



High Road West

Energy Statement

August 2026

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Document Control Sheet	
Report Reference	CS3005/HRW/ES/202608-RT
Report Revision	-
Issue Purpose	For Planning
Report Prepared For:	Formation Design & Build
Report Author:	Ryan Thrower
Approved By	Neil Rothon
Date of Issue	21 st August 2026
Date of Revised Issue	-
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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 CO₂ 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
<i>Be Lean</i> : Use Less Energy	60.5
CO ₂ Savings at <i>Be Lean</i>	10%
<i>Be Clean</i> : Supply Energy Efficiently	60.5
<i>Be Green</i> : 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 CO₂ 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 CO₂ 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 CO₂ per square-metre per annum (kg/CO₂/m²). 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-Values	Proposed U-Values (W/m ² K)
<i>Walls</i>		
External Wall	0.26 W/m ² K	0.12 W/m ² K
Sheltered Wall Types	0.26 W/m ² K	0.21-0.3 W/m ² K
Party Wall	0.26 W/m ² K	0 W/m ² K
<i>Floors</i>		
Ground Floor	0.18 W/m ² K	0.11 W/m ² K
Exposed Floor	0.18 W/m ² K	0.13 W/m ² K
<i>Roof</i>		
Roofs	0.16 W/m ² K	0.12 W/m ² K
<i>Openings</i>		
Windows	1.6 W/m ² K	0.84 W/m ² K (avg.)
	G-Value	0.37
Front Doors	1.6 W/m ² K	1.2 W/m ² K
<i>Air Permeability</i>		
3 m ³ /(hm ²) @50Pa		
<i>Thermal Bridging</i>		
<i>Manually Calculated Psi Values for Concrete Frame Construction (Haringey Set)</i>		
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](#).

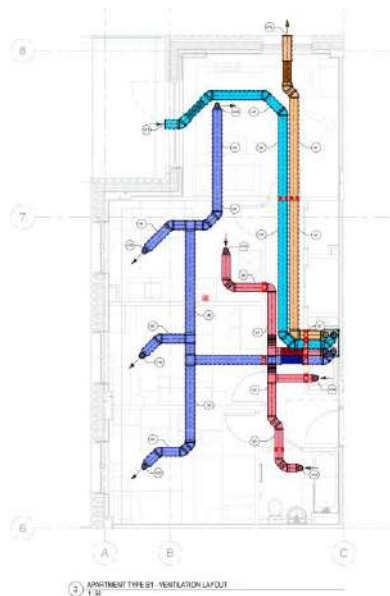
For this scheme the data will be uploaded at the as-built stage as per Planning Condition 32c.

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
<i>Be Lean</i> : Use Less Energy	60.5
CO ₂ Savings at <i>Be Lean</i>	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.

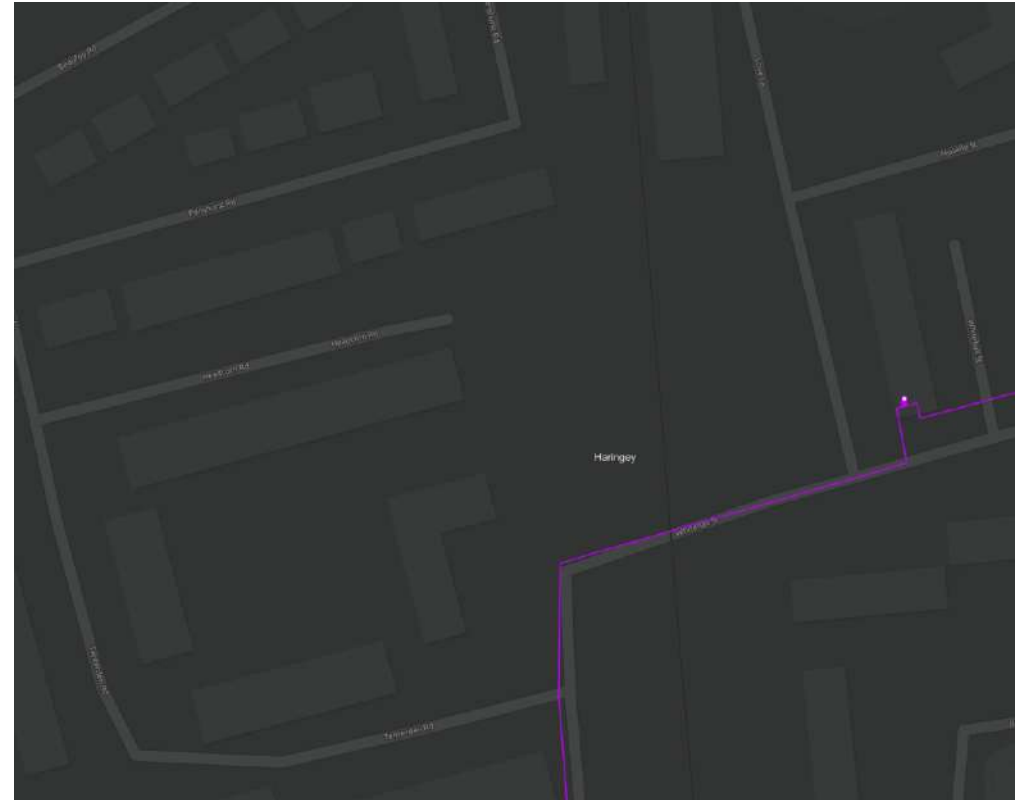


Figure: London Heat Map (2026)

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

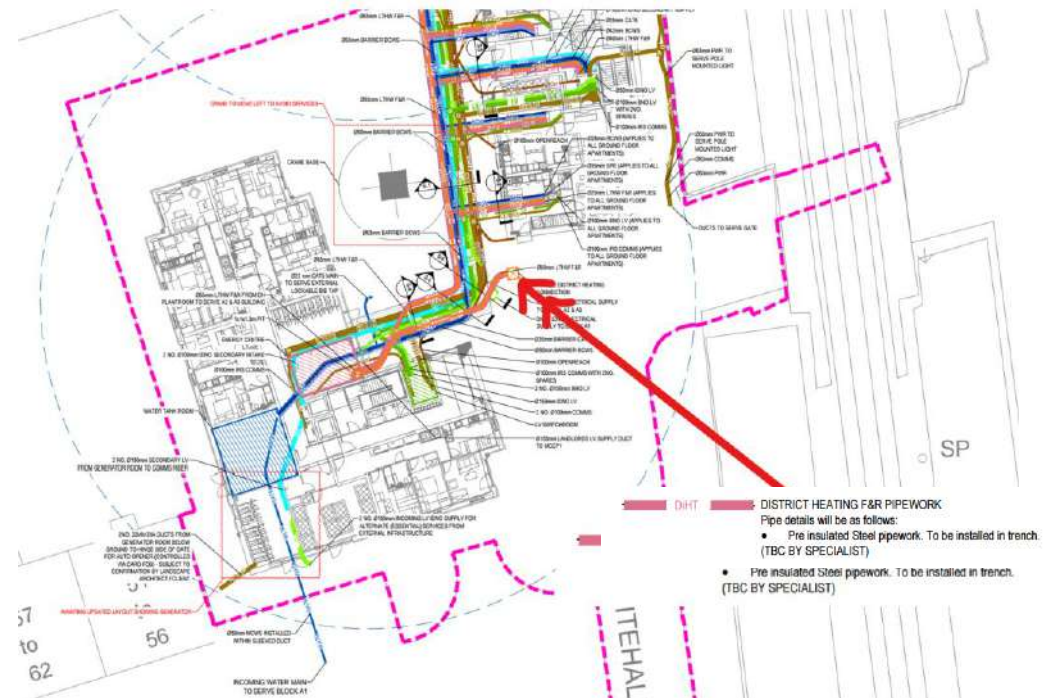


Figure: DHN proposed future connection (full drawing in Appendices

5.2 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	

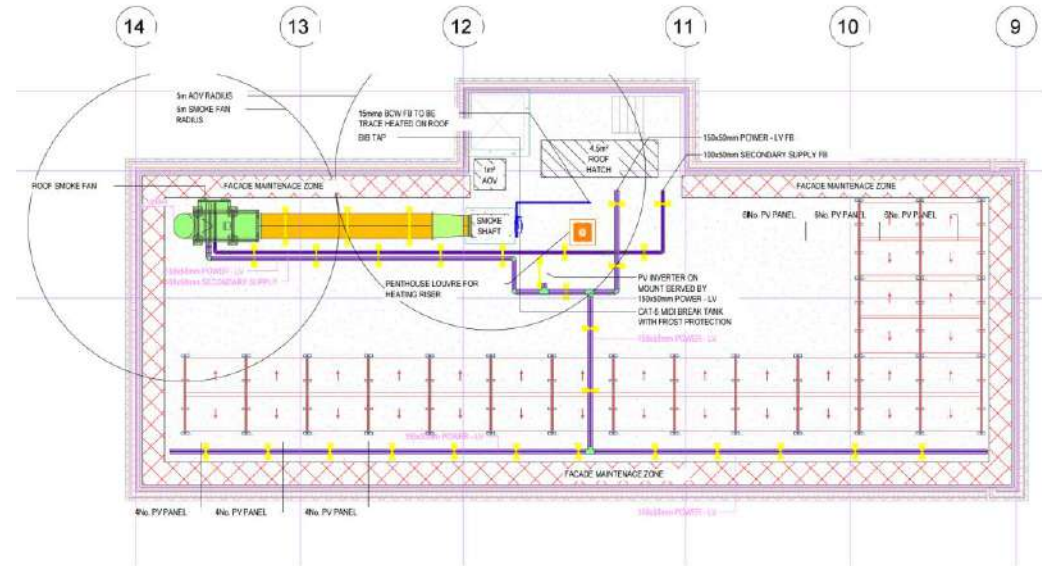


Figure: PV Layout for A2 and A3 (full drawing in Appendices)

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 CO₂ 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.

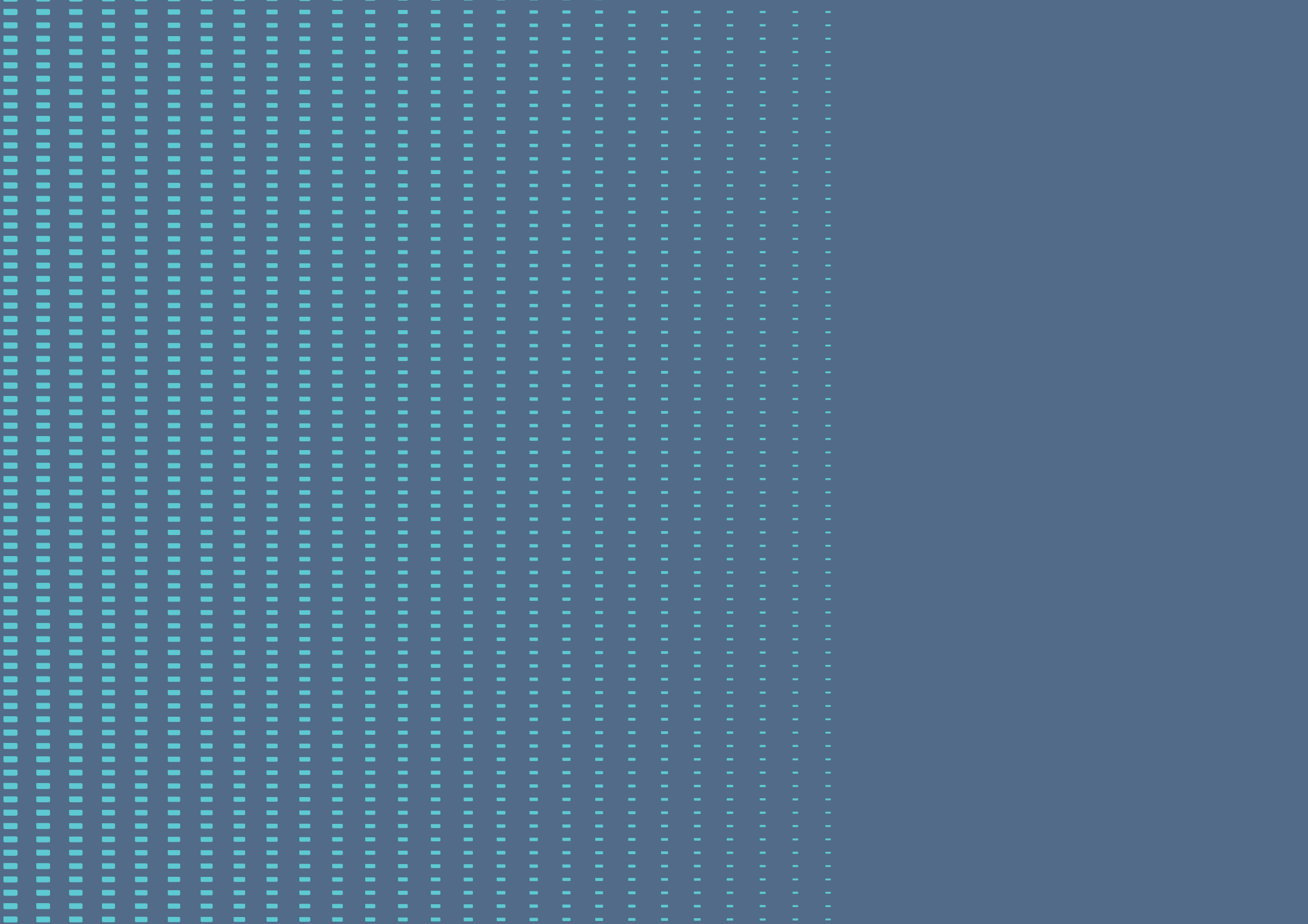
Carbon Offset

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

As per the CO₂ 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
<i>Be Lean</i> : Use Less Energy	60.5
CO ₂ Savings at <i>Be Lean</i>	10%
<i>Be Clean</i> : Supply Energy Efficiently	60.5
<i>Be Green</i> : 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



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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.96 kgCO₂/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 m ² , No overhang
Windows facing South:	2.45 m ² , No overhang
Windows facing West:	8.80 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.12 W/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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		secondary		other		total	m3 per hour				
	heating		heating									
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)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500
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

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)												
(38)m	Jan 22.2830	Feb 22.0332	Mar 21.7834	Apr 20.5343	May 20.2844	Jun 19.0353	Jul 19.0353	Aug 18.7855	Sep 19.5350	Oct 20.2844	Nov 20.7841	Dec 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)
HLP	Jan 0.6359	Feb 0.6333	Mar 0.6306	Apr 0.6175	May 0.6149	Jun 0.6017	Jul 0.6017	Aug 0.5991	Sep 0.6070	Oct 0.6149	Nov 0.6201	Dec 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)													
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:												1.0000	(47)
Store volume													
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	3.5462	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)

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)

[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)

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)

	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												13.6047 (99)
										(98) / (4) =		

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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 (negative value allowed since DFEE <= TFEE)			815.9452 (373)
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

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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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)
Number of open flues	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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1263 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3763 (18)
					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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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:												1.0000 (47)
Store volume												0.2134 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1152 (55)
Enter (49) or (54) in (55)												

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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	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)
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)
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)

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)

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)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	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	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)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	(94)
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	1.0000	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												28.5327	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 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 (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	(216)
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													(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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.07 kgCO₂/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

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)							
Number of open flues	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)							
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)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	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		Openings	NetArea	U-value	A x U	K-value	A x K				
	m2		m2	m2	W/m2K	W/K	kJ/m2K	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)												
(38)m	Jan 32.2339	Feb 31.8725	Mar 31.5111	Apr 29.7042	May 29.3428	Jun 27.5359	Jul 27.5359	Aug 27.1745	Sep 28.2587	Oct 29.3428	Nov 30.0656	Dec 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)
HLP	Jan 0.6985	Feb 0.6955	Mar 0.6925	Apr 0.6776	May 0.6746	Jun 0.6596	Jul 0.6596	Aug 0.6566	Sep 0.6656	Oct 0.6746	Nov 0.6805	Dec 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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)

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)

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	19.5457	19.6799	19.9117	20.2235	20.4138	20.4710	20.4734	20.4755	20.4501	20.1957	19.8265	19.5391 (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)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	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)
Ext temp.	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)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	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)
Space heating kWh	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	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 per m2												2556.2390 (98)
												(98) / (4) = 21.1960 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			1160.2499 (373)
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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)												
(38)m	Jan 65.6271	Feb 65.2799	Mar 64.9397	Apr 63.3415	May 63.0424	Jun 61.6505	Jul 61.6505	Aug 61.3927	Sep 62.1866	Oct 63.0424	Nov 63.6474	Dec 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)
HLP	Jan 1.0041	Feb 1.0012	Mar 0.9984	Apr 0.9852	May 0.9827	Jun 0.9711	Jul 0.9711	Aug 0.9690	Sep 0.9756	Oct 0.9827	Nov 0.9877	Dec 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)
Daily hot water use	Jan 112.4839	Feb 108.3936	Mar 104.3032	Apr 100.2129	May 96.1226	Jun 92.0323	Jul 92.0323	Aug 96.1226	Sep 100.2129	Oct 104.3032	Nov 108.3936	Dec 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:												1.0000 (47)
Store volume												0.2134 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

[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	0.6300	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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 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 (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	(216)
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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 21.67 kgCO₂/m² Fail
Excess emissions = 3.26 kgCO₂/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/yr OK

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	-
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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 TRVs	OK
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Hot water controls:

No cylinder stat

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
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Based on:

Overshading:	Average
Windows facing South:	2.45 m ² , No overhang
Windows facing West:	13.11 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.12 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.12 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	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)
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												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)
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)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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 content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.0310 (45)
	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)

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			1328.6444 (373)
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	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												
Effective ac	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)
	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)
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)
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 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	0.6300	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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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 m ²										(98) / (4) =		41.5898 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 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 (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	(216)
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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.92 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 44.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 35.6 kWh/m²/yr OK

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
Permitted by DBSCG 0.29
Primary pipework insulated: Nominal cylinder loss: 0.12 kWh/day
OK
No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVs OK

Hot water controls:

No cylinder stat

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/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)
Number of open flues	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)
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												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)				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/m ² K							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)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												40.7533 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	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)
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)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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 content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1264.7756 (45)
	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)	
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)	

	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												16.6009 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			661.7150 (373)
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)
Number of open flues	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)
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												
Effective ac	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)
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:												1.0000 (47)
Store volume												0.2134 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1152 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)
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)
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)

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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 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 (217)m	87.1214	86.7900	86.0080	84.1697	81.5351	79.8000	79.8000	79.8000	79.8000	84.5988	86.4716	79.8000	(216)
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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.98 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 38.3 kWh/m²/yr OK

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 TRVs OK
Hot water controls: No cylinder stat

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/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)
Number of open flues	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)
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												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(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)
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)

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	3.5462	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 (66)

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)

[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	442.4280	412.9978	377.5699	342.0080	323.5264	322.6830 (84)		

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)

	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												18.8450 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			649.6234 (373)
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	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												
Effective ac	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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:												1.0000 (47)
Store volume												0.2134 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1152 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)
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)
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			
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 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 (217)m	87.0137	86.6884	85.9240	84.1518	81.5933	79.8000	79.8000	79.8000	79.8000	84.4896	86.3485	79.8000	(216)
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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.63 kgCO₂/m² Fail
Excess emissions = 1.21 kgCO₂/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/yr OK

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	-
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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 TRVs	OK
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Hot water controls:

No cylinder stat

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
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Based on:

Overshading:	Average
Windows facing North:	4.90 m ² , No overhang
Windows facing East:	13.11 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.12 W/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	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)
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)												
(38)m	Jan 19.8002	Feb 19.5870	Mar 19.3739	Apr 18.3081	May 18.0950	Jun 17.0292	Jul 17.0292	Aug 16.8161	Sep 17.4555	Oct 18.0950	Nov 18.5213	Dec 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)											
HLP	Jan 0.5890	Feb 0.5866	Mar 0.5842	Apr 0.5722	May 0.5698	Jun 0.5578	Jul 0.5578	Aug 0.5554	Sep 0.5626	Oct 0.5698	Nov 0.5746	Dec 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)
Daily hot water use	Jan 105.8157	Feb 101.9679	Mar 98.1200	Apr 94.2722	May 90.4243	Jun 86.5765	Jul 86.5765	Aug 90.4243	Sep 94.2722	Oct 98.1200	Nov 101.9679	Dec 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:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)												
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												
Specific data or Table 6b												
Specific data or Table 6c												
Access factor Table 6d												
Gains W												
North												
East												
4.9000 10.6334 0.3700 0.6600 0.7700 8.8175 (74)												
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) =												
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			1081.9277 (373)
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	88.9000	TFA
Assumed number of occupants	2.6104	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	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)
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												
Effective ac	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)
	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)												
(38)m	Jan 41.9781	Feb 41.7720	Mar 41.5700	Apr 40.6213	May 40.4438	Jun 39.6174	Jul 39.6174	Aug 39.4644	Sep 39.9357	Oct 40.4438	Nov 40.8028	Dec 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)
HLP	Jan 0.9338	Feb 0.9314	Mar 0.9292	Apr 0.9185	May 0.9165	Jun 0.9072	Jul 0.9072	Aug 0.9055	Sep 0.9108	Oct 0.9165	Nov 0.9205	Dec 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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 (56)
Primary 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 (57)
Total heat required for water heating calculated for each month	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)
Solar input	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)
Output from w/h	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)
Heat gains from water heating, kWh/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 (64)
	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)

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)
(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
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)

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	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	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)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	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)
Ext temp.	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)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	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)
Space heating kWh	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 per m2	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)
												2502.0113	(98)
												28.1441	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	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 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 (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	(216)
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)

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 Rotheron, Neil Rotheron, Tel: 02037358169, neil@nrgconsulting.org			Assessor ID	L759-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.80 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 30.9 kWh/m²/yr OK

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 TRVs OK

Hot water controls: No cylinder stat

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 m ² , No overhang
Windows facing South:	2.45 m ² , No overhang
Windows facing West:	8.80 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.12 W/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.64 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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		secondary		other		total	m3 per hour					
	heating		heating										
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:													
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0.5000 (23a) 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)			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)												
(38)m	Jan 22.2830	Feb 22.0332	Mar 21.7834	Apr 20.5343	May 20.2844	Jun 19.0353	Jul 19.0353	Aug 18.7855	Sep 19.5350	Oct 20.2844	Nov 20.7841	Dec 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)
HLP	Jan 0.6359	Feb 0.6333	Mar 0.6306	Apr 0.6175	May 0.6149	Jun 0.6017	Jul 0.6017	Aug 0.5991	Sep 0.6070	Oct 0.6149	Nov 0.6201	Dec 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)
Daily hot water use	Jan 107.8484	Feb 103.9267	Mar 100.0049	Apr 96.0831	May 92.1614	Jun 88.2396	Jul 88.2396	Aug 92.1614	Sep 96.0831	Oct 100.0049	Nov 103.9267	Dec 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:												1.0000	(47)
Store volume													
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	3.5462	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)

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)

[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)	

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)

	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			957.5859	(373)
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	95.0000	TFA
Assumed number of occupants	2.6882	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
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

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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 (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1263 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3763 (18)
					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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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:												1.0000 (47)
Store volume												0.2134 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1152 (55)
Enter (49) or (54) in (55)												

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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)
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)
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)

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)

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)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	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	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)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	(94)
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	1.0000	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												28.5327	(99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)

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 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 (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	(216)
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													(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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.09 kgCO₂/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

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 m ² , No overhang
Windows facing West:	9.05 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.12 W/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.81 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)							
Number of open flues	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)							
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)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

267.4400 (35)
17.9314 (36)
(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)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)

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)

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	19.5457	19.6799	19.9117	20.2235	20.4138	20.4710	20.4734	20.4755	20.4501	20.1957	19.8265	19.5391 (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)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	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)
Ext temp.	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)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	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)
Space heating kWh	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	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 per m2												2556.2390 (98)
												(98) / (4) = 21.1960 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			1361.6588 (373)
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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	secondary	other	total	m3 per hour			
										heating	heating						
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)												
(38)m	Jan 65.6271	Feb 65.2799	Mar 64.9397	Apr 63.3415	May 63.0424	Jun 61.6505	Jul 61.6505	Aug 61.3927	Sep 62.1866	Oct 63.0424	Nov 63.6474	Dec 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)
HLP	Jan 1.0041	Feb 1.0012	Mar 0.9984	Apr 0.9852	May 0.9827	Jun 0.9711	Jul 0.9711	Aug 0.9690	Sep 0.9756	Oct 0.9827	Nov 0.9877	Dec 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)
Daily hot water use	Jan 112.4839	Feb 108.3936	Mar 104.3032	Apr 100.2129	May 96.1226	Jun 92.0323	Jul 92.0323	Aug 96.1226	Sep 100.2129	Oct 104.3032	Nov 108.3936	Dec 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:												1.0000 (47)
Store volume												0.2134 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

[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	0.6300		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												
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 (91)
Temperature adjustment												
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 (92)
												0.0000
												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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 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 (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	(216)
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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.98 kgCO₂/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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)
Number of open flues	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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					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)
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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												63.1815 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	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)
Days in month												0.8596 (40)
	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)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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 content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1408.0310 (45)
	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)	
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)	

	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												25.4127 (99)
										(98) / (4) =		

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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	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 (negative value allowed since DFEE <= TFEE)			764.0496 (373)
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

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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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)
Number of open flues	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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1633 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4133 (18)
					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												
Effective ac	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)
	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)

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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)
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)
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 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	0.6300		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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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 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 (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	(216)
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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.85 kgCO₂/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 m ² , No overhang	
Windows facing East:	7.35 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.12 W/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.45 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	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)
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												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												40.7533 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	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)
Days in month												0.6943 (40)
	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)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	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 content (annual)	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)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1264.7756 (45)
	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)	
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)	

	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												16.6009 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			776.5828 (373)
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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 * 40 = 0.0000 (6a)
Number of open flues	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)
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												
Effective ac	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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)
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:												1.0000 (47)
Store volume												0.2134 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1152 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)
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)
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)

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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 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 (217)m	87.1214	86.7900	86.0080	84.1697	81.5351	79.8000	79.8000	79.8000	79.8000	84.5988	86.4716	79.8000	(216)
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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.12 kgCO₂/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 m ² , No overhang	
Windows facing East:	7.35 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.12 W/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.40 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	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)
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												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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)
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 content (annual)	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)
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)
	Total = Sum(45)m =											1199.4071 (45)

Water storage loss:													1.0000 (47)
Store volume													
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)

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)

[Jan				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Table 6b		Table 6c	factor		W	
					W/m2	or		or	Table 6d			
North				5.7600	10.6334	0.3700		0.6600	0.7700		10.3651	
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)

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	19.5417	19.7026	19.9719	20.2942	20.4656	20.5178	20.5220	20.5231	fLA = Living area / (4) =	20.2738	19.8671	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	19.5417	19.7026	19.9719	20.2942	20.4656	20.5178	20.5220	20.5231	20.4973	20.2738	19.8671	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)

	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)

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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	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 (negative value allowed since DFEE <= TFEE)			762.3922 (373)
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

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	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)
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 m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
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, m ²)			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/m ² K							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:												1.0000 (47)
Store volume												0.2134 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1152 (55)
Enter (49) or (54) in (55)												

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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	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)
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)
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		Specific data or Table 6b		Specific data or Table 6c		FF		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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	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)
Ext temp.	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)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	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)
Space heating kWh	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	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 per m2										(98) / (4) =		31.9611 (99)

8c. Space cooling requirement

Not applicable

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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 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 (217)m	87.0137	86.6884	85.9240	84.1518	81.5933	79.8000	79.8000	79.8000	79.8000	84.4896	86.3485	79.8000 (216)
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)

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					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

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 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 7.44 kgCO₂/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 m ² , No overhang	
Windows facing East:	13.11 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.12 W/m ² K
Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.84 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	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)
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)												
(38)m	Jan 19.8002	Feb 19.5870	Mar 19.3739	Apr 18.3081	May 18.0950	Jun 17.0292	Jul 17.0292	Aug 16.8161	Sep 17.4555	Oct 18.0950	Nov 18.5213	Dec 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)											
HLP	Jan 0.5890	Feb 0.5866	Mar 0.5842	Apr 0.5722	May 0.5698	Jun 0.5578	Jul 0.5578	Aug 0.5554	Sep 0.5626	Oct 0.5698	Nov 0.5746	Dec 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)
Daily hot water use	Jan 105.8157	Feb 101.9679	Mar 98.1200	Apr 94.2722	May 90.4243	Jun 86.5765	Jul 86.5765	Aug 90.4243	Sep 94.2722	Oct 98.1200	Nov 101.9679	Dec 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:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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)												
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												
Specific data or Table 6b												
Specific data or Table 6c												
Access factor Table 6d												
Gains W												
North												
East												
4.9000 10.6334 0.3700 0.6600 0.7700 8.8175 (74)												
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) =												
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

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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (negative value allowed since DFEE <= TFEE)			622.1729	(373)
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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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 (m ²)	Storey height (m)	Volume (m ³)
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	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	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)
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												
Effective ac	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)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	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)
Average = Sum(39)m / 12 =	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)
												81.6533 (39)
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)
Daily hot water use												
Energy conte	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 content (annual)	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)
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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 (56)
Primary 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 (57)
Total heat required for water heating calculated for each month	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)
Solar input	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)
Output from w/h	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)
Heat gains from water heating, kWh/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 (64)
	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)

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)
(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
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)

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	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	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)
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

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	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)
Ext temp.	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)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	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)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	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)
												2502.0113	(98)
												28.1441	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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	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 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 (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	(216)
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

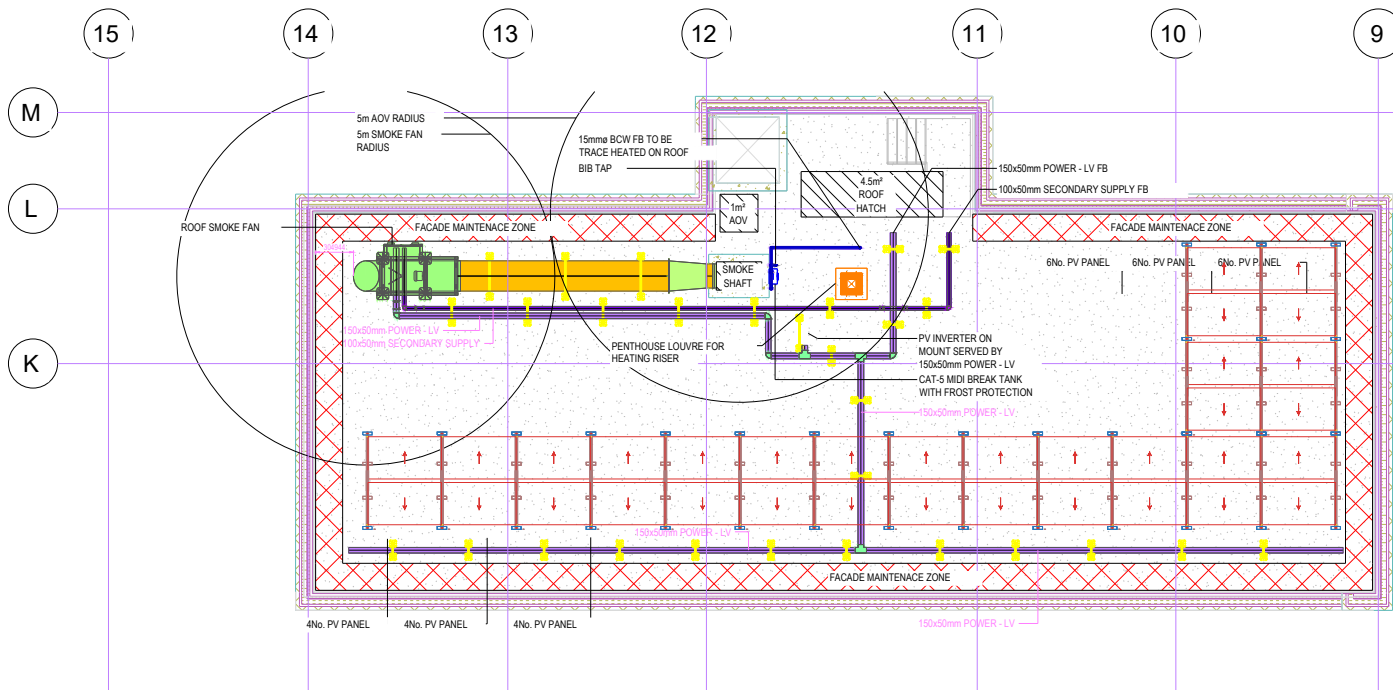
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2675.9479	0.2160	578.0048 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2176.5071	0.2160	470.1255 (264)
Space and water heating			1048.1303 (265)
Pumps and fans	75.0000	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



Appendix 5





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

SG-54TG4D 500-520W

N-type TOPCon Solar Double Glass Bifacial Module

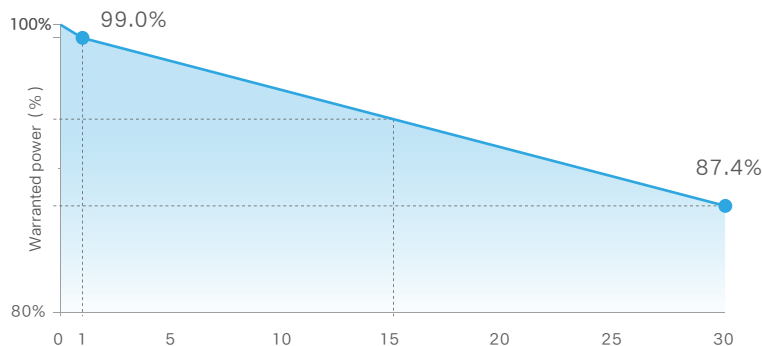
Maximum Efficiency 23.4%

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



25Year

Warranty for Materials and Processing

30Year

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 lightweight 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

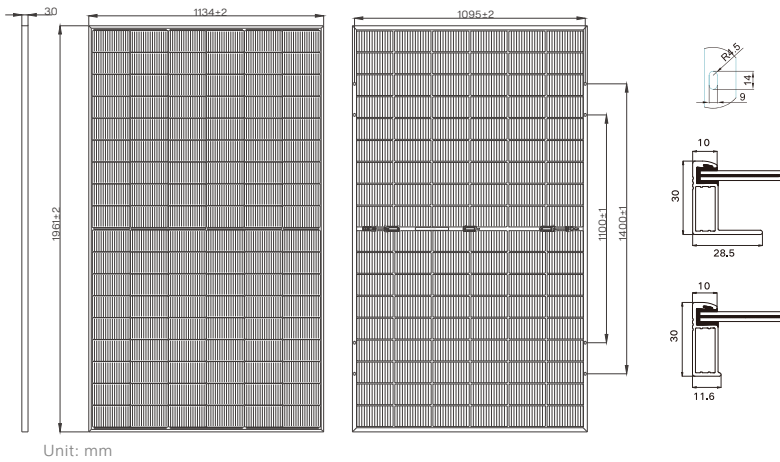
Minimizes the chance of degradation caused by PID phenomena through optimization of cell production technology and material control



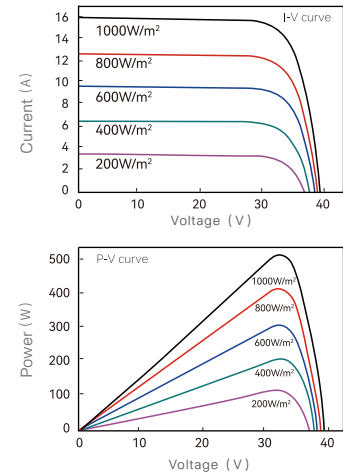
Superior Mechanical Load Capacity

Heavy snow load up to 5400 Pa
wind load up to 2400 Pa

Engineering Drawings



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
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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 //



**DESIGNED & MADE
IN THE UK**

ROWAN //



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.



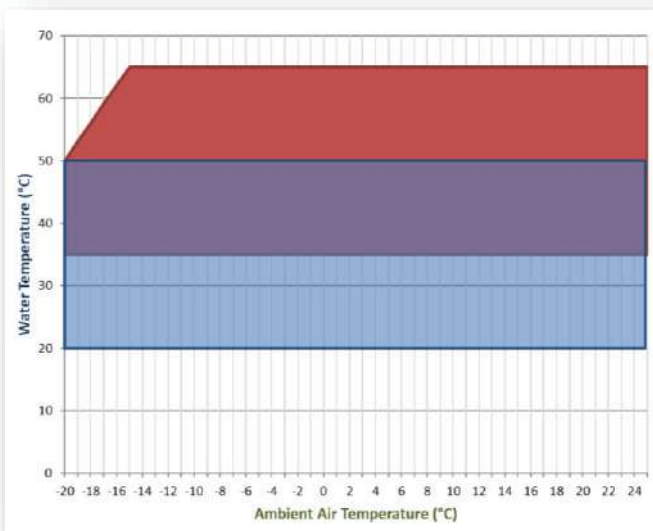
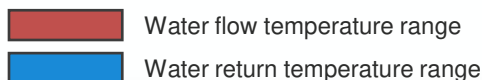
Model	-5°C capacity	+7°C capacity
Rowan 240/160	160kW	240kW
Rowan 360/240	240kW	360kW
Rowan 480/320	320kW	480kW
Rowan 600/400	400kW	600kW

- 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.

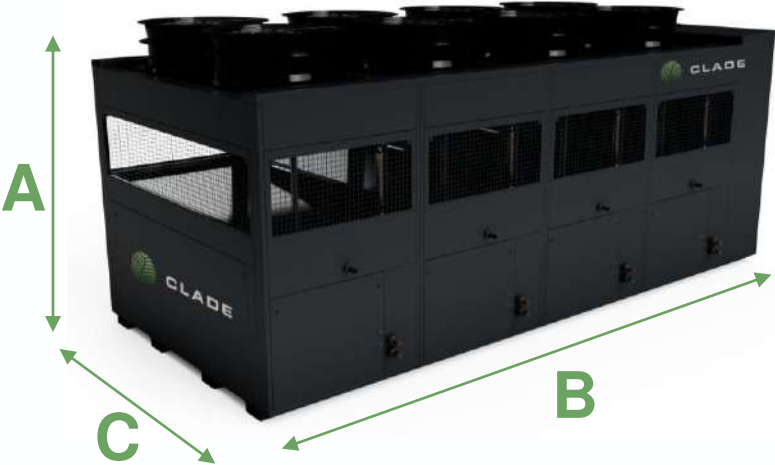
Its high latent heat and superior thermal conductivity enable efficient heat transfer, enhancing the energy efficiency of heat pump systems. R290 operates effectively across a wide range of temperatures, making it suitable for both heating and cooling applications.

While its flammability requires 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 CO₂. 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



TECHNICAL SPECIFICATION //

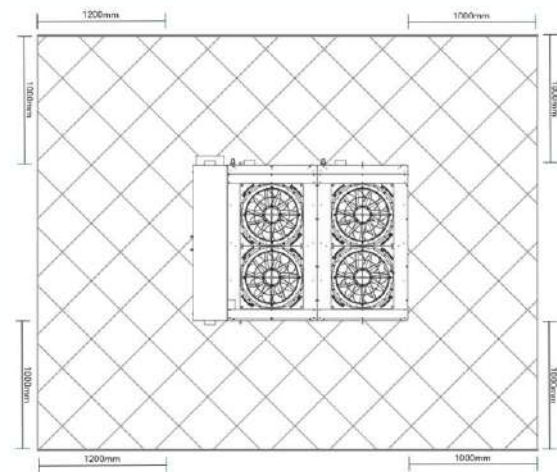
Rowan Range		240/160kW	360/240kW	480/320kW	600/400kW
REFRIGERATION SIDE					
Compressor Type	-	Reciprocating			
Compressor Qty	Pcs.	2	3	4	5
Refrigerant	-	Propane (R290)			
Refrigerant Circuits	Pcs	2	3	4	5
Variable speed drive (VSD)	Pcs.	2	3	4	5
Refrigerant charge	kg	12	18	24	30
No. evaporators	Pcs.	2	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	I	2	3	4	5
Exchanger Water Content (per module)	I	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	kV A	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 L_{W(A)} 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	



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	65/5	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
	60/5	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
	55/4	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
	50/4	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
	45/3	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
	40/3	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
	35/3	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
	30/2	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
	25/2	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
	50/4	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
	55/5	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
	60/5	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
	65/6	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



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



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

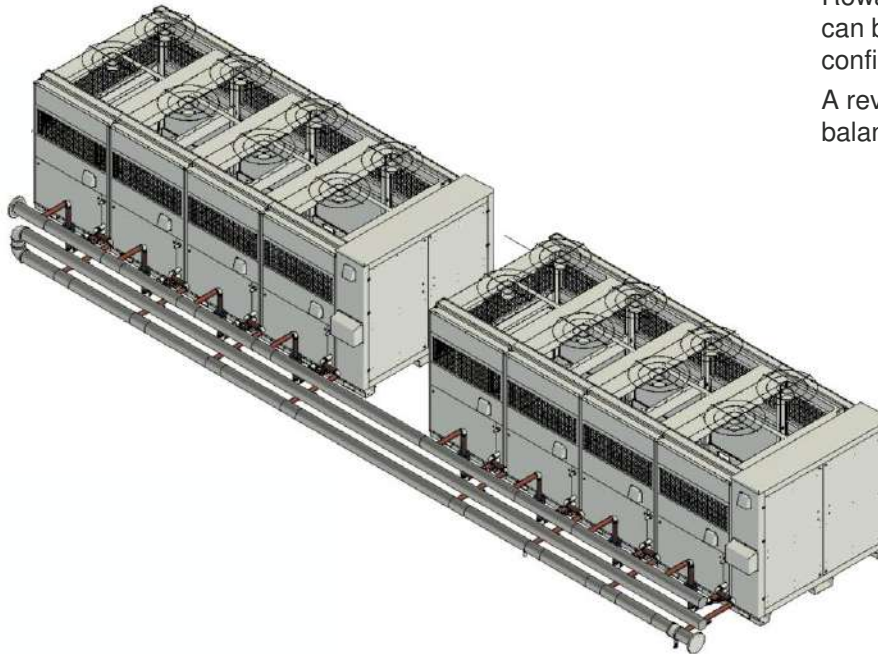


ROWAN PERFORMANCE – 600/400 EFFICIENCY MODE //

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 innovates to improve our products, the information in this document is 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.

By utilizing this advice, you acknowledge that it is provided "as is" without any warranties or guarantees, express or implied, regarding its completeness, accuracy, reliability, suitability, or availability.

We strongly recommend consulting with a qualified professional before implementing any advice or making any decisions based on the information provided.

In no event shall Clade or its representatives be liable for any direct, indirect, incidental, special, or consequential damages, including but not limited to loss of profits, data, or other intangible losses, arising out of or in connection with the use of, or reliance on, the technical advice provided.



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Stone Pits Lane, Morley,
LEEDS LS27 7JZ

Appendix 7



KAMSTRUP MULTICAL 403 & 603 ULTRASONIC ENERGY METERS

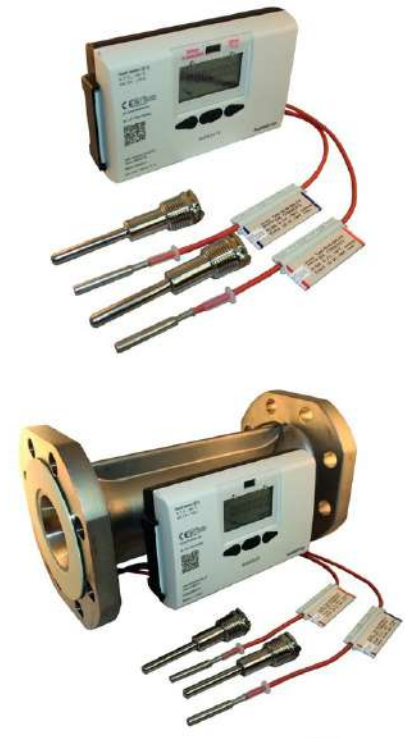
Multical 403 & 603 is a static heat meter, cooling meter or combined heating/cooling meter based on the ultrasonic principle.

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](#)



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 $\pm 5\%$
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

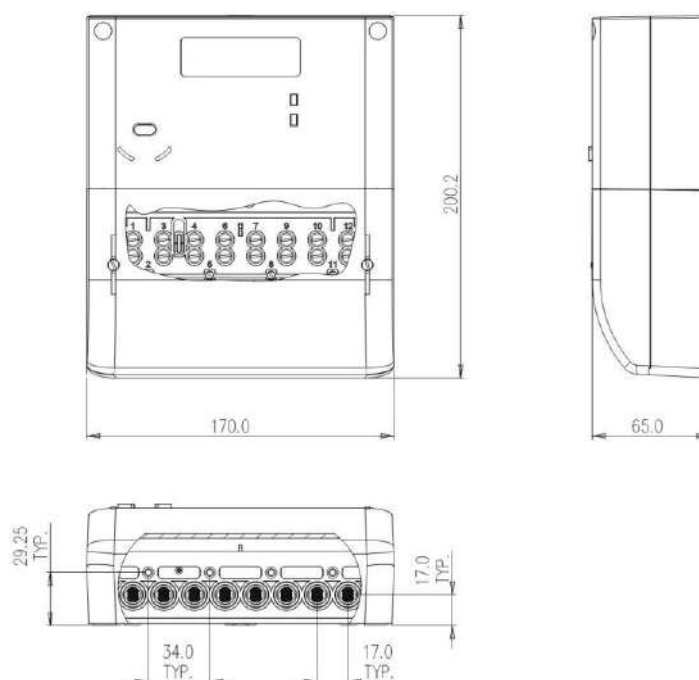
Environmental

Temperature Range	-25°C to +55°C
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Physical

Ingress protection	IP54, to BS EN60529
Terminal arrangement	DIN43857-Part 2, fixing centres of 150 $\pm$ 1mm
	Main Terminal size 8.2mm $\varnothing \pm 0.2$
Terminal Construction	Solid brass

Dimensions

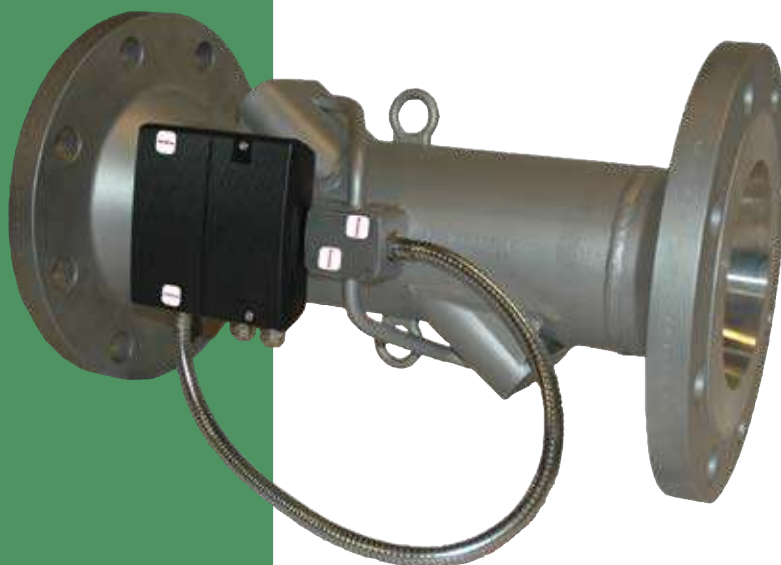


NB * denotes standard setting

Data sheet

• **ULTRAFLOW® 54**
DN150-300

- For flow from 150 m³/h up to 1000 m³/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



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



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



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 @ $t_{BAT} < 30\text{ °C}$
– 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 Fulfil 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	Fulfil 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]

At medium temperatures above 90 °C or below ambient temperature the electronics box must be wall-mounted or mounted via the enclosed distance piece.

Storage temperature [empty sensor]	-25...60 °C
Pressure stage	PN16, PS16 PN25, PS25

Flow data

Nom. flow q_p	Nom. diameter	Meter factor *	Dynamic range	$q_s : q_p$	Flow @125 Hz **	$\Delta p @ q_p$	Min. cut off
[m³/h]	[mm]	[imp./l]	$q_p : q_i$		[m³/h]	[bar]	[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 mm²)

Power supply cable 24/230 VAC (optional)

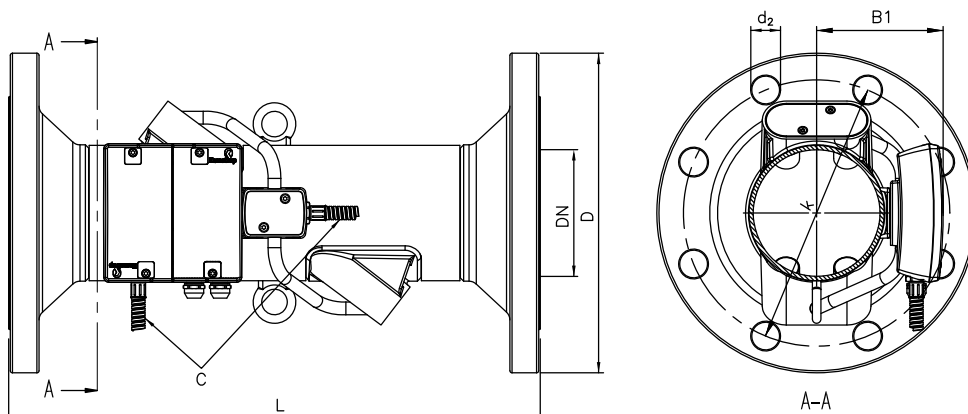
Cable with PVC mantle (2 x 0.75 mm²)

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	

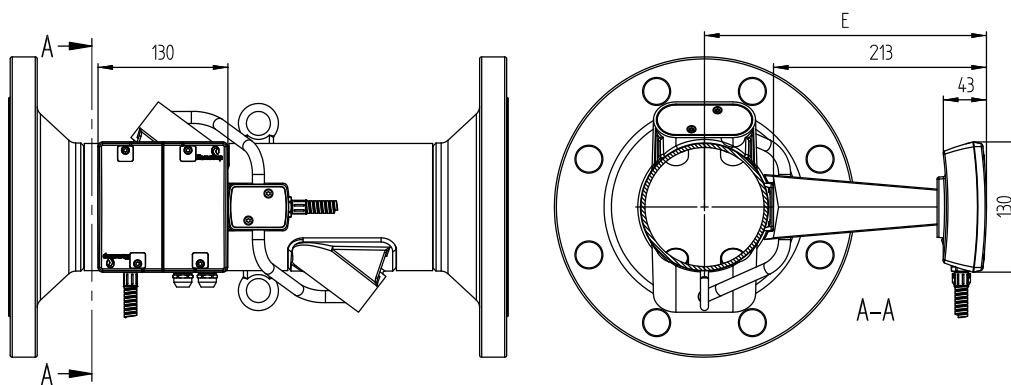
Flange EN 1092-1. Flange facing type B, raised face.

Dimensional sketches



Flange EN 1092-1. Flange facing type B, raised face.

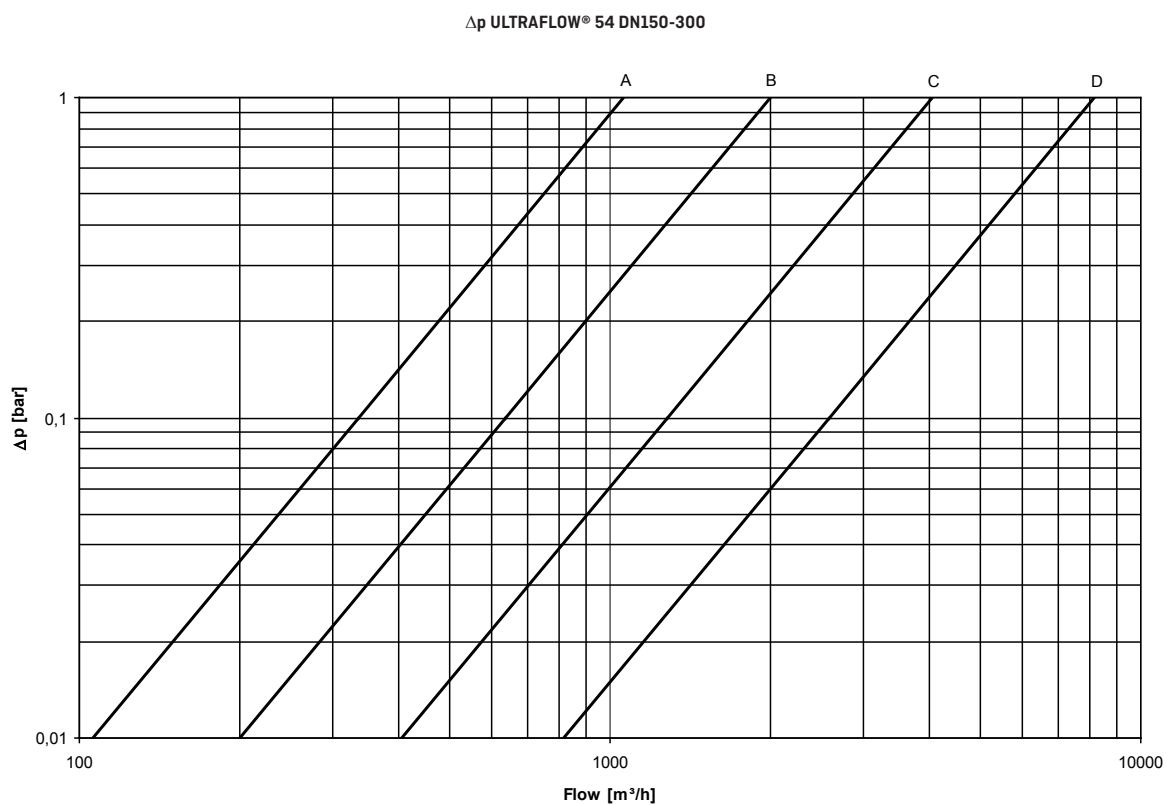
Nom. diameter	PN	Nom. flow q_p	L	D	k	Bolts			B1	E	Steel tube length C	Approx. weight
						Quantity	Thread	d_2				
[mm]	[bar]	[m³/h]	[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
DN150	25	150 & 250	500	300	250	8	M24	26	119	282	650	37
DN150	25	400	500	300	250	8	M24	26	140	303	625	36
DN200	25	400 & 600	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^*	$q@0.25 \text{ bar}$ [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.

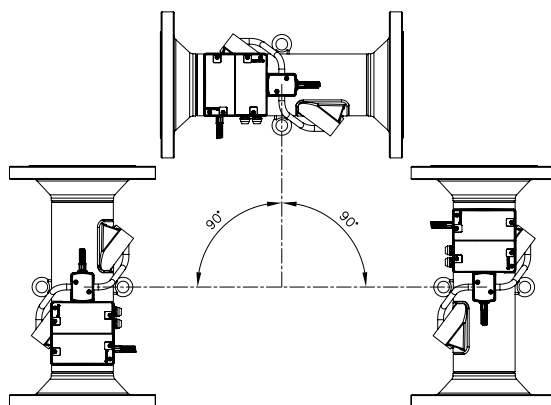
If other calculator types are connected, ULTRAFLOW® 54 must be fitted with a galvanically separated output module and a power supply of its own.

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

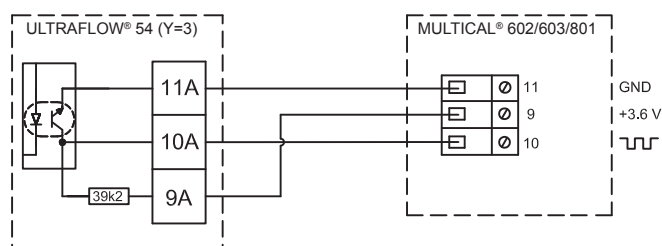
ULTRAFLOW® 54 and MULTICAL®, galvanically separated

If ULTRAFLOW® 54 and MULTICAL® are connected via output module (Y=2 or 3), ULTRAFLOW® 54 is galvanically separated from MULTICAL®.

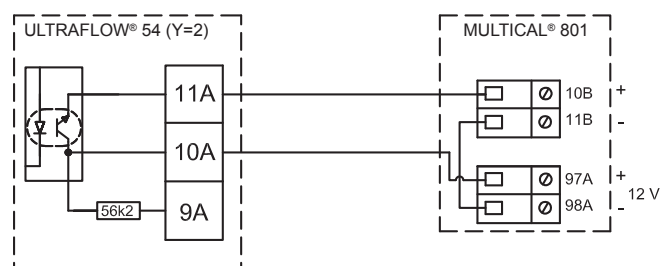
Maximum cable length depends on calculator.

Note: Flow info cannot be read.

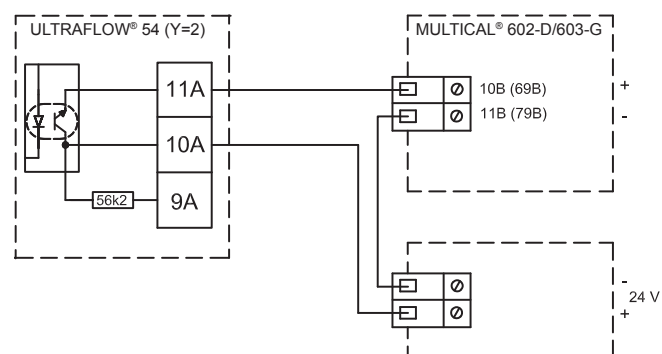
Three-wire connection,
MULTICAL® 602/603/801 via output module (Y=2 or 3).



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-FECP-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-FECP-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

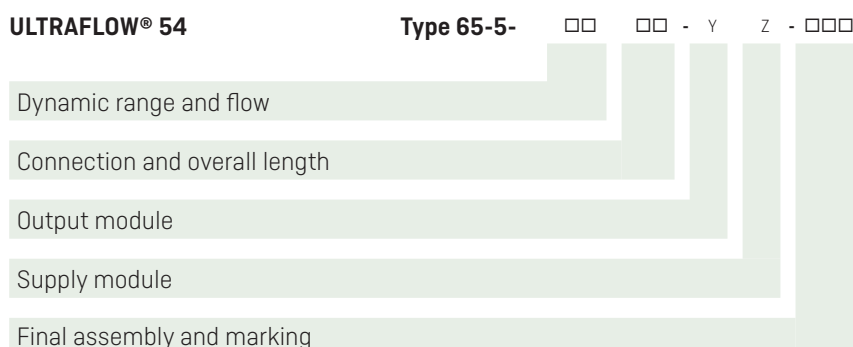
In addition to the basic variants output module (Y), supply module (Z) as well as meter factor (CC) and pulse duration (E) must be selected.

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 ULTRAFLW® 54.

q_p [m³/h]	Meter factor			Pulse duration				
	[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 ULTRAFLW® 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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