315	2400	4358	4290
360/240 kW LN	2840	4715	2400	6270	6172
480/320 kW LN	2840	6115	2400	8188	8053
600/400 kW LN	2840	7515	2400	10105	9935

CLADE

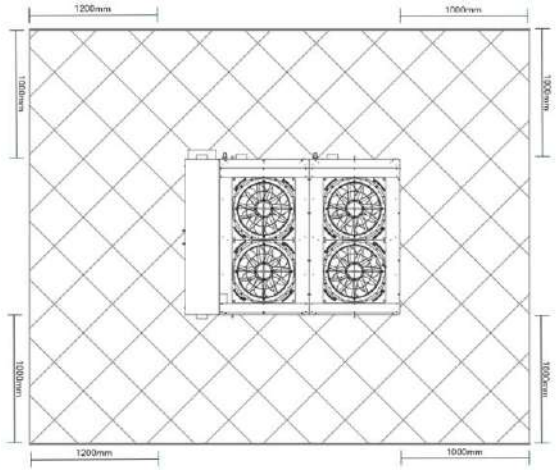
TECHNICAL SPECIFICATION //

Rowan Range		240/160kW	360/240kW	480/320kW	600/400kW
REFRIGERATION SIDE					
Compressor Type	-	Reciprocating			
Compressor Qty	Pcs.	2	3	4	5
Refrigerant	-	Propane (R290)			
Refrigerant Circuits	Pcs	2	3	4	5
Variable speed drive (VSD)	Pcs.	2	3	4	5
Refrigerant charge	kg	12	18	24	30
No. evaporators	Pcs.	2	3	4	5
Evaporators Type	-	Flat bed			
Fin Material	-	AL/MG			
Defrost Type	-	Hot Gas			
Defrost medium	-	R290			
Electrical supply	-	3~ 400V 50 HZ			
WATER SIDE					
Type of internal exchangers	-	Stainless steel plate heat exchanger			
Number of internal heat exchangers	l	2	3	4	5
Exchanger Water Content (per module)	l	8.4			
Connections waterside inlet/outlet	DN	67	67	67	67
Connections waterside pressure rating	PN	6			
Factory pressure test rating	PN	6			
Control Methodology	-	PICV			
Pressure Drop Across Each Module (A7/W65) 15K TD	kPa	48.8			

FANS SECTION					
ELECTRICAL DATA					
Total Absorbed Power (at 7°C ambient)	kW	83.4	125.1	166.8	208.5
Total Current per phase	A	141.6	212.4	283.3	354.1
Starting Method	-	Soft Start			
Max Starting Current	A	205.8	110.7	147.6	184.5
Total kVA	kVA	98.1	147.2	196.2	245.5
Electrical supply	-	3~ 400V 50 HZ			
Communication protocol	-	BACNET over IP (optional extra)			
IP-Class	-	IP54			

Rowan Range		240/160kW	360/240kW	480/320kW	600/400kW
WATER FLOW RATES					
PER MODULE					
Nominal dT 10 K	l/s	2.78			
Nominal dT 15 K	l/s	1.81			
Nominal dT 20 K	l/s	1.36			
Minimum Water Flow Rate	l/s	0.46			
PER UNIT					
Nominal dT 10 K	l/s	5.56	8.34	11.12	13.9
Nominal dT 15 K	l/s	3.62	5.43	7.24	9.05
Nominal dT 20 K	l/s	2.72	4.08	5.44	6.8
Minimum water volume in heating	l	2239			
Total internal water volume	l	58.2	87.3	116.4	145.5

CLEARANCES



CONTROL OPTIONS //

Capped Capacity Control

There are two options for output capacity available from the Clade controls.

1. Efficiency mode: Capped at -5°C – the unit will only deliver heat up to the -5°C ambient rated output.
2. Power mode: Capped at +7°C – the unit will deliver heat up to the maximum rating at +7°C ambient temperature.

See capacity tables for details

Pressure Independent Control Valve

All Birch R290 heat pump systems are equipped with Pressure Independent Control Valves (PICVs) and do not include an internal circulating pump. The PICVs are provided to regulate the flow of water through the plate heat exchanger by varying the pressure drop across the valve independently of the inlet pressure. This design ensures that the system-side flow balance remains unaffected.

Acoustic information

Noise details are detailed below for the Rowan heat pump Range. The A-weighted sound power levels LwA shown below are declared in accordance with BS EN ISO 4871:2009. Measurements were performed using the BS EN ISO 9614-1:2009 sound-intensity method (survey grade). The “Sound Pressure at 10 m” values actual site sound pressures will vary with distance, screening, reflections, and background noise. Conditions apply see product manual for full information.

Rowan Range	240/160kW		360/240kW		480/320kW		600/400kW	
	SN	LN	SN	LN	SN	LN	SN	LN
Sound Power Level, $L_{W(A)}$ (dB) (1)(2)	86	72	88	74	90	77	92	78
Sound Pressure Level at 10m (dB) (3)	54	39	56	42	58	44	59	46
Uncertainty (dB)	4		4		4		4	

CLADE

ROWAN PERFORMANCE – 240/160 EFFICIENCY MODE //

EFFICIENCY MODE (-5°C CAPACITY CONTROL)																							
Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ROWAN SN + LN 240/160	65/55	2.4	148.5	71.4	2.1	167.2	76.1	2.2	167.2	72.5	2.3	167.2	68.6	2.4	167.2	66.1	2.5	167.2	64.8	2.6	167.2	61.7	2.7
	60/50	2.6	149.7	67.8	2.2	168.9	72.1	2.3	168.9	68.4	2.5	168.9	64.5	2.6	168.9	62.0	2.7	168.9	60.7	2.8	168.9	57.6	2.9
	55/45	2.7	151.1	64.4	2.3	170.6	68.3	2.5	170.6	64.6	2.6	170.6	60.7	2.8	170.6	58.2	2.9	170.6	57.0	3.0	170.6	53.9	3.2
	50/40	2.9	152.5	61.3	2.5	172.3	64.9	2.7	172.3	61.0	2.8	172.3	57.2	3.0	172.3	54.7	3.2	172.3	53.5	3.2	172.3	50.4	3.4
	45/35	3.1	154.0	58.4	2.6	174.1	61.7	2.8	174.1	57.8	3.0	174.1	53.9	3.2	174.1	51.4	3.4	174.1	50.2	3.5	174.1	47.2	3.7
	40/30	3.4	155.5	55.8	2.8	175.9	58.8	3.0	175.9	54.7	3.2	175.9	50.8	3.5	175.9	48.3	3.6	175.9	47.1	3.7	175.9	44.1	4.0
	35/30	3.5	157.5	53.8	2.9	178.3	56.6	3.2	178.3	52.5	3.4	178.3	48.6	3.7	178.3	46.1	3.9	178.3	44.9	4.0	178.3	41.9	4.3
	30/25	3.8	159.0	51.5	3.1	180.1	54.0	3.3	180.1	49.8	3.6	180.1	45.9	3.9	180.1	43.3	4.2	180.1	42.2	4.3	180.1	39.2	4.6
	25/20	4.0	160.5	49.3	3.3	181.8	51.5	3.5	181.8	47.2	3.8	181.8	43.3	4.2	181.8	40.7	4.5	181.8	39.6	4.6	181.8	36.6	5.0
	50/45	2.9	153.1	61.9	2.5	173.0	65.6	2.6	173.0	61.8	2.8	173.0	57.9	3.0	173.0	55.4	3.1	173.0	54.2	3.2	173.0	51.2	3.4
	55/50	2.7	151.7	65.0	2.3	171.3	69.1	2.5	171.3	65.3	2.6	171.3	61.5	2.8	171.3	59.0	2.9	171.3	57.8	3.0	171.3	54.8	3.1
	60/55	2.5	150.4	68.4	2.2	169.6	72.8	2.3	169.6	69.2	2.5	169.6	65.3	2.6	169.6	62.9	2.7	169.6	61.6	2.8	169.6	58.5	2.9
	65/60	2.4	149.2	72.1	2.1	168.0	76.9	2.2	168.0	73.3	2.3	168.0	69.5	2.4	168.0	67.0	2.5	168.0	65.7	2.6	168.0	62.6	2.7

CLADE

ROWAN PERFORMANCE – 360/240 EFFICIENCY MODE //

EFFICIENCY MODE (-5°C CAPACITY CONTROL)																							
Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ROWAN SN + LN 360/240	65/55	2.4	222.7	107.2	2.1	250.8	114.2	2.2	250.8	108.7	2.3	250.8	102.9	2.4	250.8	99.2	2.5	250.8	97.2	2.6	250.8	92.5	2.7
	60/50	2.6	224.6	101.6	2.2	253.3	108.1	2.3	253.3	102.6	2.5	253.3	96.7	2.6	253.3	93.0	2.7	253.3	91.1	2.8	253.3	86.5	2.9
	55/45	2.7	226.6	96.6	2.3	255.9	102.5	2.5	255.9	96.9	2.6	255.9	91.0	2.8	255.9	87.3	2.9	255.9	85.5	3.0	255.9	80.9	3.2
	50/40	2.9	228.8	91.9	2.5	258.5	97.3	2.7	258.5	91.6	2.8	258.5	85.8	3.0	258.5	82.0	3.2	258.5	80.2	3.2	258.5	75.7	3.4
	45/35	3.1	231.0	87.6	2.6	261.2	92.6	2.8	261.2	86.7	3.0	261.2	80.8	3.2	261.2	77.1	3.4	261.2	75.3	3.5	261.2	70.8	3.7
	40/30	3.4	233.2	83.7	2.8	263.9	88.1	3.0	263.9	82.1	3.2	263.9	76.2	3.5	263.9	72.4	3.6	263.9	70.7	3.7	263.9	66.2	4.0
	35/30	3.5	236.2	80.7	2.9	267.5	84.9	3.2	267.5	78.7	3.4	267.5	72.9	3.7	267.5	69.1	3.9	267.5	67.4	4.0	267.5	62.9	4.3
	30/25	3.8	238.5	77.2	3.1	270.1	81.0	3.3	270.1	74.7	3.6	270.1	68.8	3.9	270.1	65.0	4.2	270.1	63.3	4.3	270.1	58.8	4.6
	25/20	4.0	240.7	74.0	3.3	272.7	77.3	3.5	272.7	70.8	3.8	272.7	64.9	4.2	272.7	61.1	4.5	272.7	59.4	4.6	272.7	54.9	5.0
	50/45	2.9	229.6	92.8	2.5	259.5	98.4	2.6	259.5	92.7	2.8	259.5	86.9	3.0	259.5	83.2	3.1	259.5	81.4	3.2	259.5	76.8	3.4
	55/50	2.7	227.6	97.5	2.3	256.9	103.6	2.5	256.9	98.0	2.6	256.9	92.2	2.8	256.9	88.5	2.9	256.9	86.7	3.0	256.9	82.1	3.1
	60/55	2.5	225.6	102.6	2.2	254.5	109.2	2.3	254.5	103.8	2.5	254.5	98.0	2.6	254.5	94.3	2.7	254.5	92.4	2.8	254.5	87.8	2.9
	65/60	2.4	223.7	108.2	2.1	252.0	115.4	2.2	252.0	110.0	2.3	252.0	104.2	2.4	252.0	100.5	2.5	252.0	98.5	2.6	252.0	93.9	2.7

CLADE

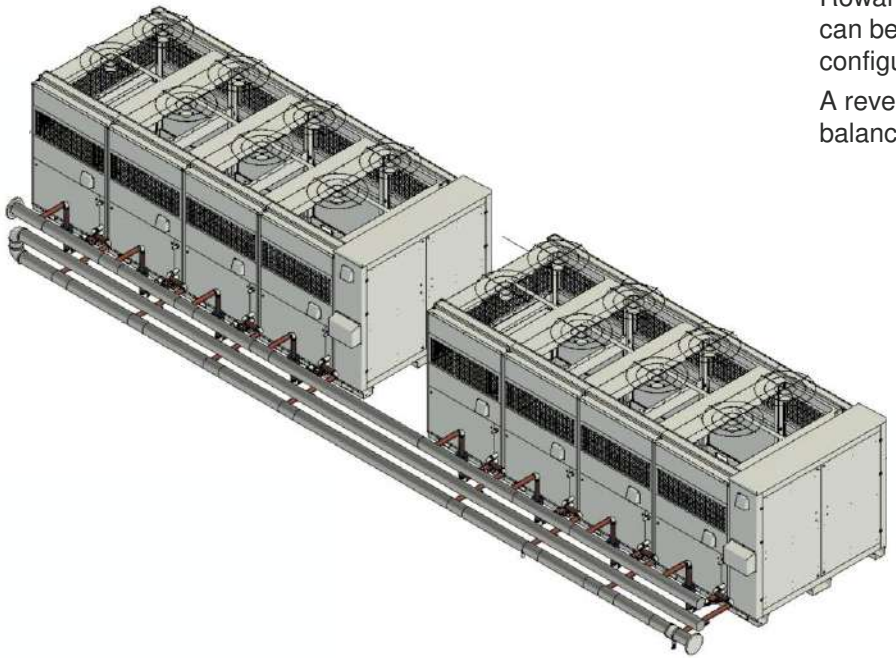
ROWAN PERFORMANCE – 480/320 EFFICIENCY MODE //

EFFICIENCY MODE (-5°C CAPACITY CONTROL)																							
Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ROWAN SN + LN 480/320	65/55	2.4	296.9	142.9	2.1	334.5	152.2	2.2	334.5	145.0	2.3	334.5	137.2	2.4	334.5	132.2	2.5	334.5	129.6	2.6	334.5	123.3	2.7
	60/50	2.6	299.5	135.5	2.2	337.8	144.1	2.3	337.8	136.7	2.5	337.8	129.0	2.6	337.8	124.0	2.7	337.8	121.5	2.8	337.8	115.3	2.9
	55/45	2.7	302.2	128.8	2.3	341.2	136.7	2.5	341.2	129.1	2.6	341.2	121.4	2.8	341.2	116.4	2.9	341.2	113.9	3.0	341.2	107.8	3.2
	50/40	2.9	305.0	122.6	2.5	344.7	129.8	2.7	344.7	122.1	2.8	344.7	114.3	3.0	344.7	109.4	3.2	344.7	106.9	3.2	344.7	100.9	3.4
	45/35	3.1	308.0	116.8	2.6	348.3	123.4	2.8	348.3	115.5	3.0	348.3	107.8	3.2	348.3	102.8	3.4	348.3	100.4	3.5	348.3	94.4	3.7
	40/30	3.4	311.0	111.5	2.8	351.9	117.5	3.0	351.9	109.4	3.2	351.9	101.6	3.5	351.9	96.6	3.6	351.9	94.2	3.7	351.9	88.3	4.0
	35/30	3.5	315.0	107.6	2.9	356.6	113.2	3.2	356.6	105.0	3.4	356.6	97.2	3.7	356.6	92.1	3.9	356.6	89.8	4.0	356.6	83.9	4.3
	30/25	3.8	318.0	103.0	3.1	360.1	108.0	3.3	360.1	99.6	3.6	360.1	91.7	3.9	360.1	86.6	4.2	360.1	84.4	4.3	360.1	78.4	4.6
	25/20	4.0	320.9	98.6	3.3	363.6	103.1	3.5	363.6	94.5	3.8	363.6	86.5	4.2	363.6	81.4	4.5	363.6	79.2	4.6	363.6	73.3	5.0
	50/45	2.9	306.2	123.7	2.5	346.0	131.1	2.6	346.0	123.5	2.8	346.0	115.8	3.0	346.0	110.9	3.1	346.0	108.5	3.2	346.0	102.5	3.4
	55/50	2.7	303.4	130.0	2.3	342.6	138.1	2.5	342.6	130.7	2.6	342.6	123.0	2.8	342.6	118.0	2.9	342.6	115.6	3.0	342.6	109.5	3.1
	60/55	2.5	300.8	136.8	2.2	339.3	145.6	2.3	339.3	138.4	2.5	339.3	130.7	2.6	339.3	125.7	2.7	339.3	123.2	2.8	339.3	117.1	2.9
	65/60	2.4	298.3	144.3	2.1	336.1	153.8	2.2	336.1	146.7	2.3	336.1	138.9	2.4	336.1	134.0	2.5	336.1	131.4	2.6	336.1	125.2	2.7

ROWAN PERFORMANCE – 600/400 EFFICIENCY MODE //

EFFICIENCY MODE (-5°C CAPACITY CONTROL)																							
Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ROWAN SN + LN 600/400	65/55	2.4	371.2	178.6	2.1	418.1	190.3	2.2	418.1	181.2	2.3	418.1	171.5	2.4	418.1	165.3	2.5	418.1	162.0	2.6	418.1	154.2	2.7
	60/50	2.6	374.4	169.4	2.2	422.2	180.1	2.3	422.2	170.9	2.5	422.2	161.2	2.6	422.2	155.0	2.7	422.2	151.8	2.8	422.2	144.1	2.9
	55/45	2.7	377.7	161.0	2.3	426.5	170.8	2.5	426.5	161.4	2.6	426.5	151.7	2.8	426.5	145.5	2.9	426.5	142.4	3.0	426.5	134.8	3.2
	50/40	2.9	381.3	153.2	2.5	430.9	162.2	2.7	430.9	152.6	2.8	430.9	142.9	3.0	430.9	136.7	3.2	430.9	133.7	3.2	430.9	126.1	3.4
	45/35	3.1	385.0	146.0	2.6	435.3	154.3	2.8	435.3	144.4	3.0	435.3	134.7	3.2	435.3	128.5	3.4	435.3	125.5	3.5	435.3	117.9	3.7
	40/30	3.4	388.7	139.4	2.8	439.8	146.9	3.0	439.8	136.8	3.2	439.8	127.0	3.5	439.8	120.7	3.6	439.8	117.8	3.7	439.8	110.3	4.0
	35/30	3.5	393.7	134.5	2.9	445.8	141.5	3.2	445.8	131.2	3.4	445.8	121.5	3.7	445.8	115.2	3.9	445.8	112.3	4.0	445.8	104.9	4.3
	30/25	3.8	397.4	128.7	3.1	450.2	135.0	3.3	450.2	124.5	3.6	450.2	114.6	3.9	450.2	108.3	4.2	450.2	105.5	4.3	450.2	98.0	4.6
	25/20	4.0	401.1	123.3	3.3	454.5	128.9	3.5	454.5	118.1	3.8	454.5	108.2	4.2	454.5	101.8	4.5	454.5	99.0	4.6	454.5	91.6	5.0
	50/45	2.9	382.7	154.6	2.5	432.5	163.9	2.6	432.5	154.4	2.8	432.5	144.8	3.0	432.5	138.6	3.1	432.5	135.6	3.2	432.5	128.1	3.4
	55/50	2.7	379.3	162.5	2.3	428.2	172.6	2.5	428.2	163.3	2.6	428.2	153.7	2.8	428.2	147.6	2.9	428.2	144.5	3.0	428.2	136.9	3.1
	60/55	2.5	376.0	171.0	2.2	424.1	182.1	2.3	424.1	172.9	2.5	424.1	163.3	2.6	424.1	157.2	2.7	424.1	154.0	2.8	424.1	146.3	2.9
	65/60	2.4	372.9	180.4	2.1	420.1	192.3	2.2	420.1	183.3	2.3	420.1	173.7	2.4	420.1	167.5	2.5	420.1	164.2	2.6	420.1	156.5	2.7

HEADER ARRANGEMENT //



Rowan heat pumps require external headers which can be arranged in either a right or left hand configuration to suit the application.

A reverse return arrangement provides good balancing across all modules.

ABOUT THIS INFORMATION //

Performance may vary based on climate conditions, installation quality, and specific usage patterns. Actual energy savings may differ from estimates.

Professional installation is required to ensure optimal performance and compliance with local building codes. Improper installation will void the warranty.

Regular maintenance is necessary to maintain efficiency and performance. Failure to perform recommended maintenance may reduce system lifespan and efficiency.

Efficiency ratings (COP) are based on standard testing conditions and control patterns. Actual efficiency may vary depending on operational conditions and geographic location. COP are instantaneous figures not averaged over any period of time which may include defrost and other system variables.

Heat pumps are designed for specific use. Using the product for unintended purposes may result in suboptimal performance or damage.

Noise levels produced by the heat pump may vary based on the installation environment and operating conditions. Sound pressure figures are for free field without the specifics of the site application.

Please refer to the user manual and installation guide for detailed information on operation, maintenance, and safety instructions.

Clade continually innovate to improve our products, the information in this document are valid (excepting typographic errors) at the time of publication. Availability, specification and performance are subject to change from time to time and without warning.

Any technical advice provided is for informational purposes only, unless specifically covered by a purchase order, and is based on our current understanding and available information. While we strive to ensure the accuracy and reliability of the information provided, it is not intended to be a substitute for professional advice or services tailored to specific circumstances.

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THANK YOU //

www.clade-es.com

Sales@clade-es.com
Aftersales@clade-es.com

Head Office & Registered Office //
Bristol & Bath Science Park,
Dirac Crescent, Emersons Green,
BRISTOL BS16 7FR

The Technology Centre //
Unit R3 Gildersome Spur Industrial Estate,
Stone Pits Lane, Morley,
LEEDS LS27 7JZ

A BRAND OF GROUPE ATLANTIC
UK, ROI & NORTH AMERICA DIVISIONS

Appendix 7



KAMSTRUP MULTICAL 403 & 603 ULTRASONIC ENERGY METERS

Multical 403 & 603 is a static heat meter, cooling meter or combined heating/cooling meter based on the ultrasonic principle.





FEATURES

- MID Approved Class II
- DN15-40 screwed, DN50-250 Flanged
- M-Bus or Pulse as standard – please specify
- Battery, 230v or 24v – please specify
- Complete with 1.5m temperature sensors, pockets & connections
- Heating version as standard, cooling available on request
- Longer temperature sensors available on request – 3m, 5m, 10m
- Other communication options available on request – Modbus, Bacnet etc.

ULTRAFLOW. 54 DN15-125 - Download Data Sheet
ULTRAFLOW® 54 DN150-300 - Download Data Sheet

Three Phase Whole Current Meter

emlite
Innovate Design Deliver

The emlite EMP1 Three phase metering range offers high quality accurate meters that are suitable for direct connected domestic, commercial, Solar PV and light industrial applications.



Features -

- Fully MID approved
- 4 quadrant power measurement (Import and Export, Active and Reactive Energy)
- Optional Power Quality Information - Volts, Current, Power etc.
- Optional pulsed outputs
- Optical communications port
- Solid brass terminals

The EMP1.az and EMP1.av are the entry models of the emlite three phase metering range. They are suitable for a host of different applications where basic consumption or generation metering is required. The EMP1.az and EMP1.av variants covered in this information sheet are of solid high quality construction and benefit from features normally found in more expensive metering.

- Accuracy Class A or B (MID) [active energy] and Cl 2 [reactive energy*]
- 4 quadrant energy measurement
- Optional power quality information*
- Configurable pulsed outputs**
- Multiple terminal cover options (Short, Extended(Standard), Extended plus)
- Clear easy to read 8 digit LCD with specific symbols for different quantities.
- Solid Brass terminals
- Optional finger guard for main terminals

Camax UK Ltd
Unit 8, Jubilee Court, Copgrove
01423 340 000

Three Phase Whole Current Meter

EMP1.AV only



Pulsed Output

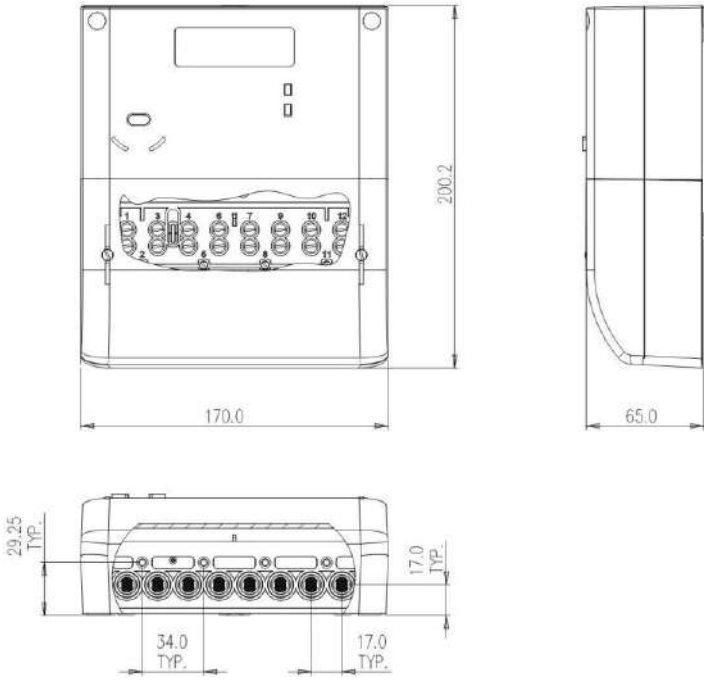
An opto-isolated pulse output can provide data for collection by an energy management system or AMR data logger. These pulses are output via the meter's auxiliary terminals.

The output conforms to IEC 62053-31.

Technical Data - Meter

Electrical			
	Voltage	Nominal voltage	3 x 230v
		Voltage withstand	400V continuously
	Frequency	Nominal frequency	50Hz, variation ±5%
	Current	Basic current (Iref)	5, 10, 15 and 20*
		Maximum (Imax)	100A
Metrology	Accuracy	Active energy	Class B, to EN 50470 1-3*
		Reactive energy	Class 2, to IEC 62053–23
Environmental		Temperature Range	-25˚C to +55°C
		Ingress protection	IP54, to BS EN 60529
Physical		Terminal arrangement	DIN43857-Part 2, fixing centres of 150±1mm
		Main Terminal size	8.2mmø ± 0.2
		Terminal Construction	Solid brass

Dimensions



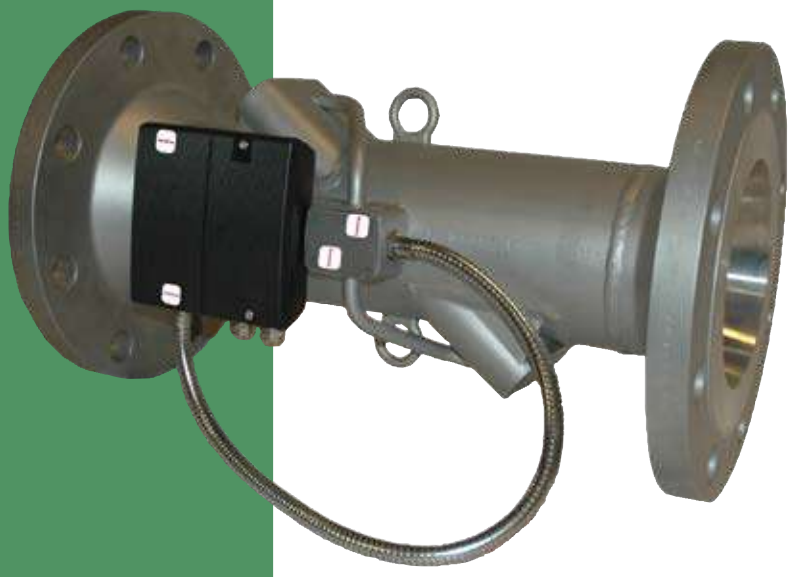
NB * denotes standard setting

kamstrup

Data sheet

ULTRAFLOW® 54
DN150-300

- For flow from 150 m^3/h up to 1000 m^3/h
- Ultrasonic flow sensor
- Compact design
- Static meter, no moving parts
- Large dynamic range
- No wear
- High accuracy
- Longevity



MID 2014/32/EU

CE M18 0200

EN 1434

DK-BEK 1178 – 06/11/2014

DK 268 18

EN 1434

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Application

ULTRAFLOW® 54 is a static flow sensor based on the ultrasonic measuring principle. It is primarily used as a volume flow sensor for energy meters such as MULTICAL®.

ULTRAFLOW® 54 has been designed for use in heating and cooling installations where water is the heat-bearing medium.

ULTRAFLOW® 54 employs ultrasonic measuring techniques and microprocessor technology. All calculating and flow measuring circuits are collected on one single board, thus providing a compact and rational design and, in addition, exceptionally high measuring accuracy and reliability is obtained.

The volume is measured using bidirectional ultrasonic technique based on the transit time method, with proven long-term stability and accuracy. Four ultrasonic transducers are used to send sound signals both against and with the flow. The ultrasonic signal travelling with the flow reaches the opposite transducer first. The time difference between the two signals can be converted into flow velocity and thereby also volume.

A three-wire signal cable is used to connect ULTRAFLOW® 54 to the Kamstrup MULTICAL® calculator. The cable supplies the flow sensor and also transfers the signal from sensor to calculator. A signal corresponding to the flow – or more correctly, a number of pulses proportional to the water volume flowing through – is transmitted.

ULTRAFLOW® 54 is available with internal supply, e.g. if the distance between MULTICAL® and ULTRAFLOW® 54 is 10 m or more.

If ULTRAFLOW® 54 is used for other equipment (e.g. other brands of calculators), the meter must be fitted with a galvanically separated output module and a supply of its own.

Approvals

Type approval

ULTRAFLOW® 54 is approved as a heat meter in accordance with MID 2014/32/EU:

EC-Type Examination certificate	DK-0200-MI004-008
MID-certificate acc. to module D	DK-0200-MID-D-001

CE M18 0200

ULTRAFLOW® 54 is approved as a cooling meter in accordance with DK-BEK 1178 – 06/11/2014:

System designation	TS 27.02 002
Verification	DANAK accreditation 268

DK 268 18

Please contact Kamstrup A/S for further information relating to type approval and verification.

Standard

EN 1434:2015

CE-marking

ULTRAFLOW® 54 is marked in accordance with:

– EMC-directive	2014/30/EU
– LV-directive	2014/35/EU (when fitted with 230 VAC power supply)
– PE-directive	2014/68/EU (category II)

MID designation

– Mechanical environment	Class M1 and M2
– Electromagnetic environment	Class E1 and E2
– Ambient temperature	5...55 °C, closed location (indoor installation)

Technical data

Electrical data

Supply voltage	3.6 VDC ± 0.1 VDC
Supply, galvanically coupled output module (Y=1)	Powered by MULTICAL®
Supply, galvanically separated output module (Y=2) *	
– Mains supply	230 VAC +15/-30 %, 50 Hz 24 VAC ±50 %, 50 Hz
- Power consumption	< 1 W
- Backup	Integral SuperCap eliminates interruptions due to short-term power failures
Supply, galvanically separated output module (Y=3)	
– Battery	3.65 VDC, D-cell lithium
- Replacement interval	6-years @ t_{BAT} < 30 °C
– Mains supply	230 VAC +15/-30 %, 50 Hz 24 VAC ±50 %, 50 Hz
- Power consumption	< 1 W
- Backup	Integral SuperCap eliminates interruptions due to short-term power failures
Length of signal cable, flow sensor electronics box	
– Galvanically coupled output module (Y=1)	Max. 10 m (powered by MULTICAL® calculator) Max. 30 m via Cable Extender Box (powered by MULTICAL® calculator)
– Galvanically separated output module (Y=2 and Y=3)	Depending on the calculator.
EMC data	Fulfils EN 1434:2015 class C, MID E1 and E2

* It is possible to use battery supply in combination with output module (Y=2), e.g. for temporary supply of flow sensors installed at construction sites.

Technical data

Mechanical data

Metrological class	2 or 3
Environmental class	Fulfils EN 1434 class C
Ambient temperature	5…55 °C (indoors)
Protection class	IP67
Humidity	< 93 % RH non-condensing
Medium in flow sensor	Water (recommended water quality as in CEN TR 16911 and AGFW FW510)
Medium temperature	2…150 °C (Heat and heat/cooling meters) 2…130 °C (Heat/cooling meters) 2…50 °C (Cooling meters)
Storage temperature (empty sensor)	-25…60 °C
Pressure stage	PN16, PS16 PN25, PS25

At medium temperatures above 90 °C or below ambient temperature the electronics box must be wall-mounted or mounted via the enclosed distance piece.

Flow data

Nom. flow q_p [m³/h]	Nom. diameter [mm]	Meter factor* [imp./l]	Dynamic range q_p:q_i	q_s:q_p	Flow @125 Hz ** [m³/h]	Δp@q_p [bar]	Min. cut off [l/h]
150	DN150	1	100:1	2:1	450	0.02	300
250	DN150	0.6	100:1	2:1	750	0.055	500
400	DN150	0.4	100:1	2:1	1125	0.04	800
400	DN200	0.4	100:1	2:1	1125	0.01	800
400	DN250	0.4	100:1	2:1	1125	0.01	800
600	DN200	0.25	100:1	2:1	1800	0.022	1200
600	DN250	0.25	100:1	2:1	1800	0.022	1200
1000	DN250	0.15	100:1	2:1	3000	0.015	2000
1000	DN300	0.15	100:1	2:1	3000	0.015	2000

* Default value. The meter factor appears from the ULTRAFLOW® label.

** Saturation flow. Max. pulse frequency is maintained at higher flow rates.

Materials

Wetted parts

Housing	Stainless steel, W.no. 1.4307
Transducer holder	Stainless steel, W.no. 1.4308
Transducer	Titanium
Gaskets	Fibre

Electronics box

Base	Thermoplastic, PC 10 % GF
Cover	Thermoplastic, PC 10 % GF
Fitting hardware and distance piece for the electronic box	Thermoplastic, PPS 40 % GF

Signal cable

Silicone cable (3 x 0.5 mm^2)

Power supply cable 24/230 VAC (optional)

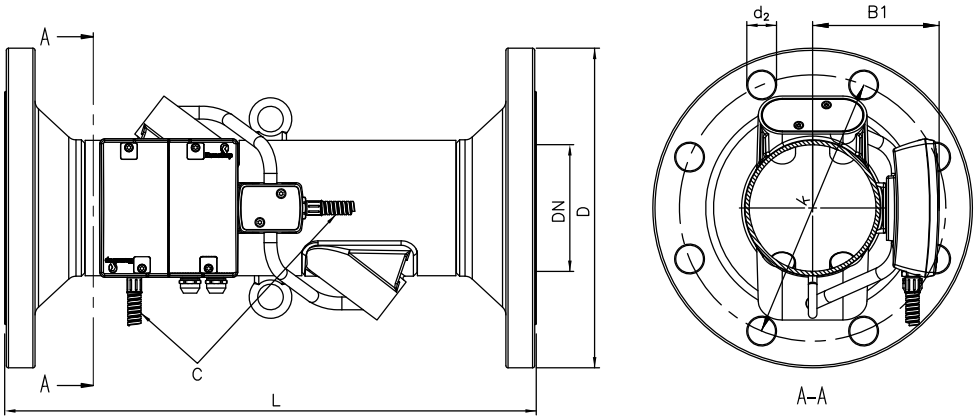
Cable with PVC mantle (2 x 0.75 mm^2)

Type summary

Nom. flow q_p [m^3/h]	Sizes		
150	DN150 x 500 mm		
250	DN150 x 500 mm		
400	DN150 x 500 mm	DN200 x 500 mm	DN250 x 600 mm
600	DN200 x 500 mm	DN250 x 600 mm	
1000	DN250 x 600 mm	DN300 x 500 mm	

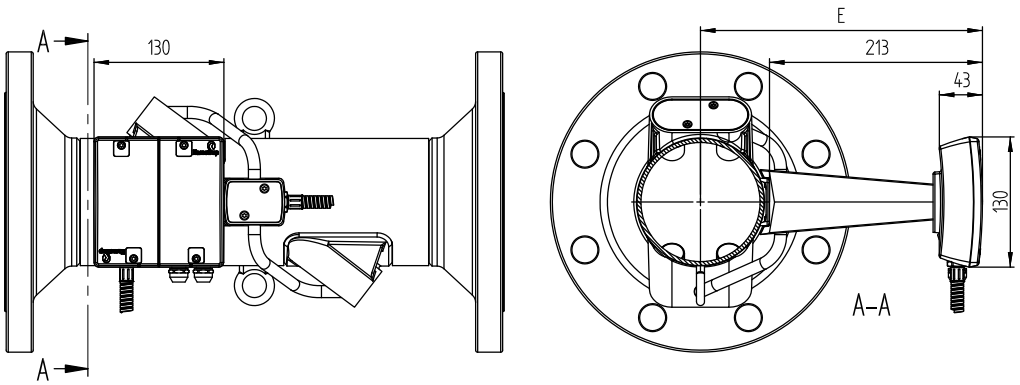
Flange EN 1092-1. Flange facing type B, raised face.

Dimensional sketches



Flange EN 1092-1. Flange facing type B, raised face.

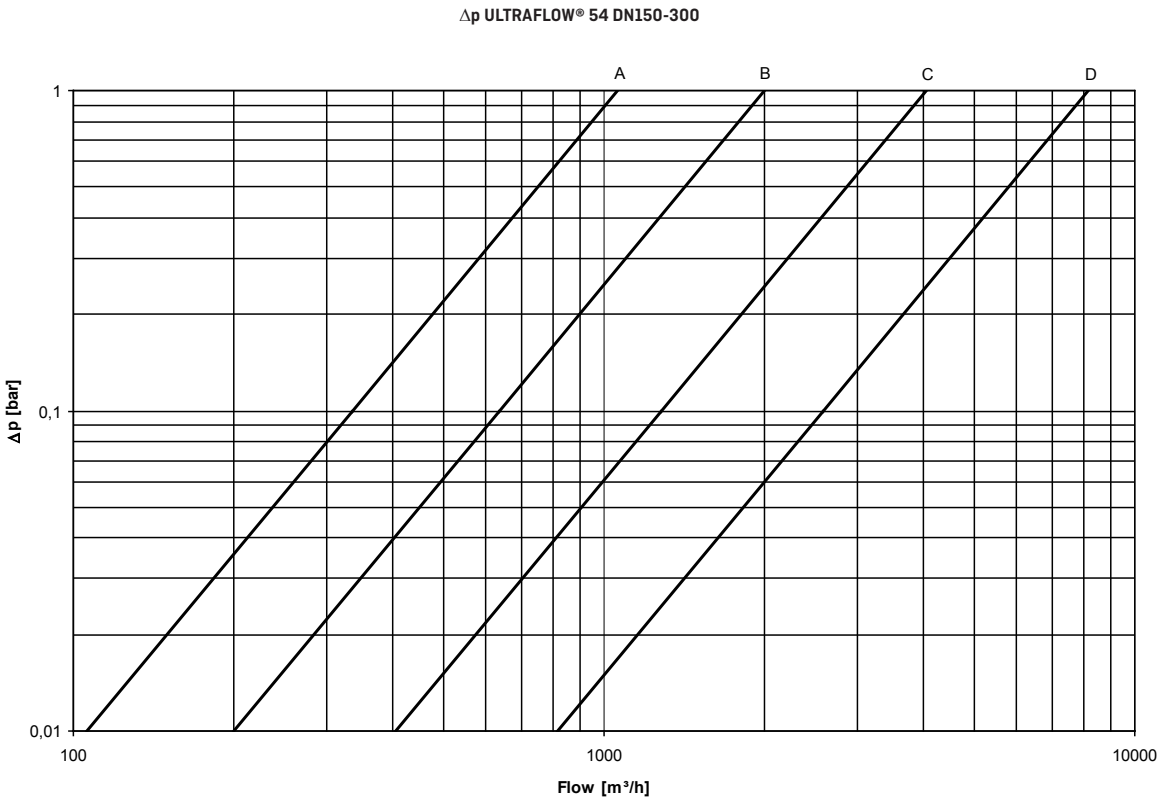
Nom. diameter	PN	Nom. flow q_p	L	D	k	Bolts			B1	E	Steel tube length C	Approx. weight
						Quantity	Thread	d_2				
[mm]	[bar]	[m³/h]	[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
DN150	25	150 & 250	500	300	250	8	M24	26	119	282	650	37
DN150	25	400	500	300	250	8	M24	26	140	303	625	36
DN200	25	400 & 600	500	360	310	12	M24	26	166	329	570	49
DN250	25	400 & 600	600	425	370	12	M27	30	166	329	570	79
DN250	25	1000	600	425	370	12	M27	30	194	357	500	75
DN300	16	1000	500	460	410	12	M24	26	194	357	500	76



Pressure loss

Graph	Nominal flow q_p [m³/h]	Nominal diameter [mm]	k_v*	q@0.25 bar [m³/h]
A	150 & 250	DN150	1060	530
B	400	DN150	2000	1000
C	400 & 600	DN200 & DN250	4040	2020
D	1000	DN250 & DN300	8160	4080

* $q=k_v \times \sqrt{\Delta p}$



Installation

Prior to installation of the flow sensor, the system should be flushed.

Correct flow sensor position (inlet or outlet) appears from the front label of MULTICAL®. The flow direction is indicated by an arrow on the flow sensor.

Please note: ULTRAFLOW® 54 may be lifted in the lifting rings only.

Pressure stage ULTRAFLOW® 54: PN16, PS16/PN25, PS25. See marking on label.

Temperature of medium, ULTRAFLOW® 54: 2…150 °C/ 2…130 °C/2…50 °C. See marking on label.

Mechanical environment: M1 and M2 (fixed installation with minimum vibration and fixed installation with considerable or high vibration level respectively). See marking on label.

Electromagnetic environment: E1 and E2 (housing/light industry and industry respectively). See marking on label.

The meter's signal cables must be drawn at min. 25 cm distance to other installations.

Climatic environment: Must be installed in environments with non-condensing humidity as well as in closed locations (indoors).

The ambient temperature must be within 5…55 °C.

Maintenance and repair: The flow sensor is verified separately and can, therefore, be separated from the calculator.

It is permitted to replace the supply and change the supply type. For battery supply a lithium battery with connector from Kamstrup A/S must be used. Lithium batteries must be correctly handled and disposed of (see Kamstrup document 5510-408, "Lithium batteries - Handling and disposal"). Other repairs require subsequent reverification in an accredited laboratory.

If ULTRAFLOW® 54 is connected via a galvanically coupled output module, the flow sensor may be connected to a Kamstrup MULTICAL® calculator only.

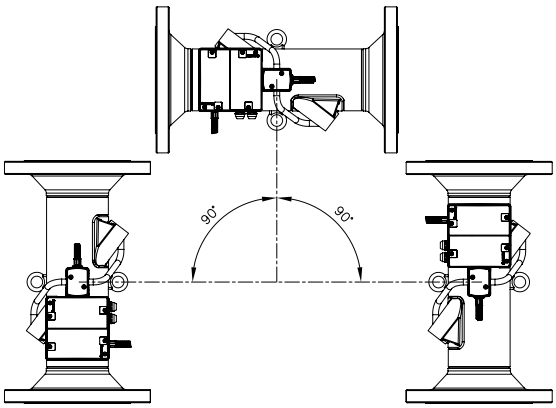
If other calculator types are connected, ULTRAFLOW® 54 must be fitted with a galvanically separated output module and a power supply of its own.

Please note: Make sure that meter factor of flow sensor and calculator are identical.

The steel tube between flow sensor housing and electronics box must not be disassembled.

At medium temperatures above 90 °C or below ambient temperature the flow sensor's electronics box must be mounted via the enclosed distance piece. Alternatively, the electronics box can be wall-mounted at a distance of minimum 170 mm from the sensor.

When the installation has been completed, water flow can be turned on. The valve on the inlet side must be opened first.



Installation angle of ULTRAFLOW® 54

ULTRAFLOW® 54 can be installed horizontally, vertically, or at an angle.

ULTRAFLOW® 54 is normally installed horizontally, with the lifting rings oriented vertically. The ultrasound paths in the flow sensor tube will thus be vertical, which is optimal in connection with possible stratification of the medium.

Straight inlet ULTRAFLOW® 54

ULTRAFLOW® 54 requires neither straight inlet nor outlet in order to fulfil the Measuring Instruments Directive (MID) 2014/32/EU and EN 1434:2015. Only in case of heavy flow disturbances before the meter will a straight inlet section be necessary.

We recommend following the guidelines in CEN CR 13582.

Operating pressure

In order to prevent cavitation, the back pressure at ULTRAFLOW® 54 (the pressure at the flow sensor outlet) must be min. 1.5 bar at q_p and min. 2.5 bar at q_s. This applies to temperatures up to approx. 80 °C.

Connection to calculator

ULTRAFLOW® 54 and MULTICAL®, galvanically coupled

If ULTRAFLOW® 54 and MULTICAL® are connected via output module (Y=1), ULTRAFLOW® 54 is galvanically coupled with MULTICAL® and is powered via the three-wire signal cable (cable length up to 10 m).

If ULTRAFLOW® must be connected to MULTICAL® with a cable length between 10 m and 30 m and galvanic separation is not necessary, a Cable Extender Box can be utilized. See document no. 5512-2008 (DK-GB-DE-RO) for further information.

Battery life time in e.g. MULTICAL® 602 is approximately 10 years depending on data communication to the calculator.

Note: It is not permitted to mount a supply module or battery in ULTRAFLOW® 54.

ULTRAFLOW® 54	→	MULTICAL®		
11	→	11	GND	(Blue)
9	→	9	+ 3.6 V	(Red)
10	→	10	⎍⎍⎍	(Yellow)

Connection to calculator

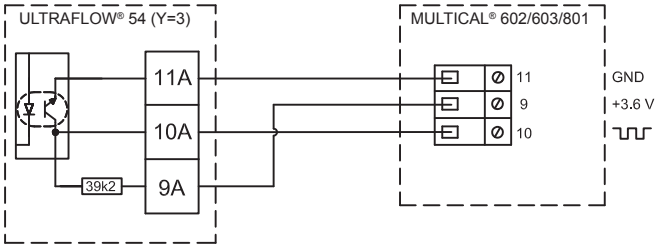
ULTRAFLOW® 54 and MULTICAL®, galvanically separated

If ULTRAFLOW® 54 and MULTICAL® are connected via output module (Y=2 or 3), ULTRAFLOW® 54 is galvanically separated from MULTICAL®.

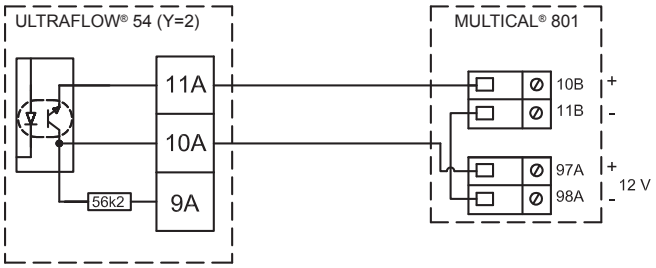
Maximum cable length depends on calculator.

Note: Flow info cannot be read.

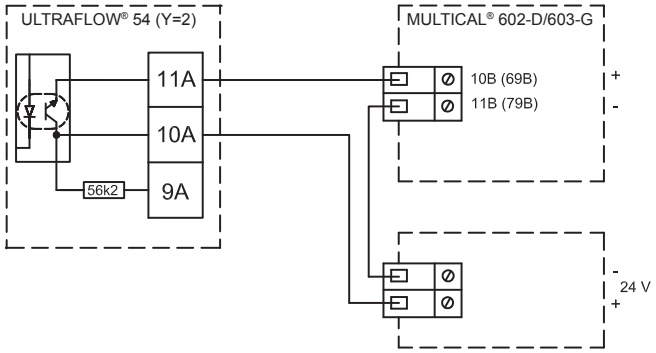
Three-wire connection,
MULTICAL® 602/603/801 via output module (Y=2 or 3).



Two-wire connection,
MULTICAL® 801 via output module (Y=2).



Two-wire connection,
MULTICAL® 602-D/603-G via output module (Y=2) and external 24 VDC supply.



When using long signal cables, careful consideration is required in connection with installation. Due to EMC there must be a distance of min. 25 cm between signal cables and all other cables.

Type numbers of ULTRAFLOW® 54 for MULTICAL®

Type number *	Nom. flow q_p [m³/h]	Min. flow q_i [m³/h]	Max. flow q_s [m³/h]	Connection [mm]	PN [bar]	Length [mm]	Meter factor [imp./l]	Material flow sensor housing
65-5-FCCN-XXX	150	1.5	300	DN150	25	500	1	Stainless steel
65-5-FDCN-XXX	250	2.5	500	DN150	25	500	0.6	Stainless steel
65-5-FECN-XXX	400	4.0	800	DN150	25	500	0.4	Stainless steel
65-5-FECP-XXX	400	4.0	800	DN200	25	500	0.4	Stainless steel
65-5-FECR-XXX	400	4.0	800	DN250	25	600	0.4	Stainless steel
65-5-FFCP-XXX	600	6.0	1200	DN200	25	500	0.25	Stainless steel
65-5-FFCR-XXX	600	6.0	1200	DN250	25	600	0.25	Stainless steel
65-5-FGCR-XXX	1000	10.0	2000	DN250	25	600	0.15	Stainless steel
65-5-FGDS-XXX	1000	10.0	2000	DN300	16	500	0.15	Stainless steel

* XXX-code pertaining to final assembly, approvals etc. – determined by Kamstrup A/S. Some variants may not be available in national approvals.

Type numbers for separate ULTRAFLOW® 54

Type number *	Nom. flow q_p [m³/h]	Min. flow q_i [m³/h]	Max. flow q_s [m³/h]	Connection [mm]	PN [bar]	Length [mm]	Material flow sensor housing
65-5-FCCN-YZ-XXX	150	1.5	300	DN150	25	500	Stainless steel
65-5-FDCN-YZ-XXX	250	2.5	500	DN150	25	500	Stainless steel
65-5-FECN-YZ-XXX	400	4.0	800	DN150	25	500	Stainless steel
65-5-FECP-YZ-XXX	400	4.0	800	DN200	25	500	Stainless steel
65-5-FECR-YZ-XXX	400	4.0	800	DN250	25	600	Stainless steel
65-5-FFCP-YZ-XXX	600	6.0	1200	DN200	25	500	Stainless steel
65-5-FFCR-YZ-XXX	600	6.0	1200	DN250	25	600	Stainless steel
65-5-FGCR-YZ-XXX	1000	10.0	2000	DN250	25	600	Stainless steel
65-5-FGDS-YZ-XXX	1000	10.0	2000	DN300	16	500	Stainless steel

* XXX-code pertaining to final assembly, approvals etc. –determined by Kamstrup A/S. Some variants may not be available in national approvals.

Type number composition of separate ULTRAFLOW® 54

In addition to the basic variants output module (Y), supply module (Z) as well as meter factor (CC) and pulse duration (E) must be selected.

The variant with galvanically coupled output module (Y=1) is solely for use together with MULTICAL®.

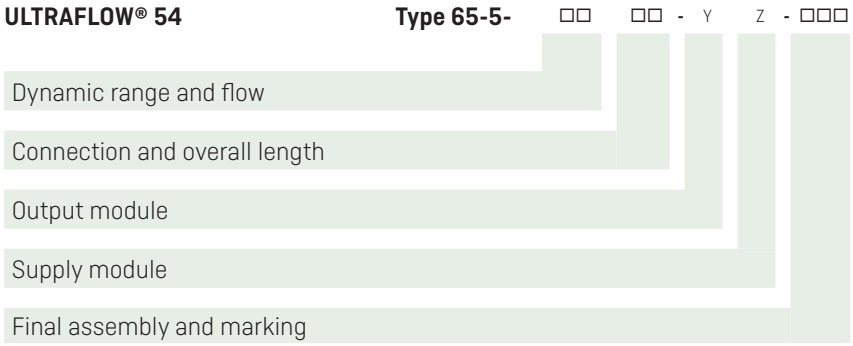
The variant with galvanically separated output module (Y=2 or 3) is used in the following situations:

A More than 10 m cable length between MULTICAL® and ULTRAFLOW® 54 is required (Y=2).

B As flow sensor no. 2 in connection with MULTICAL®.
If two flow sensors are used together with MULTICAL®, one must include a galvanically separated output module (Y=2 or 3).

C Together with other equipment/foreign calculators (Y=2 or 3).

Please note: Flow info cannot be read if output module with galvanic separation is used.



Type numbers of output and supply modules

Type number overview of output modules (Y) as well as supply modules (Z) for separate ULTRAFLOW® 54

Y	Output module	Corresponding supply module
1	Galvanically coupled module	0 (powered by MULTICAL®)
2	Galvanically separated module	0, 7, 8
3	Galvanically separated module, "Low power"	0, 2, 7, 8

Z	Supply module	Corresponding output module
0	No supply	1, 2, 3
2	Battery, D-cell	3
7	230 VAC supply module	2, 3
8	24 VAC supply module	2, 3

Programming variants of meter factor and pulse duration

Overview of programming variants of meter factor (CC) and pulse durations (E) for separate ULTRAFLOW® 54.

q_p	Meter factor			Pulse duration				
[m³/h]	[imp./l]	[l/imp.]	CC	[ms] (E=1)	[ms] (E=4)	[ms] (E=5)	[ms] (E=6)	
150	1		33	3.9	-	-	-	Default
150		10	34	-	20	-	-	
150		25	64	-	20	-	-	
150		100	35	-	20	50	100	
150		250	65	-	20	50	100	
150		1000	36	-	20	50	100	
150		2500	66	-	20	50	100	
250	0.6		43	3.9	-	-	-	Default
250		10	34	-	20	-	-	
250		25	64	-	20	-	-	
250		100	35	-	20	50	100	
250		250	65	-	20	50	100	
250		1000	36	-	20	50	100	
250		2500	66	-	20	50	100	
400	0.4		63	3.9	-	-	-	Default
400		100	35	-	20	50	-	
400		250	65	-	20	50	100	
400		1000	36	-	20	50	100	
400		2500	66	-	20	50	100	
600	0.25		14	3.9	-	-	-	Default
600		100	35	-	20	50	-	
600		250	65	-	20	50	-	
600		1000	36	-	20	50	100	
600		2500	66	-	20	50	100	
1000	0.15		24	3.9	-	-	-	Default
1000	(0.25)	4	14	3.9	-	-	-	*)
1000		100	35	-	20	50	-	
1000		250	65	-	20	50	-	
1000		1000	36	-	20	50	100	
1000		2500	66	-	20	50	100	

* Spare part for ULTRAFLOW® type 65-S/R/T q_p 1000. Configured 65-5-FGCR. No flow info.

Accessories

Description	Type number
Flange gaskets	
DN150, PN25 (1 pc.)	1150-140
DN200, PN25 (1 pc.)	1150-139
DN250, PN25 (1 pc.)	1150-141
DN300, PN16 (1 pc.)	1150-164
Supply	
D-cell lithium battery with two-pole connector	65000000-2000
230 VAC supply module	65000000-7000
24 VAC supply module	65000000-8000
Miscellaneous	
Short distance piece	6561-332
Cable Extender Box	6699-036

Cables

ULTRAFLOW® 54 DN150-300, when ordered with MULTICAL®, is delivered with 2.5 m signal cable, optionally 5 or 10 m. The cable is mounted in the ULTRAFLOW® 54 electronics box and in MULTICAL® 6xx.

When ULTRAFLOW® 54 is ordered with MULTICAL® 8xx, the calculator is delivered separately. Hence the cable is only mounted in the ULTRAFLOW® 54 electronics box.

ULTRAFLOW® 54 DN150-300, when ordered as a separate flow sensor, is optionally available with signal cable in lengths of 2.5, 5 or 10 m.
The cable is mounted in the ULTRAFLOW® 54 electronics box.

If 24/230 VAC supply module is selected, the sensor is optionally available with power cable. The cable is mounted in the sensor's electronics box from the factory.

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Kamstrup A/S
Industrivej 28, Stilling
DK-8660 Skanderborg
T: +45 89 93 10 00
F: +45 89 93 10 01
info@kamstrup.com
kamstrup.com