



Tangmere

Energy Statement

March 2026

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Document Control Sheet	
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1 Executive Summary

NRG Consulting have been commissioned to undertake a revised Energy Statement on a proposed development at **Tangmere, Broadwater Farm Estate, N17 6HW**.

The scheme benefits from Planning Permission (Ref: HGY/2022/0823). The description of development is:

Demolition of the existing buildings and structures and erection of new mixed-use buildings including residential (Use Class C3), commercial, business and service (Class E) and local community and learning (Class F) floorspace; energy centre (sui generis); together with landscaped public realm and amenity spaces; public realm and highways works; car-parking; cycle parking; refuse and recycling facilities; and other associated works. Site comprising: Tangmere and Northolt Blocks: Energy Centre; Medical Centre: Enterprise Centre: and former Moselle school site, at Broadwater Farm Estate.

The report has been written to discharge **Planning Conditions 43a, 45, 47 and 58a**. Wording of which can be found within Section 2.

This document illustrates a reduction in CO₂ emissions over Part L of the Building Regulations (2021) via:

Energy Efficiency – Be Lean

- U-Values have been set to achieve Passive house requirements.
- 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 a DEN, be it within the Broadwater Farm Estate or a wider Haringey network.

Renewable Energy – Be Green

The following on-site renewable technologies will be provided:

- Communal Air Source Heat Pump
- PV Panels

Carbon Offsetting

As per Planning Condition 45, carbon offset contributions have been produced based on the communal heating (ASHP) on-site. This is as the composition of the Northolt Energy Centre is unknown and will likely be heat pump based also.

	CO ₂ Emissions (Tonnes per Annum)		
	Residential	Commercial	Total
Baseline: Part L 2013 (SAP 10)	165.4	3.7	169.1
Be Lean: Use Less Energy	130.7	2.2	132.9
CO₂ Savings at Be Lean	21%	41%	21%
Be Clean: Supply Energy Efficiently	130.7	2.2	132.9
Be Green: Use Renewable Energy	41.8	1.3	43.2
Total CO₂ Savings – Part L 2013 (SAP 10)	75%	64%	74%

Table: Carbon Emissions Table - Tangmere

2 Planning Conditions Wording

Planning Condition 43a

The development hereby approved shall be constructed in accordance with the Energy Statement by XCO2 (dated October 2022) delivering a minimum 65.8% improvement on carbon emissions over 2013 Building Regulations Part L, with SAP10 emission factors, high fabric efficiencies, new central energy centre, and a minimum 332 kWp solar photovoltaic (PV) array.

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

- a. Confirmation of how this development will meet the zero-carbon policy requirement in line with the Energy Hierarchy;
- b. Confirmation of the necessary fabric efficiencies to achieve a minimum 10% reduction in SAP2012 carbon factors, including details showing how thermal bridging is reduced;
- c. Specification and efficiency of the proposed Mechanical Ventilation and Heat Recovery (MVHR), with plans showing the rigid MVHR ducting and location of the unit;
- d. Details of the PV, demonstrating the roof areas have 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 shall be carried out strictly in accordance with the details so approved prior to first operation 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 and shall be maintained at least annually thereafter.

Planning Condition 45

Prior to commencement of above ground construction, a revised carbon offset calculation and details of the off-site carbon offset mechanism shall be submitted to and approved by the Local Planning Authority. This should separately identify the carbon savings achieved by the heat network in the new build development and the existing development for both the ASHP and DEN connection scenarios (noting that the saving in the existing homes is expected to be substantial in both cases). If the calculation shows

the combined savings in the new and existing development are over and above those required to make the new development zero carbon, the savings may be banked by the developer for future projects.

Note: Tangmere is entirely new-build so this assessment is for a communal ASHP scenario only pending finalisation of the BWF Energy Centre within Northolt.

Planning Condition 47

No development shall take place beyond the superstructure of the development until a detailed scheme for energy monitoring has been submitted to and approved in writing by the Local Planning Authority. The details shall include details of suitable automatic meter reading 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 and the monitored data for each block shall be submitted to the Local Planning Authority, at daily intervals for a period of 5 years from final completion.

Planning Condition 58a

(a) Prior to the completion of the superstructure a detailed scheme for energy monitoring has been submitted to and approved in writing by the Local Planning Authority. This shall include details of suitable automatic meter reading 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.

2.1 Planning Condition Analysis

- The scheme shall meet the zero-carbon policy requirement
- Over 10% fabric efficiencies have been achieved.
- Details of the energy monitoring and metering has been provided.
- Eventual connection to the Broadwater Farm Energy Centre (ASHP led)
- Over 100kWp of PV is being installed.

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 2021 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-Vales	Proposed U-Values (W/m²K)
Walls		
External Wall	0.26 W/m²K	0.14 W/m²K
Sheltered Wall Types	0.26 W/m²K	0.24-0.27 W/m²K
Floors		
Ground Floor	0.18 W/m²K	0.10 W/m²K
Exposed Floor	0.18 W/m²K	0.13 W/m²K
Roof		
Roofs	0.16 W/m²K	0.11 W/m²K
Openings		
Windows	1.6 W/m²K	0.9 W/m²K
Front Doors	1.6 W/m²K	1.0-1.2 W/m²K
Air Permeability		
Flats	2.5 m³/(hm²) @50Pa	
Townhouses	1.8 m³/(hm²) @50Pa	
Thermal Bridging		
Manually Calculated Psi Values by NRG from detailed drawings		
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	Mechanical Ventilation with Heat Recovery
Ventilation Details	Nuaire MRXBOX – ECO2
Heating 1	Communal Air Source Heat Pump (Clade Acer)
Heating Details	SCOP: 2.7
Emitters	Underfloor Heating
Heating Controls	Programmer / Thermostat – Charging linked to use
Hot Water	HIU – SAV 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](#).

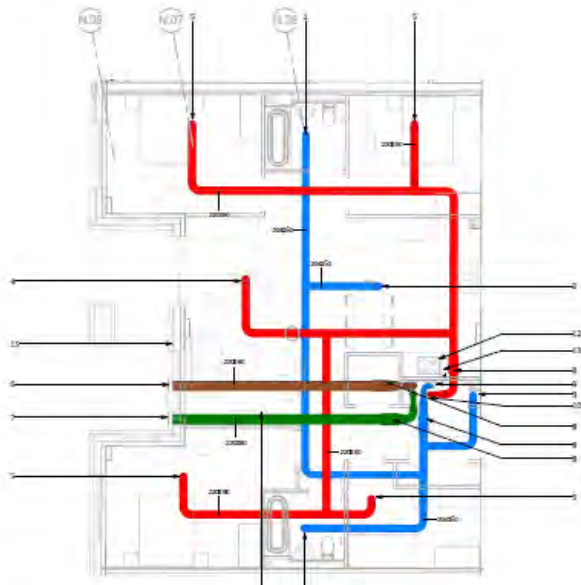
For this scheme the data will be uploaded at the as-built stage as per Planning Condition 58b.

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 – ECO2
Number	All
Dimensions	607mm (W) * 600mm (D) * 378mm (H)
Efficiency	88% (average)
SFP	0.54 W/l/s (average)
Summer Bypass	Yes

MVHR drawings can be found in the Appendices. A typical layout is highlighted below.



3.7 Commercial Unit

The commercial unit will be finished to shell and core. The fabric is as per Section 3.1 and the unit has the following M&E parameters:

- Standalone heating & cooling
- Hot water assumed via instantaneous electric
- Lighting to be high-efficiency LEDs

The BRUKLs for *Be Lean* and *Be Green* can be found in the Appendices.

3.8 Carbon Savings at Be Lean

	CO ₂ Emissions (Tonnes per Annum)		
	Residential	Commercial	Total
Baseline: Part L 2013 (SAP 10)	165.4	3.7	169.1
<i>Be Lean</i> : Use Less Energy	130.7	2.2	132.9
CO ₂ Savings at <i>Be Lean</i>	21%	41%	21%

4 Renewable Energy – Be Green

Renewable energy is being provided as per the approved planning strategy therefore this document contains no formal feasibility section. However, it can be confirmed that the chosen technologies are considered appropriate for the scheme and its aims.

4.1 Air Source Heat Pumps (Centralised Energy Centre)

Wider Broadwater Farm Estate

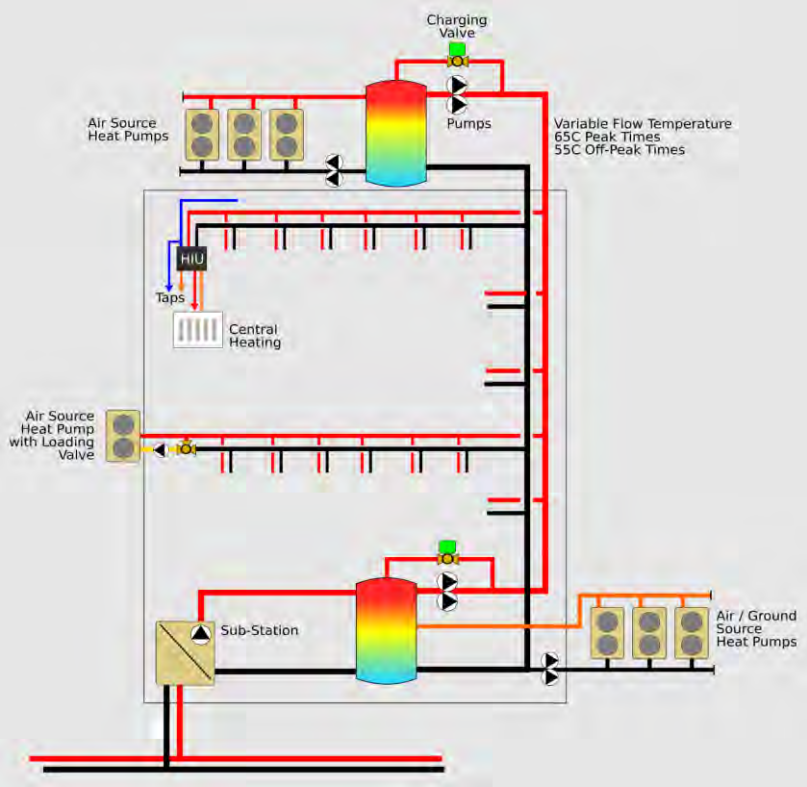
The Broadwater Farm Estate, as per the planning approved scheme, will have a communal Energy Centre within the Northolt parcel. The scheme will eventually connect to this Energy Centre.

Tangmere

In the interim, an on-site communal heat network is proposed. This will be via ASHPs.

Benefits of this system are:

- The system use air-source heat technology to deliver efficient heating solutions. By extracting heat from the external air, even in colder temperatures, the system ensures a renewable approach to heating with a seasonal coefficient of performance of around 3. This efficiency will be maximised by minimising flow and return temperatures, thereby reducing heat losses and improving overall system efficacy.
- The inclusion of a buffer vessel aids in managing peak heating demand. It stores excess heat, which can be utilised during times of high demand, ensuring consistent heating with appropriate on-site heating capacity.
- A central system means that maintenance and servicing are centralised. This reduces the burden on individual residents and with the correct management arrangements will ensure the system is kept working at optimum efficiency.



Communal ASHP System Details – Energy Centre	
Dwellings to be Connected	All
Hot Water	Yes
SCOP	2.7
Fraction of Heat	100%
Energy Centre Location	Roof
Table: Proposed ASHP Specification	

4.2 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	108.15 kWp
Module Output	515 watts (monocrystalline)
Number of Panels	210
Tilt of Collectors & Orientation	10 degrees
Inverter Scenario	Landlords Supply
Table: Proposed PV Specification	

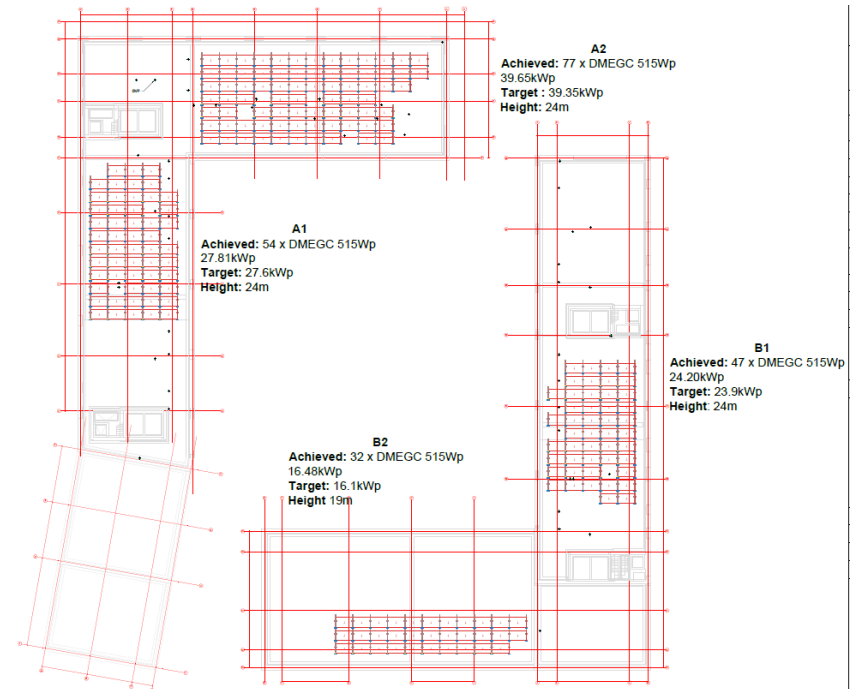


Figure: PV Layout (full drawing in Appendices)

5 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.

5.1 Planning Stage - Carbon Offset – Overall Broadwater Farm Site

The carbon offset from the XCO2 report is not quantified but instead discussed as:

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

5.2 Construction Stage – Carbon Offset – Tangmere – 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)	43.2 tonnes per annum
Price per Tonne (b)	£95
Development Lifespan (c)	30 years
Calculation	A x (B x C) = D
CO₂ Offsetting Contribution (d)	£123,079
Table : Carbon Offsetting – ASHP Scenario	

6 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 achieve Passivhaus.
- LED Lighting with high luminous efficacy (lm/W) will be provided to all fittings.
- A Mechanical Ventilation with Heat Recovery unit 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*)

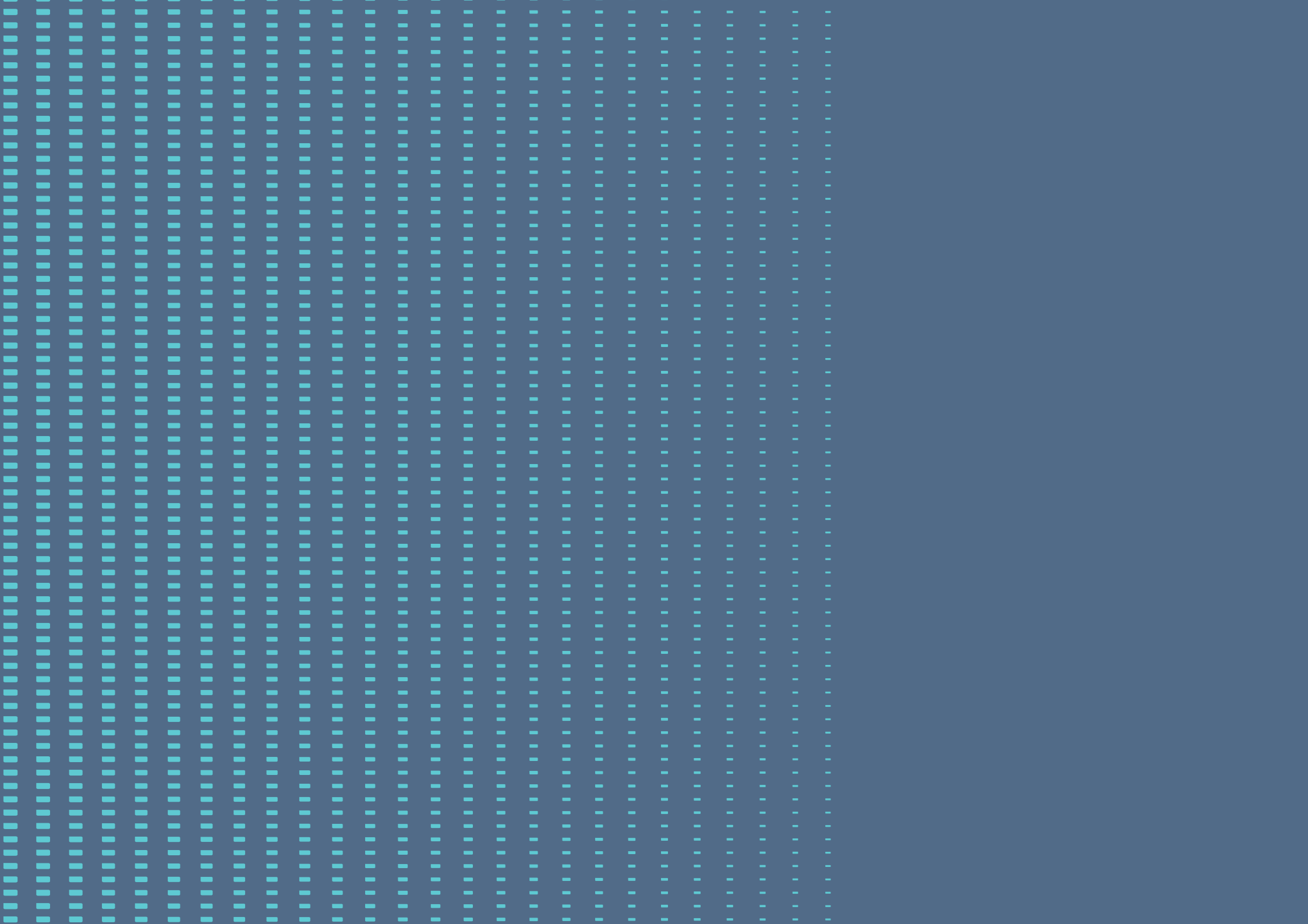
A feasibility on renewable technologies has been undertaken and the following systems are proposed for the scheme:

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

The scheme achieves 74% better than Part L 2013 (via SAP 10) and thus complies with the requirements of the Planning Condition. This is an improvement on the previous Energy Statement as the scheme is now 100% ASHP rather than 80% previously.

As per the CO₂ emissions shown on this page, the proposed scheme is a highly-sustainable and almost net-zero 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	Commercial	Total
Baseline: Part L 2013 (SAP 10)	165.4	3.7	169.1
<i>Be Lean</i> : Use Less Energy	130.7	2.2	132.9
CO ₂ Savings at <i>Be Lean</i>	21%	41%	21%
<i>Be Clean</i> : Supply Energy Efficiently	130.7	2.2	132.9
<i>Be Green</i> : Use Renewable Energy	41.8	1.3	43.2
Total CO ₂ Savings – Part L 2013 (SAP 10)	75%	64%	74%
Table: Carbon Emissions Table - Tangmere			



Appendix 1



SAP 10.0 Performance

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

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	165.4	
After energy demand reduction (be lean)	130.7	
After heat network connection (be clean)	130.7	
After renewable energy (be green)	41.8	

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	34.7	21%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	88.9	54%
Cumulative on site savings	123.5	75%
Annual savings from off-set payment	41.8	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	1,255	-
Cash in-lieu contribution (£)	119,251	

*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

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	3.7	
After energy demand reduction (be lean)	2.2	
After heat network connection (be clean)	2.2	
After renewable energy (be green)	1.3	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	1.5	41%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.8	23%
Total Cumulative Savings	2.4	64%
Annual savings from off-set payment	1.3	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	40	-
Cash in-lieu contribution (£)*	3,828	

Appendix 2



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT03			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type FT03		
Property	B0.04, Tangmere, London, N17				
SAP Rating	86 B	DER	14.07	TER	16.66
Environmental	89 B	% DER<TER	15.56		
CO ₂ Emissions (t/year)	1.05	DFEE	41.88	TFEE	50.45
General Requirements Compliance	Pass	% DFEE<TFEE	16.99		
Assessor Details	Mr. Neil Rothern, Neil Rothern, 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

Ground-floor flat, total floor area 97 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) 16.66 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.07 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)41.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.95 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.47
Maximum	1.5 OK
MVHR efficiency:	89%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	Not significant	OK
Based on:		
Overshading:	Average	
Windows facing North:	8.72 m ² , No overhang	
Windows facing South:	3.74 m ² , No overhang	
Air change rate:	6.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Floor U-value	0.09 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 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	97.3000 (1b)	x 2.5000 (2b)	= 243.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 243.2500 (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							2.5000					
Infiltration rate							0.1250	(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) =	0.0969 (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)
	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (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	0.2453	0.2428	0.2404	0.2283	0.2259	0.2138	0.2138	0.2114	0.2186	0.2259	0.2307	0.2356 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			12.4600	0.8687	10.8243		(27)					
Heat Loss Floor 1			97.3000	0.0900	8.7570		(28a)					
External Wall 1	52.5000	14.7100	37.7900	0.1400	5.2906		(29a)					
Total net area of external elements Aum(A, m2)			149.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.5719		(33)					
Party Wall 1			76.5500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							226.6600 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.5682 (36)					
Total fabric heat loss							(33) + (36) = 51.1401 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 19.6881	Feb 19.4937	Mar 19.2993	Apr 18.3272	May 18.1328	Jun 17.1608	Jul 17.1608	Aug 16.9663	Sep 17.5496	Oct 18.1328	Nov 18.5216	Dec 18.9104 (38)
Heat transfer coeff	70.8282	70.6338	70.4394	69.4673	69.2729	68.3009	68.3009	68.1065	68.6897	69.2729	69.6617	70.0506 (39)
Average = Sum(39)m / 12 =	69.4187 (39)											
HLP	Jan 0.7279	Feb 0.7259	Mar 0.7239	Apr 0.7140	May 0.7120	Jun 0.7020	Jul 0.7020	Aug 0.7000	Sep 0.7060	Oct 0.7120	Nov 0.7159	Dec 0.7199 (40)
HLP (average)	0.7135 (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												2.7131 (42)
Average daily hot water use (litres/day)												98.6358 (43)
Daily hot water use	Jan 108.4994	Feb 104.5539	Mar 100.6085	Apr 96.6631	May 92.7176	Jun 88.7722	Jul 88.7722	Aug 92.7176	Sep 96.6631	Oct 100.6085	Nov 104.5539	Dec 108.4994 (44)
Energy conte	160.9014	140.7254	145.2160	126.6028	121.4784	104.8267	97.1373	111.4665	112.7978	131.4549	143.4933	155.8244 (45)
Energy content (annual)												Total = Sum(45)m = 1551.9250 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.1352	21.1088	21.7824	18.9904	18.2218	15.7240	14.5706	16.7200	16.9197	19.7182	21.5240	23.3737 (46)	
Water storage loss:												

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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												
187.8283 165.0464 172.1429 152.6611 148.4053 130.8849 124.0642 138.3933 138.8560 158.3818 169.5515 182.7513 (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												
187.8283 165.0464 172.1429 152.6611 148.4053 130.8849 124.0642 138.3933 138.8560 158.3818 169.5515 182.7513 (64)												
Heat gains from water heating, kWh/month												
75.0412 66.2480 69.8258 62.9420 61.9331 55.7015 53.8396 58.6041 58.3518 65.2502 68.5581 73.3531 (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 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
25.3044 22.4751 18.2780 13.8376 10.3438 8.7327 9.4359 12.2652 16.4623 20.9027 24.3965 26.0076 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
251.8875 254.5013 247.9146 233.8923 216.1916 199.5555 188.4416 185.8278 192.4145 206.4368 224.1374 240.7735 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 (71)												
Water heating gains (Table 5)												
100.8618 98.5834 93.8519 87.4195 83.2434 77.3631 72.3651 78.7689 81.0442 87.7019 95.2196 98.5929 (72)												
Total internal gains												
441.7500 439.2560 423.7407 398.8457 373.4751 349.3476 333.9389 340.5582 353.6173 378.7377 407.4498 429.0704 (73)												

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
North			8.7200	10.6334	0.4000	0.7000	0.7700	17.9920 (74)				
South			3.7400	46.7521	0.4000	0.7000	0.7700	33.9284 (78)				
Solar gains	51.9204	89.9497	129.2075	173.8457	209.7842	215.5632	204.7402	176.3695	144.1866	100.8624	62.4122	44.3163 (83)
Total gains	493.6704	529.2057	552.9482	572.6913	583.2592	564.9108	538.6791	516.9277	497.8039	479.6001	469.8620	473.3867 (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 86.4926 86.7307 86.9700 88.1870 88.4345 89.6931 89.6931 89.9491 89.1854 88.4345 87.9409 87.4528												
alpha 6.7662 6.7820 6.7980 6.8791 6.8956 6.9795 6.9795 6.9966 6.9457 6.8956 6.8627 6.8302												
util living area	0.9984	0.9970	0.9929	0.9761	0.9123	0.7402	0.5537	0.5987	0.8517	0.9789	0.9964	0.9988 (86)
MIT	20.2159	20.3069	20.4627	20.6791	20.8722	20.9783	20.9974	20.9957	20.9429	20.7138	20.4302	20.1985 (87)
Th 2	20.3162	20.3180	20.3197	20.3285	20.3303	20.3391	20.3391	20.3409	20.3356	20.3303	20.3268	20.3232 (88)
util rest of house												
0.9980 0.9961 0.9906 0.9681 0.8839 0.6764 0.4727 0.5167 0.7998 0.9704 0.9952 0.9985 (89)												
MIT 2 19.2480 19.3823 19.6106 19.9287 20.1928 20.3225 20.3379 20.3387 20.2851 19.9818 19.5694 19.2281 (90)												
Living area fraction												
fLA = Living area / (4) =												
MIT 19.6459 19.7624 19.9609 20.2372 20.4721 20.5921 20.6090 20.6088 20.5555 20.2827 19.9233 19.6271 (92)												
Temperature adjustment												0.0000
adjusted MIT 19.6459 19.7624 19.9609 20.2372 20.4721 20.5921 20.6090 20.6088 20.5555 20.2827 19.9233 19.6271 (93)												

8. Space heating requirement

Utilisation	0.9974	0.9952	0.9892	0.9668	0.8905	0.7017	0.5061	0.5505	0.8183	0.9697	0.9942	0.9980 (94)
Useful gains	492.3755	526.6728	546.9635	553.6899	519.3999	396.3933	272.6157	284.5620	407.3457	465.0458	467.1350	472.4380 (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												
1086.9251 1049.7905 948.1769 787.5633 607.6676 409.2678 273.8181 286.6433 443.4281 670.7516 893.2920 1080.6751 (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												
442.3449 351.5351 298.5028 168.3889 65.6711 0.0000 0.0000 0.0000 0.0000 153.0452 306.8330 452.5284 (98)												
Space heating												2238.8493 (98)
Space heating per m2												(98) / (4) = 23.0098 (99)

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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	2238.8493	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2350.7918	(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	1868.9670	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1962.4153	(310a)
Electricity used for heat distribution	43.1321	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	174.3494	(330a)
Total electricity for the above, kWh/year	174.3494	(331)
Electricity for lighting (calculated in Appendix L)	446.8828	(332)
Total delivered energy for all uses	4934.4394	(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			91.0000 (367a)
Space heating from Boilers	4739.7880	0.2160	1023.7942 (367)
Electrical energy for heat distribution	43.1321	0.5190	22.3855 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1046.1798 (373)
Space and water heating			1046.1798 (376)
Pumps and fans	174.3494	0.5190	90.4874 (378)
Energy for lighting	446.8828	0.5190	231.9322 (379)
Total CO2, kg/year			1368.5993 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.0700 (384)

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

DER	14.0700	ZC1
Total Floor Area	97.3000	TFA
Assumed number of occupants	2.7131	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	15.3405	ZC2
CO2 emissions from cooking, equation (L16)	1.8922	ZC3
Total CO2 emissions	31.3027	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	31.3027	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	97.3000 (1b)	x 2.5000 (2b)	= 243.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 243.2500 (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) = 0.1233 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3733 (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) = 0.2893 (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	0.3689	0.3617	0.3544	0.3183	0.3110	0.2749	0.2749	0.2676	0.2893	0.3110	0.3255	0.3400 (22b)
	0.5680	0.5654	0.5628	0.5506	0.5484	0.5378	0.5378	0.5358	0.5419	0.5484	0.5530	0.5578 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			12.4600	1.3258	16.5189		(27)					
Heat Loss Floor 1			97.3000	0.1300	12.6490		(28a)					
External Wall 1	52.5000	14.7100	37.7900	0.1800	6.8022		(29a)					
Total net area of external elements Aum(A, m2)			149.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.2201		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.2350 (36)					
Total fabric heat loss							(33) + (36) = 55.4551 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 45.5982	Feb 45.3861	Mar 45.1782	Apr 44.2017	May 44.0190	Jun 43.1686	Jul 43.1686	Aug 43.0111	Sep 43.4961	Oct 44.0190	Nov 44.3886	Dec 44.7750 (38)
Heat transfer coeff	101.0533	100.8412	100.6333	99.6569	99.4742	98.6237	98.6237	98.4662	98.9513	99.4742	99.8438	100.2301 (39)
Average = Sum(39)m / 12 =												99.6560 (39)
HLP	Jan 1.0386	Feb 1.0364	Mar 1.0343	Apr 1.0242	May 1.0223	Jun 1.0136	Jul 1.0136	Aug 1.0120	Sep 1.0170	Oct 1.0223	Nov 1.0261	Dec 1.0301 (40)
HLP (average)												1.0242 (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												2.7131 (42)
Average daily hot water use (litres/day)												98.6358 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	108.4994	104.5539	100.6085	96.6631	92.7176	88.7722	88.7722	92.7176	96.6631	100.6085	104.5539	108.4994 (44)
Energy conte	160.9014	140.7254	145.2160	126.6028	121.4784	104.8267	97.1373	111.4665	112.7978	131.4549	143.4933	155.8244 (45)
Energy content (annual)										Total = Sum(45)m =		1551.9250 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.1352	21.1088	21.7824	18.9904	18.2218	15.7240	14.5706	16.7200	16.9197	19.7182	21.5240	23.3737 (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												

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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	187.7353	164.9625	172.0499	152.5711	148.3123	130.7949	123.9712	138.3004	138.7660	158.2888	169.4616	182.6583 (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	187.7353	164.9625	172.0499	152.5711	148.3123	130.7949	123.9712	138.3004	138.7660	158.2888	169.4616	182.6583 (64)
	74.9668	66.1808	69.7514	62.8701	61.8587	55.6295	53.7653	58.5297	58.2799	65.1759	68.4861	73.2787 (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	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5687	21.8217	17.7466	13.4353	10.0430	8.4788	9.1616	11.9086	15.9837	20.2950	23.6872	25.2515	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	251.8875	254.5013	247.9146	233.8923	216.1916	199.5555	188.4416	185.8278	192.4145	206.4368	224.1374	240.7735	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	(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)	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	(71)
Water heating gains (Table 5)	100.7619	98.4834	93.7519	87.3195	83.1434	77.2632	72.2651	78.6690	80.9443	87.6020	95.1196	98.4929	(72)
Total internal gains	443.9143	441.5026	426.1094	401.3434	376.0744	351.9937	336.5646	343.1016	356.0387	381.0300	409.6406	431.2142	(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					8.7200	10.6334	0.6300	0.7000	0.7700		28.3374	
South					3.7400	46.7521	0.6300	0.7000	0.7700		53.4373 (74)	
Solar gains	81.7747	141.6707	203.5017	273.8069	330.4101	339.5120	322.4658	277.7819	227.0939	158.8583	98.2992	69.7982 (83)
Total gains	525.6890	583.1733	629.6111	675.1503	706.4845	691.5057	659.0304	620.8836	583.1326	539.8883	507.9398	501.0124 (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	66.8651	67.0058	67.1442	67.8021	67.9266	68.5124	68.5124	68.6220	68.2856	67.9266	67.6752	67.4143	
alpha	5.4577	5.4671	5.4763	5.5201	5.5284	5.5675	5.5675	5.5748	5.5524	5.5284	5.5117	5.4943	
util living area	0.9988	0.9976	0.9943	0.9817	0.9357	0.8065	0.6350	0.6906	0.9057	0.9867	0.9975	0.9991	(86)
MIT	19.8547	19.9732	20.1785	20.4635	20.7391	20.9273	20.9847	20.9761	20.8470	20.5041	20.1299	19.8324	(87)
Th 2	20.0513	20.0531	20.0549	20.0632	20.0648	20.0720	20.0720	20.0734	20.0692	20.0648	20.0616	20.0583	(88)
util rest of house	0.9984	0.9968	0.9921	0.9740	0.9069	0.7268	0.5130	0.5702	0.8528	0.9797	0.9965	0.9988	(89)
MIT 2	18.5118	18.6864	18.9871	19.4051	19.7878	20.0183	20.0657	20.0623	19.9339	19.4677	18.9219	18.4843	(90)
Living area fraction	19.0639	19.2154	19.4769	19.8402	20.1789	20.3920	20.4435	20.4379	20.3093	19.8937	19.4185	19.0385	(92)
Temperature adjustment	19.0639	19.2154	19.4769	19.8402	20.1789	20.3920	20.4435	20.4379	20.3093	19.8937	19.4185	19.0385	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9978	0.9958	0.9904	0.9717	0.9111	0.7567	0.5636	0.6201	0.8686	0.9781	0.9955	0.9983	(94)
Ext temp.	524.5404	580.7174	623.5568	656.0677	643.6468	523.2604	371.4519	385.0101	506.5220	528.0538	505.6543	500.1700	(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	1491.9378	1443.5843	1305.9042	1090.2663	843.4290	571.2239	379.0597	397.6005	614.4177	924.4864	1229.9257	1487.2642	(97)
Space heating kWh	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	719.7437	579.8466	507.6665	312.6230	148.6379	0.0000	0.0000	0.0000	0.0000	294.9458	521.4754	734.3981	(98)
Space heating per m2												3819.3370	(98)
												39.2532	(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													4084.8525 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	719.7437	579.8466	507.6665	312.6230	148.6379	0.0000	0.0000	0.0000	0.0000	294.9458	521.4754	734.3981	(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)	769.7793	620.1568	542.9588	334.3562	158.9710	0.0000	0.0000	0.0000	0.0000	315.4501	557.7277	785.4525	(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	187.7353	164.9625	172.0499	152.5711	148.3123	130.7949	123.9712	138.3004	138.7660	158.2888	169.4616	182.6583	(64)
Efficiency of water heater (217)m	88.0574	87.8899	87.5293	86.6878	84.8197	79.8000	79.8000	79.8000	79.8000	86.4516	87.6186	88.1459	(216)
Fuel for water heating, kWh/month	213.1966	187.6922	196.5627	176.0007	174.8560	163.9034	155.3524	173.3087	173.8923	183.0952	193.4083	207.2227	(219)
Water heating fuel used												2198.4912	(219)
Annual totals kWh/year													
Space heating fuel - main system												4084.8525	(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)												433.8902	(232)
Total delivered energy for all uses												6792.2339	(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	4084.8525	0.2160	882.3281 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2198.4912	0.2160	474.8741 (264)
Space and water heating			1357.2022 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	433.8902	0.5190	225.1890 (268)
Total CO2, kg/m2/year			1621.3163 (272)
Emissions per m2 for space and water heating			13.9486 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3144 (272b)
Emissions per m2 for pumps and fans			0.4001 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9486 * 1.00) + 2.3144 + 0.4001, rounded to 2 d.p.			16.6600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT04			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type FT04		
Property	A201, Tangmere, London, N17				
SAP Rating	87 B	DER	11.31	TER	14.07
Environmental	91 B	% DER<TER	19.60		
CO ₂ Emissions (t/year)	0.84	DFEE	28.90	TFEE	37.57
General Requirements Compliance	Pass	% DFEE<TFEE	23.07		
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 90 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) 14.07 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.31 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 37.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 28.9 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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: 2.50 (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, 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: 0.54
Maximum 1.5 OK
MVHR efficiency: 88%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing East: 3.12 m², No overhang
Windows facing South: 7.14 m², No overhang
Windows facing West: 7.48 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Air permeability 2.5 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	89.7000 (1b)	x 2.5000 (2b)	= 224.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 224.2500 (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							2.5000					
Infiltration rate							0.1250	(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) =	0.1063 (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	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (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) =												74.8000 (23c)
Effective ac	0.2615	0.2588	0.2562	0.2429	0.2402	0.2269	0.2269	0.2243	0.2323	0.2402	0.2455	0.2508 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			17.7400	0.8687	15.4112		(27)					
External Wall 1	85.5000	19.9900	65.5100	0.1400	9.1714		(29a)					
Total net area of external elements Aum(A, m2)			85.5000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2826		(33)					
Party Wall 1			29.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							215.1000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1386 (36)					
Total fabric heat loss							(33) + (36) = 35.4212 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	19.3493	19.1528	18.9562	17.9734	17.7768	16.7939	16.7939	16.5974	17.1871	17.7768	18.1699	18.5631 (38)
Heat transfer coeff	54.7705	54.5740	54.3774	53.3946	53.1980	52.2151	52.2151	52.0186	52.6083	53.1980	53.5911	53.9843 (39)
Average = Sum(39)m / 12 =												53.3454 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6106	0.6084	0.6062	0.5953	0.5931	0.5821	0.5821	0.5799	0.5865	0.5931	0.5974	0.6018 (40)
HLP (average)												0.5947 (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												2.6216 (42)
Average daily hot water use (litres/day)												96.4628 (43)
Daily hot water use	Jan 106.1091	Feb 102.2506	Mar 98.3921	Apr 94.5336	May 90.6750	Jun 86.8165	Jul 86.8165	Aug 90.6750	Sep 94.5336	Oct 98.3921	Nov 102.2506	Dec 106.1091 (44)
Energy conte	157.3567	137.6252	142.0169	123.8137	118.8022	102.5173	94.9973	109.0108	110.3128	128.5589	140.3321	152.3916 (45)
Energy content (annual)												Total = Sum(45)m = 1517.7356 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.6035	20.6438	21.3025	18.5721	17.8203	15.3776	14.2496	16.3516	16.5469	19.2838	21.0498	22.8587 (46)
Water storage loss:												
Store volume												1.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 (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 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month											
Solar input	184.2836	161.9462	168.9437	149.8720	145.7291	128.5755	121.9242	135.9377	136.3710	155.4858	179.3184 (62)
	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											
	184.2836	161.9462	168.9437	149.8720	145.7291	128.5755	121.9242	135.9377	136.3710	155.4858	179.3184 (64)
Heat gains from water heating, kWh/month											Total per year (kWh/year) = Sum(64)m = 1834.7776 (64)
	73.8626	65.2172	68.7621	62.0147	61.0432	54.9336	53.1281	57.7876	57.5256	64.2873	72.2117 (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	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.8625	19.4180	15.7918	11.9554	8.9368	7.5448	8.1525	10.5969	14.2231	18.0595	21.0781	22.4701 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.5247	240.9999	234.7626	221.4842	204.7226	188.9690	178.4447	175.9695	182.2068	195.4852	212.2468	228.0004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080 (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)	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637 (71)
Water heating gains (Table 5)	99.2777	97.0494	92.4222	86.1315	82.0473	76.2967	71.4087	77.6715	79.8967	86.4077	93.7597	97.0587 (72)
Total internal gains	421.9887	419.7912	405.3005	381.8950	358.0306	335.1344	320.3297	326.5618	338.6504	362.2763	389.4086	409.8531 (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				3.1200	19.6403	0.4000	0.7000	0.7700		11.8903 (76)		
South				7.1400	46.7521	0.4000	0.7000	0.7700		64.7724 (78)		
West				7.4800	19.6403	0.4000	0.7000	0.7700		28.5063 (80)		
Solar gains	105.1690	185.1048	265.2695	342.5277	391.7594	391.2775	376.3442	340.0572	292.5171	208.1868	127.1472	89.1895 (83)
Total gains	527.1578	604.8960	670.5700	724.4226	749.7900	726.4119	696.6739	666.6190	631.1676	570.4631	516.5558	499.0426 (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	97.8551	98.2075	98.5625	100.3768	100.7477	102.6441	102.6441	103.0320	101.8770	100.7477	100.0086	99.2803
alpha	7.5237	7.5472	7.5708	7.6918	7.7165	7.8429	7.8429	7.8688	7.7918	7.7165	7.6672	7.6187
util living area	0.9932	0.9806	0.9415	0.8284	0.6505	0.4595	0.3297	0.3589	0.5718	0.8713	0.9807	0.9952 (86)
MIT	20.4826	20.6221	20.7919	20.9390	20.9907	20.9995	21.0000	20.9999	20.9972	20.9253	20.6837	20.4561 (87)
Th 2	20.4205	20.4224	20.4244	20.4343	20.4362	20.4461	20.4461	20.4481	20.4422	20.4362	20.4323	20.4284 (88)
util rest of house												
	0.9916	0.9761	0.9295	0.8018	0.6139	0.4200	0.2883	0.3159	0.5269	0.8436	0.9755	0.9940 (89)
MIT 2	19.7225	19.9249	20.1647	20.3662	20.4275	20.4457	20.4461	20.4481	20.4400	20.3545	20.0230	19.6905 (90)
Living area fraction												
	fLA = Living area / (4) =											
MIT	19.9852	20.1658	20.3815	20.5641	20.6222	20.6371	20.6375	20.6388	20.6326	20.5517	20.2513	19.9551 (92)
Temperature adjustment												
	adjusted MIT											
	19.9852	20.1658	20.3815	20.5641	20.6222	20.6371	20.6375	20.6388	20.6326	20.5517	20.2513	19.9551 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9900	0.9738	0.9285	0.8081	0.6261	0.4336	0.3026	0.3307	0.5423	0.8496	0.9736	0.9928 (94)
Useful gains	521.9094	589.0767	622.6416	585.4414	469.4312	314.9723	210.8073	220.4717	342.2893	484.6644	502.8931	495.4563 (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												
	859.0861	833.1173	754.8401	622.8013	474.6413	315.2283	210.8198	220.4961	343.6686	529.4126	704.7947	850.5279 (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												
	250.8595	163.9953	98.3557	26.8991	3.8763	0.0000	0.0000	0.0000	0.0000	33.2927	145.3691	264.1733 (98)
Space heating												
	(98) / (4) =											
Space heating per m2	11.0013 (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	986.8209	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1036.1619	(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	1834.7776	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1926.5164	(310a)
Electricity used for heat distribution	29.6268	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	184.6699	(330a)
Total electricity for the above, kWh/year	184.6699	(331)
Electricity for lighting (calculated in Appendix L)	386.0978	(332)
Total delivered energy for all uses	3533.4461	(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			91.0000 (367a)
Space heating from Boilers	3255.6905	0.2160	703.2292 (367)
Electrical energy for heat distribution	29.6268	0.5190	15.3763 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			718.6055 (373)
Space and water heating			718.6055 (376)
Pumps and fans	184.6699	0.5190	95.8437 (378)
Energy for lighting	386.0978	0.5190	200.3848 (379)
Total CO2, kg/year			1014.8339 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.3100 (384)

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

DER		11.3100	ZC1
Total Floor Area	TFA	89.7000	
Assumed number of occupants	N	2.6216	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.7575	ZC2
CO2 emissions from cooking, equation (L16)		2.0281	ZC3
Total CO2 emissions		29.0956	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		29.0956	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	89.7000 (1b)	x 2.5000 (2b)	= 224.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 224.2500 (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) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1338 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3838 (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) =				0.3262 (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	0.4159	0.4078	0.3996	0.3588	0.3507	0.3099	0.3099	0.3017	0.3262	0.3507	0.3670	0.3833 (22b)
	0.5865	0.5831	0.5798	0.5644	0.5615	0.5480	0.5480	0.5455	0.5532	0.5615	0.5673	0.5735 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			17.7400	1.3258	23.5189		(27)					
External Wall 1	85.5000	19.9900	65.5100	0.1800	11.7918		(29a)					
Total net area of external elements Aum(A, m2)			85.5000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	37.5607		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5950 (36)					
Total fabric heat loss						(33) + (36) =	44.1557 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.4021	Feb 43.1535	Mar 42.9099	Apr 41.7656	May 41.5515	Jun 40.5548	Jul 40.5548	Aug 40.3702	Sep 40.9387	Oct 41.5515	Nov 41.9846	Dec 42.4374 (38)
Heat transfer coeff	87.5578	87.3093	87.0657	85.9213	85.7072	84.7106	84.7106	84.5260	85.0945	85.7072	86.1403	86.5932 (39)
Average = Sum(39)m / 12 =												85.9203 (39)
HLP	Jan 0.9761	Feb 0.9733	Mar 0.9706	Apr 0.9579	May 0.9555	Jun 0.9444	Jul 0.9444	Aug 0.9423	Sep 0.9487	Oct 0.9555	Nov 0.9603	Dec 0.9654 (40)
HLP (average)												0.9579 (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												2.6216 (42)
Average daily hot water use (litres/day)												96.4628 (43)
Daily hot water use	Jan 106.1091	Feb 102.2506	Mar 98.3921	Apr 94.5336	May 90.6750	Jun 86.8165	Jul 86.8165	Aug 90.6750	Sep 94.5336	Oct 98.3921	Nov 102.2506	Dec 106.1091 (44)
Energy conte	157.3567	137.6252	142.0169	123.8137	118.8022	102.5173	94.9973	109.0108	110.3128	128.5589	140.3321	152.3916 (45)
Energy content (annual)												Total = Sum(45)m = 1517.7356 (45)
Distribution loss (46)m = 0.15 x (45)m	23.6035	20.6438	21.3025	18.5721	17.8203	15.3776	14.2496	16.3516	16.5469	19.2838	21.0498	22.8587 (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	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)

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 (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	184.1906	161.8622	168.8507	149.7820	145.6361	128.4856	121.8312	135.8447	136.2810	155.3928	166.3004	179.2255 (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	184.1906	161.8622	168.8507	149.7820	145.6361	128.4856	121.8312	135.8447	136.2810	155.3928	166.3004	179.2255 (64)
Heat gains from water heating, kWh/month	73.7882	65.1500	68.6877	61.9427	60.9688	54.8616	53.0537	57.7132	57.4536	64.2129	67.4350	72.1373 (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	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4404	19.0431	15.4869	11.7246	8.7643	7.3992	7.9951	10.3923	13.9485	17.7108	20.6711	22.0362 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.5247	240.9999	234.7626	221.4842	204.7226	188.9690	178.4447	175.9695	182.2068	195.4852	212.2468	228.0004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080 (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)	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637 (71)
Water heating gains (Table 5)	99.1777	96.9494	92.3222	86.0315	81.9474	76.1967	71.3088	77.5715	79.7967	86.3077	93.6598	96.9587 (72)
Total internal gains	424.4667	422.3163	407.8956	384.5642	360.7581	337.8887	323.0724	329.2572	341.2759	364.8276	391.9016	412.3193 (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	3.1200	19.6403	0.6300	0.7000	0.7700	18.7272 (76)
South	7.1400	46.7521	0.6300	0.7000	0.7700	102.0166 (78)
West	7.4800	19.6403	0.6300	0.7000	0.7700	44.8974 (80)

Solar gains	165.6412	291.5401	417.7995	539.4811	617.0211	616.2621	592.7421	535.5901	460.7145	327.8942	200.2568	140.4735 (83)
Total gains	590.1079	713.8564	825.6951	924.0452	977.7792	954.1508	915.8144	864.8473	801.9904	692.7218	592.1585	552.7928 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	71.1434	71.3460	71.5456	72.4985	72.6796	73.5347	73.5347	73.6953	73.2030	72.6796	72.3142	71.9360
alpha	5.7429	5.7564	5.7697	5.8332	5.8453	5.9023	5.9023	5.9130	5.8802	5.8453	5.8209	5.7957
util living area	0.9967	0.9899	0.9684	0.8989	0.7546	0.5593	0.4058	0.4474	0.6966	0.9379	0.9915	0.9977 (86)
MIT	20.0550	20.2438	20.4990	20.7732	20.9357	20.9908	20.9988	20.9979	20.9691	20.7377	20.3383	20.0214 (87)
Th 2	20.1033	20.1056	20.1079	20.1186	20.1206	20.1299	20.1299	20.1317	20.1263	20.1206	20.1165	20.1123 (88)
util rest of house	0.9957	0.9868	0.9587	0.8711	0.7007	0.4872	0.3262	0.3641	0.6220	0.9140	0.9884	0.9970 (89)
MIT 2	18.8425	19.1182	19.4845	19.8659	20.0624	20.1242	20.1295	20.1309	20.1041	19.8299	19.2652	18.8003 (90)
Living area fraction	19.2615	19.5072	19.8351	20.1795	20.3642	20.4237	20.4299	20.4305	20.4030	20.1436	19.6361	19.2223 (92)
Temperature adjustment	19.2615	19.5072	19.8351	20.1795	20.3642	20.4237	20.4299	20.4305	20.4030	20.1436	19.6361	19.2223 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9943	0.9841	0.9551	0.8732	0.7163	0.5119	0.3538	0.3930	0.6466	0.9147	0.9861	0.9960 (94)
Ext temp.	586.7663	702.4982	788.6334	806.8723	700.4064	488.4209	323.9773	339.8452	518.5547	633.6249	583.9239	550.5565 (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	1309.9977	1275.3468	1161.0318	969.1469	742.5842	493.3271	324.4360	340.6832	536.3518	817.9564	1079.8598	1300.8313 (97)
Space heating kWh	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 per m2	538.0841	384.9543	277.0645	116.8378	31.3802	0.0000	0.0000	0.0000	0.0000	137.1427	357.0738	558.2044 (98)
												2400.7418 (98)
												26.7641 (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													2567.6383 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	538.0841	384.9543	277.0645	116.8378	31.3802	0.0000	0.0000	0.0000	0.0000	137.1427	357.0738	558.2044	(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)	575.4911	411.7158	296.3256	124.9602	33.5617	0.0000	0.0000	0.0000	0.0000	146.6766	381.8972	597.0101	(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	184.1906	161.8622	168.8507	149.7820	145.6361	128.4856	121.8312	135.8447	136.2810	155.3928	166.3004	179.2255	(64)
Efficiency of water heater (217)m	87.5078	87.0451	86.1271	84.1605	81.5084	79.8000	79.8000	79.8000	79.8000	84.4827	86.8018	87.6438	(216)
Fuel for water heating, kWh/month	210.4848	185.9521	196.0484	177.9719	178.6763	161.0095	152.6707	170.2315	170.7783	183.9344	191.5863	204.4929	(219)
Water heating fuel used												2183.8370	(219)
Annual totals kWh/year													
Space heating fuel - main system												2567.6383	(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)												378.6434	(232)
Total delivered energy for all uses												5205.1187	(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	2567.6383	0.2160	554.6099 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2183.8370	0.2160	471.7088 (264)
Space and water heating			1026.3187 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.6434	0.5190	196.5159 (268)
Total CO2, kg/m2/year			1261.7596 (272)
Emissions per m2 for space and water heating			11.4417 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1908 (272b)
Emissions per m2 for pumps and fans			0.4339 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.4417 * 1.00) + 2.1908 + 0.4339, rounded to 2 d.p.			14.0700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT05			Issued on Date	20/03/2026
Assessment Reference	Be lean	Prop Type Ref	Flat Type FT05		
Property	A202, Tangmere, London, N17				
SAP Rating	87 B	DER	11.75	TER	13.94
Environmental	90 B	% DER<TER	15.71		
CO ₂ Emissions (t/year)	1.06	DFEE	35.31	TFEE	42.03
General Requirements Compliance	Pass	% DFEE<TFEE	15.99		
Assessor Details	Mr. Neil Rothern, Neil Rothern, 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 116 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) 13.94 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.75 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)35.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	1.89 m ² , No overhang
Windows facing East:	3.38 m ² , No overhang
Windows facing South:	1.89 m ² , No overhang
Windows facing West:	12.41 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 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	115.6000 (1b)	x 2.5000 (2b)	= 289.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 289.0000 (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					2.5000
Infiltration rate					0.1250 (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) =				0.1063 (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	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												74.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2615	0.2588	0.2562	0.2429	0.2402	0.2269	0.2269	0.2243	0.2323	0.2402	0.2455	0.2508 (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			2.2500	1.2000	2.7000		(26)
Windows (Uw = 0.90)			19.5700	0.8687	17.0010		(27)
External Wall 1	85.5000	21.8200	63.6800	0.1400	8.9152		(29a)
sheltered	29.3000		29.3000	0.2700	7.9110		(29a)
Total net area of external elements Aum(A, m2)			114.8000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		36.5272		(33)
Party Wall 1			29.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							211.4100 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.2932 (36)
Total fabric heat loss						(33) + (36) =	48.8204 (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	24.9363	24.6829	24.4296	23.1630	22.9097	21.6430	21.6430	21.3897	22.1497	22.9097	23.4163	23.9230 (38)
Heat transfer coeff	73.7566	73.5033	73.2500	71.9834	71.7300	70.4634	70.4634	70.2101	70.9700	71.7300	72.2367	72.7433 (39)
Average = Sum(39)m / 12 =												71.9200 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6380	0.6358	0.6337	0.6227	0.6205	0.6095	0.6095	0.6074	0.6139	0.6205	0.6249	0.6293 (40)
HLP (average)												0.6221 (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	2.8446 (42)
Average daily hot water use (litres/day)	101.7588 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.9347	107.8644	103.7940	99.7237	95.6533	91.5830	91.5830	95.6533	99.7237	103.7940	107.8644	111.9347 (44)
Energy conte	165.9960	145.1811	149.8139	130.6114	125.3248	108.1457	100.2129	114.9958	116.3692	135.6171	148.0367	160.7582 (45)
Energy content (annual)												Total = Sum(45)m = 1601.0629 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.8994	21.7772	22.4721	19.5917	18.7987	16.2219	15.0319	17.2494	17.4554	20.3426	22.2055	24.1137 (46)
Water storage loss:												

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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												
192.9228 169.5022 176.7408 156.6697 152.2516 134.2040 127.1398 141.9226 142.4275 162.5439 174.0949 187.6851 (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												
192.9228 169.5022 176.7408 156.6697 152.2516 134.2040 127.1398 141.9226 142.4275 162.5439 174.0949 187.6851 (64)												
Total per year (kWh/year) = Sum(64)m =												1918.1048 (64)
Heat gains from water heating, kWh/month												
76.7351 67.7295 71.3546 64.2749 63.2120 56.8051 54.8623 59.7776 59.5394 66.6342 70.0688 74.9936 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
26.3976 23.4461 19.0677 14.4355 10.7907 9.1099 9.8436 12.7951 17.1736 21.8058 25.4506 27.1313 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
279.3690 282.2679 274.9626 259.4104 239.7786 221.3275 209.0010 206.1020 213.4073 228.9595 248.5913 267.0425 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 (71)												
Water heating gains (Table 5)												
103.1386 100.7880 95.9067 89.2707 84.9623 78.8959 73.7396 80.3462 82.6936 89.5621 97.3178 100.7978 (72)												
Total internal gains												
474.5740 472.1708 455.6058 428.7853 401.2004 375.0021 358.2530 364.9121 378.9432 405.9961 437.0284 460.6403 (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												
1.8900 10.6334 0.4000 0.7000 0.7700 3.8996 (74)												
East												
3.3800 19.6403 0.4000 0.7000 0.7700 12.8812 (76)												
South												
1.8900 46.7521 0.4000 0.7000 0.7700 17.1456 (78)												
West												
12.4100 19.6403 0.4000 0.7000 0.7700 47.2945 (80)												
Solar gains	81.2209	153.2489	242.2946	343.5039	416.0320	424.5836	404.6951	350.2728	278.0602	178.8385	100.1661	67.5519 (83)
Total gains	555.7949	625.4197	697.9004	772.2892	817.2324	799.5857	762.9481	715.1849	657.0034	584.8346	537.1945	528.1922 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	92.0407	92.3579	92.6773	94.3081	94.6411	96.3424	96.3424	96.6900	95.6546	94.6411	93.9773	93.3228 (85)
alpha	7.1360	7.1572	7.1785	7.2872	7.3094	7.4228	7.4228	7.4460	7.3770	7.3094	7.2652	7.2215
util living area	0.9981	0.9951	0.9826	0.9252	0.7745	0.5605	0.4061	0.4509	0.7216	0.9580	0.9950	0.9987 (86)
MIT	20.2991	20.4188	20.6100	20.8375	20.9645	20.9971	20.9998	20.9995	20.9838	20.8069	20.5124	20.2794 (87)
Th 2	20.3959	20.3978	20.3998	20.4096	20.4116	20.4214	20.4214	20.4234	20.4175	20.4116	20.4077	20.4037 (88)
util rest of house	0.9976	0.9938	0.9781	0.9079	0.7363	0.5112	0.3528	0.3947	0.6689	0.9444	0.9935	0.9983 (89)
MIT 2	19.4365	19.6126	19.8905	20.2158	20.3763	20.4193	20.4213	20.4231	20.4040	20.1810	19.7573	19.4140 (90)
Living area fraction									fLA = Living area / (4) =			0.4491 (91)
MIT	19.8239	19.9747	20.2136	20.4950	20.6405	20.6788	20.6811	20.6820	20.6644	20.4621	20.0964	19.8027 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8239	19.9747	20.2136	20.4950	20.6405	20.6788	20.6811	20.6820	20.6644	20.4621	20.0964	19.8027 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9970 0.9927 0.9765 0.9106 0.7516 0.5333 0.3767 0.4200 0.6918 0.9457 0.9925 0.9979 (94)												
Useful gains	554.1442	620.8320	681.4675	703.2430	614.2200	426.3869	287.4404	300.3646	454.5045	553.0825	533.1742	527.0633 (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												
1144.9930 1108.0395 1004.5230 834.6476 641.3022 428.3306 287.5686 300.6394 465.8742 707.4086 938.8186 1134.9899 (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												
439.5915 327.4035 240.3533 94.6113 20.1492 0.0000 0.0000 0.0000 0.0000 114.8186 292.0640 452.2974 (98)												
Space heating												1981.2888 (98)
Space heating per m2												(98) / (4) = 17.1392 (99)

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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	1981.2888	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2080.3533	(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	1918.1048	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2014.0101	(310a)
Electricity used for heat distribution	40.9436	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	237.9915	(330a)
Total electricity for the above, kWh/year	237.9915	(331)
Electricity for lighting (calculated in Appendix L)	466.1903	(332)
Total delivered energy for all uses	4798.5451	(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			91.0000 (367a)
Space heating from Boilers	4499.3004	0.2160	971.8489 (367)
Electrical energy for heat distribution	40.9436	0.5190	21.2497 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			993.0986 (373)
Space and water heating			993.0986 (376)
Pumps and fans	237.9915	0.5190	123.5176 (378)
Energy for lighting	466.1903	0.5190	241.9527 (379)
Total CO2, kg/year			1358.5690 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.7500 (384)

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

DER		11.7500	ZC1
Total Floor Area	TFA	115.6000	
Assumed number of occupants	N	2.8446	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		14.3208	ZC2
CO2 emissions from cooking, equation (L16)		1.6200	ZC3
Total CO2 emissions		27.6908	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		27.6908	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	115.6000 (1b)	x 2.5000 (2b)	= 289.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 289.0000 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) =	0.1384 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3884 (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) =		0.3301 (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	0.4209	0.4127	0.4044	0.3632	0.3549	0.3136	0.3136	0.3054	0.3301	0.3549	0.3714	0.3879 (22b)
	0.5886	0.5852	0.5818	0.5659	0.5630	0.5492	0.5492	0.5466	0.5545	0.5630	0.5690	0.5752 (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			2.2500	1.0000	2.2500		(26)
TER Opening Type (Uw = 1.40)			19.5700	1.3258	25.9451		(27)
External Wall 1	85.5000	21.8200	63.6800	0.1800	11.4624		(29a)
sheltered	29.3000		29.3000	0.1800	5.2740		(29a)
Total net area of external elements Aum(A, m ²)			114.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9315		(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)							7.8322 (36)
Total fabric heat loss						(33) + (36) =	52.7637 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	56.1342	55.8061	55.4845	53.9740	53.6914	52.3758	52.3758
Heat transfer coeff	108.8979	108.5698	108.2482	106.7377	106.4551	105.1394	105.1394
Average = Sum(39)m / 12 =							
HLP	0.9420	0.9392	0.9364	0.9233	0.9209	0.9095	0.9095
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8446 (42)
Average daily hot water use (litres/day)													101.7588 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	111.9347	107.8644	103.7940	99.7237	95.6533	91.5830	91.5830	95.6533	99.7237	103.7940	107.8644	111.9347	(44)
Energy conte	165.9960	145.1811	149.8139	130.6114	125.3248	108.1457	100.2129	114.9958	116.3692	135.6171	148.0367	160.7582	(45)
Energy content (annual)										Total = Sum(45)m =		1601.0629	(45)
Distribution loss (46)m = 0.15 x (45)m													
	24.8994	21.7772	22.4721	19.5917	18.7987	16.2219	15.0319	17.2494	17.4554	20.3426	22.2055	24.1137	(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													

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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	192.8299	169.4182	176.6478	156.5797	152.1586	134.1140	127.0468	141.8297	142.3375	162.4510	174.0049	187.5921 (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	192.8299	169.4182	176.6478	156.5797	152.1586	134.1140	127.0468	141.8297	142.3375	162.4510	174.0049	187.5921 (64)
	76.6608	67.6624	71.2802	64.2029	63.1376	56.7331	54.7879	59.7032	59.4674	66.5598	69.9968	74.9192 (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	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.7066	22.8324	18.5686	14.0576	10.5082	8.8715	9.5859	12.4602	16.7240	21.2350	24.7844	26.4211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.3690	282.2679	274.9626	259.4104	239.7786	221.3275	209.0010	206.1020	213.4073	228.9595	248.5913	267.0425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	(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)	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	(71)
Water heating gains (Table 5)	103.0387	100.6880	95.8068	89.1707	84.8623	78.7959	73.6397	80.2462	82.5936	89.4621	97.2178	100.6979	(72)
Total internal gains	476.7830	474.4572	458.0067	431.3075	403.8179	377.6636	360.8953	367.4772	381.3937	408.3253	439.2622	462.8302	(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					1.8900	10.6334	0.6300	0.7000	0.7700	6.1419 (74)		
East					3.3800	19.6403	0.6300	0.7000	0.7700	20.2878 (76)		
South					1.8900	46.7521	0.6300	0.7000	0.7700	27.0044 (78)		
West					12.4100	19.6403	0.6300	0.7000	0.7700	74.4888 (80)		

Solar gains	127.9230	241.3670	381.6140	541.0186	655.2504	668.7192	637.3948	551.6797	437.9448	281.6707	157.7616	106.3942 (83)
Total gains	604.7060	715.8241	839.6207	972.3261	1059.0684	1046.3828	998.2902	919.1569	819.3385	689.9960	597.0238	569.2244 (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	73.7184	73.9412	74.1608	75.2103	75.4100	76.3536	76.3536	76.5310	75.9874	75.4100	75.0072	74.5906	
alpha	5.9146	5.9294	5.9441	6.0140	6.0273	6.0902	6.0902	6.1021	6.0658	6.0273	6.0005	5.9727	
util living area	0.9990	0.9970	0.9886	0.9481	0.8272	0.6268	0.4611	0.5200	0.8038	0.9774	0.9975	0.9993	(86)
MIT	19.9745	20.1262	20.3748	20.6867	20.9034	20.9855	20.9980	20.9961	20.9402	20.6331	20.2444	19.9514	(87)
Th 2	20.1319	20.1343	20.1367	20.1477	20.1498	20.1594	20.1594	20.1612	20.1557	20.1498	20.1456	20.1412	(88)
util rest of house	0.9987	0.9960	0.9846	0.9307	0.7793	0.5514	0.3743	0.4278	0.7346	0.9667	0.9965	0.9991	(89)
MIT 2	18.7466	18.9699	19.3326	19.7808	20.0576	20.1500	20.1587	20.1596	20.1086	19.7157	19.1515	18.7197	(90)
Living area fraction	19.2981	19.4892	19.8007	20.1877	20.4375	20.5253	20.5357	20.5353	20.4821	20.1277	19.6424	19.2729	(92)
Temperature adjustment	19.2981	19.4892	19.8007	20.1877	20.4375	20.5253	20.5357	20.5353	20.4821	20.1277	19.6424	19.2729	(93)
adjusted MIT	19.2981	19.4892	19.8007	20.1877	20.4375	20.5253	20.5357	20.5353	20.4821	20.1277	19.6424	19.2729	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	603.6370	712.2747	825.0906	905.8735	843.6078	611.9876	412.6569	431.4225	625.2890	666.8132	594.4503	568.5142	(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	1633.2572	1583.9493	1439.7782	1204.8238	930.1512	622.9786	413.7940	433.7777	674.2485	1014.2771	1342.3682	1622.2142	(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	766.0374	585.7653	457.3276	215.2443	64.3883	0.0000	0.0000	0.0000	0.0000	258.5132	538.5008	783.9528	(98)
Space heating												3669.7297	(98)
Space heating per m2												31.7451	(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													3924.8446 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	766.0374	585.7653	457.3276	215.2443	64.3883	0.0000	0.0000	0.0000	0.0000	258.5132	538.5008	783.9528	(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)	819.2914	626.4870	489.1204	230.2078	68.8645	0.0000	0.0000	0.0000	0.0000	276.4847	575.9367	838.4522	(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	192.8299	169.4182	176.6478	156.5797	152.1586	134.1140	127.0468	141.8297	142.3375	162.4510	174.0049	187.5921	(64)
Efficiency of water heater (217)m	88.1238	87.8572	87.2406	85.6630	82.7076	79.8000	79.8000	79.8000	79.8000	86.0476	87.6305	88.2161	(216)
Fuel for water heating, kWh/month	218.8171	192.8336	202.4834	182.7856	183.9718	168.0627	159.2065	177.7314	178.3678	188.7920	198.5667	212.6507	(219)
Water heating fuel used												2264.2693	(219)
Annual totals kWh/year													
Space heating fuel - main system												3924.8446	(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)												453.9873	(232)
Total delivered energy for all uses												6718.1012	(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	3924.8446	0.2160	847.7664 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2264.2693	0.2160	489.0822 (264)
Space and water heating			1336.8486 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	453.9873	0.5190	235.6194 (268)
Total CO2, kg/m2/year			1611.3930 (272)
Emissions per m2 for space and water heating			11.5644 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0382 (272b)
Emissions per m2 for pumps and fans			0.3367 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.5644 * 1.00) + 2.0382 + 0.3367, rounded to 2 d.p.			13.9400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT06			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type FT06		
Property	A203, Tangmere, London, N17				
SAP Rating	84 B	DER	15.88	TER	17.82
Environmental	90 B	% DER<TER	10.90		
CO ₂ Emissions (t/year)	0.71	DFEE	40.60	TFEE	45.31
General Requirements Compliance	Pass	% DFEE<TFEE	10.40		
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 55 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) 17.82 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.88 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.6 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.95 (max. 2.00)	1.20 (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: 2.50 (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, 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: 0.54
Maximum 1.5 OK
MVHR efficiency: 88%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading: Average
Windows facing North: 2.10 m², No overhang
Windows facing East: 3.38 m², No overhang
Windows facing West: 4.97 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Air permeability 2.5 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	54.9000 (1b)	x 2.5000 (2b)	= 137.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2500 (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					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					2.5000
Infiltration rate					0.1250 (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) =				0.0969 (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	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												74.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2495	0.2471	0.2447	0.2326	0.2301	0.2180	0.2180	0.2156	0.2229	0.2301	0.2350	0.2398 (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			2.2500	1.2000	2.7000		(26)
Windows (Uw = 0.90)			10.4500	0.8687	9.0782		(27)
External Wall 1	41.7600	12.7000	29.0600	0.1400	4.0684		(29a)
sheltered	29.0000		29.0000	0.2700	7.8300		(29a)
Total net area of external elements Aum(A, m ²)			70.7600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.6766	(33)
Party Wall 1			23.7800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							216.8900 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3492 (36)
Total fabric heat loss							(33) + (36) = 32.0258 (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	11.3012	11.1915	11.0818	10.5333	10.4236	9.8752	9.8752	9.7655	10.0946	10.4236	10.6430	10.8624 (38)
Heat transfer coeff	43.3270	43.2173	43.1076	42.5591	42.4494	41.9010	41.9010	41.7913	42.1204	42.4494	42.6688	42.8882 (39)
Average = Sum(39)m / 12 =												42.5317 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7892	0.7872	0.7852	0.7752	0.7732	0.7632	0.7632	0.7612	0.7672	0.7732	0.7772	0.7812 (40)
HLP (average)												0.7747 (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	1.8344 (42)
Average daily hot water use (litres/day)	77.7677 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	85.5445	82.4337	79.3230	76.2123	73.1016	69.9909	69.9909	73.1016	76.2123	79.3230	82.4337	85.5445 (44)
Energy conte	126.8600	110.9525	114.4931	99.8178	95.7776	82.6488	76.5862	87.8838	88.9334	103.6433	113.1348	122.8571 (45)
Energy content (annual)	Total = Sum(45)m =											1223.5885 (45)
Distribution loss (46)m = 0.15 x (45)m	19.0290	16.6429	17.1740	14.9727	14.3666	12.3973	11.4879	13.1826	13.3400	15.5465	16.9702	18.4286 (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												
153.7868 135.2735 141.4199 125.8761 122.7044 108.7070 103.5131 114.8107 114.9917 130.5702 139.1931 149.7839 (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												
153.7868 135.2735 141.4199 125.8761 122.7044 108.7070 103.5131 114.8107 114.9917 130.5702 139.1931 149.7839 (64)												
Heat gains from water heating, kWh/month												
63.7224 56.3485 59.6104 54.0360 53.3875 48.3273 47.0064 50.7629 50.4170 56.0029 58.4639 62.3915 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
14.7604 13.1100 10.6618 8.0717 6.0337 5.0939 5.5041 7.1545 9.6027 12.1928 14.2308 15.1706 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
159.9279 161.5874 157.4054 148.5024 137.2639 126.7014 119.6449 117.9854 122.1674 131.0704 142.3089 152.8714 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 (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)												
-73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 (71)												
Water heating gains (Table 5)												
85.6484 83.8520 80.1215 75.0500 71.7574 67.1213 63.1807 68.2296 70.0236 75.2727 81.1999 83.8595 (72)												
Total internal gains												
310.8531 309.0659 298.7052 282.1405 265.5715 249.4330 238.8461 243.8859 252.3101 269.0524 288.2560 302.4180 (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				2.1000	10.6334	0.4000	0.7000	0.7700	4.3329 (74)			
East				3.3800	19.6403	0.4000	0.7000	0.7700	12.8812 (76)			
West				4.9700	19.6403	0.4000	0.7000	0.7700	18.9407 (80)			
Solar gains	36.1548	70.5307	116.5878	172.1162	213.6821	220.1681	209.0089	177.5390	136.1492	83.7220	45.0233	29.7809 (83)
Total gains	347.0079	379.5966	415.2930	454.2568	479.2536	469.6010	447.8550	421.4249	388.4593	352.7743	333.2793	332.1989 (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)												
tau	76.3398	76.5336	76.7283	77.7171	77.9179	78.9379	78.9379	79.1451	78.5267	77.9179	77.5173	77.1208
alpha	6.0893	6.1022	6.1152	6.1811	6.1945	6.2625	6.2625	6.2763	6.2351	6.1945	6.1678	6.1414
util living area	0.9940	0.9886	0.9709	0.9086	0.7657	0.5636	0.4107	0.4544	0.7130	0.9375	0.9873	0.9953 (86)
MIT	20.2193	20.3387	20.5421	20.7885	20.9424	20.9927	20.9991	20.9984	20.9717	20.7708	20.4541	20.1946 (87)
Th 2	20.2627	20.2644	20.2662	20.2749	20.2766	20.2853	20.2853	20.2871	20.2818	20.2766	20.2731	20.2697 (88)
util rest of house	0.9925	0.9856	0.9633	0.8866	0.7211	0.5037	0.3445	0.3849	0.6510	0.9174	0.9834	0.9941 (89)
MIT 2	19.2140	19.3886	19.6816	20.0284	20.2205	20.2802	20.2849	20.2863	20.2591	20.0125	19.5635	19.1836 (90)
Living area fraction									fLA = Living area / (4) =			0.5035 (91)
MIT	19.7201	19.8669	20.1148	20.4111	20.5840	20.6389	20.6445	20.6448	20.6178	20.3943	20.0119	19.6926 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7201	19.8669	20.1148	20.4111	20.5840	20.6389	20.6445	20.6448	20.6178	20.3943	20.0119	19.6926 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9910	0.9836	0.9614	0.8911	0.7406	0.5336	0.3779	0.4199	0.6808	0.9210	0.9817	0.9929 (94)
Ext temp.	343.8899	373.3890	399.2789	404.7679	354.9576	250.5814	169.2287	176.9458	264.4717	324.9124	327.1827	329.8300 (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	668.1068	646.8305	586.9018	489.9008	377.1193	253.0371	169.4685	177.3966	274.5338	415.7610	550.9341	664.4509 (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	241.2174	183.7527	139.5915	61.2957	16.4883	0.0000	0.0000	0.0000	0.0000	67.5914	161.1011	248.9579 (98)
Space heating per m2												1119.9959 (98)
										(98) / (4) =		20.4007 (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	1119.9959 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1175.9957 (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	1540.6304 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1617.6620 (310a)
Electricity used for heat distribution	27.9366 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	113.0254 (330a)
Total electricity for the above, kWh/year	113.0254 (331)
Electricity for lighting (calculated in Appendix L)	260.6731 (332)
Total delivered energy for all uses	3167.3561 (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			91.0000 (367a)
Space heating from Boilers	3069.9534	0.2160	663.1099 (367)
Electrical energy for heat distribution	27.9366	0.5190	14.4991 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			677.6090 (373)
Space and water heating			677.6090 (376)
Pumps and fans	113.0254	0.5190	58.6602 (378)
Energy for lighting	260.6731	0.5190	135.2893 (379)
Total CO2, kg/year			871.5585 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.8800 (384)

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

DER		15.8800 ZC1
Total Floor Area	TFA	54.9000
Assumed number of occupants	N	1.8344
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.2623 ZC2
CO2 emissions from cooking, equation (L16)		2.9695 ZC3
Total CO2 emissions		36.1118 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		36.1118 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	54.9000 (1b)	x 2.5000 (2b)	= 137.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2500 (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					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) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1457 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3957 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3067 (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												
	0.3910	0.3834	0.3757	0.3374	0.3297	0.2913	0.2913	0.2837	0.3067	0.3297	0.3450	0.3604 (22b)
Effective ac	0.5764	0.5735	0.5706	0.5569	0.5543	0.5424	0.5424	0.5402	0.5470	0.5543	0.5595	0.5649 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			10.4500	1.3258	13.8542		(27)					
External Wall 1	41.7600	12.7000	29.0600	0.1800	5.2308		(29a)					
sheltered	29.0000		29.0000	0.1800	5.2200		(29a)					
Total net area of external elements Aum(A, m2)			70.7600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	26.5550	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2010 (36)					
Total fabric heat loss						(33) + (36) =	31.7560 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	26.1088	25.9743	25.8425	25.2235	25.1077	24.5686	24.5686	24.4687	24.7762	25.1077	25.3420	25.5869 (38)
Heat transfer coeff	57.8648	57.7303	57.5985	56.9795	56.8637	56.3245	56.3245	56.2247	56.5322	56.8637	57.0980	57.3429 (39)
Average = Sum(39)m / 12 =												56.9789 (39)
HLP	1.0540	1.0516	1.0492	1.0379	1.0358	1.0259	1.0259	1.0241	1.0297	1.0358	1.0400	1.0445 (40)
HLP (average)												1.0379 (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												1.8344 (42)
Average daily hot water use (litres/day)												77.7677 (43)
Daily hot water use	85.5445	82.4337	79.3230	76.2123	73.1016	69.9909	69.9909	73.1016	76.2123	79.3230	82.4337	85.5445 (44)
Energy conte	126.8600	110.9525	114.4931	99.8178	95.7776	82.6488	76.5862	87.8838	88.9334	103.6433	113.1348	122.8571 (45)
Energy content (annual)										Total = Sum(45)m =		1223.5885 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.0290	16.6429	17.1740	14.9727	14.3666	12.3973	11.4879	13.1826	13.3400	15.5465	16.9702	18.4286 (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	153.6938	135.1896	141.3269	125.7861	122.6115	108.6170	103.4201	114.7177	114.9017	130.4772	139.1031	149.6910 (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	153.6938	135.1896	141.3269	125.7861	122.6115	108.6170	103.4201	114.7177	114.9017	130.4772	139.1031	149.6910 (64)
	63.6480	56.2814	59.5360	53.9640	53.3131	48.2553	46.9320	50.6885	50.3450	55.9285	58.3919	62.3171 (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	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4431	12.8282	10.4326	7.8981	5.9040	4.9844	5.3858	7.0006	9.3963	11.9307	13.9249	14.8445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.9279	161.5874	157.4054	148.5024	137.2639	126.7014	119.6449	117.9854	122.1674	131.0704	142.3089	152.8714	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	(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)	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)	85.5484	83.7520	80.0216	74.9501	71.6575	67.0213	63.0807	68.1297	69.9236	75.1727	81.0999	83.7595	(72)
Total internal gains	313.4358	311.6841	301.3760	284.8670	268.3418	252.2235	241.6278	246.6321	255.0037	271.6903	290.8501	304.9919	(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					2.1000	10.6334	0.6300	0.7000	0.7700		6.8244 (74)	
East					3.3800	19.6403	0.6300	0.7000	0.7700		20.2878 (76)	
West					4.9700	19.6403	0.6300	0.7000	0.7700		29.8315 (80)	
Solar gains	56.9437	111.0859	183.6258	271.0830	336.5493	346.7647	329.1890	279.6239	214.4349	131.8621	70.9117	46.9049 (83)
Total gains	370.3796	422.7699	485.0018	555.9501	604.8911	598.9882	570.8168	526.2560	469.4386	403.5524	361.7618	351.8967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.8864	66.0398	66.1909	66.9100	67.0463	67.6881	67.6881	67.8083	67.4395	67.0463	66.7712	66.4860	
alpha	5.3924	5.4027	5.4127	5.4607	5.4698	5.5125	5.5125	5.5206	5.4960	5.4698	5.4514	5.4324	
util living area	0.9965	0.9922	0.9772	0.9204	0.7835	0.5867	0.4317	0.4865	0.7584	0.9571	0.9924	0.9973 (86)	
MIT	19.9601	20.1117	20.3705	20.6896	20.9041	20.9841	20.9975	20.9954	20.9404	20.6416	20.2413	19.9318 (87)	
Th 2	20.0386	20.0406	20.0426	20.0519	20.0536	20.0618	20.0618	20.0633	20.0586	20.0536	20.0501	20.0464 (88)	
util rest of house	0.9953	0.9897	0.9697	0.8957	0.7284	0.5072	0.3410	0.3900	0.6806	0.9384	0.9895	0.9965 (89)	
MIT 2	18.6563	18.8781	19.2520	19.7003	19.9656	20.0519	20.0609	20.0615	20.0142	19.6471	19.0748	18.6209 (90)	
Living area fraction									fLA = Living area / (4) =			0.5035 (91)	
MIT	19.3127	19.4991	19.8151	20.1984	20.4381	20.5212	20.5324	20.5317	20.4805	20.1478	19.6621	19.2809 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3127	19.4991	19.8151	20.1984	20.4381	20.5212	20.5324	20.5317	20.4805	20.1478	19.6621	19.2809 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9942	0.9879	0.9675	0.9000	0.7520	0.5468	0.3867	0.4387	0.7173	0.9406	0.9880	0.9955 (94)
Useful gains	368.2280	417.6395	469.2421	500.3468	454.8551	327.5196	220.7575	230.8735	336.7405	379.5907	357.4129	350.3134 (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	868.7062	842.8132	766.9296	643.7753	496.8811	333.5110	221.4930	232.3012	360.7036	542.9239	717.2701	864.7821 (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	372.3557	285.7167	221.4796	103.2685	31.2674	0.0000	0.0000	0.0000	0.0000	121.5199	259.0972	382.7647 (98)
Space heating												1777.4697 (98)
Space heating per m2										(98) / (4) =		32.3765 (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													1901.0371 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	372.3557	285.7167	221.4796	103.2685	31.2674	0.0000	0.0000	0.0000	0.0000	121.5199	259.0972	382.7647	(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)	398.2414	305.5794	236.8765	110.4476	33.4411	0.0000	0.0000	0.0000	0.0000	129.9678	277.1093	409.3740	(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	153.6938	135.1896	141.3269	125.7861	122.6115	108.6170	103.4201	114.7177	114.9017	130.4772	139.1031	149.6910	(64)
Efficiency of water heater (217)m	87.0883	86.7634	86.0077	84.2932	81.7643	79.8000	79.8000	79.8000	79.8000	84.6249	86.4507	79.8000	(216)
Fuel for water heating, kWh/month	176.4805	155.8140	164.3189	149.2245	149.9572	136.1116	129.5991	143.7565	143.9871	154.1831	160.9046	171.6394	(219)
Water heating fuel used												1835.9765	(219)
Annual totals kWh/year													
Space heating fuel - main system												1901.0371	(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)												255.0690	(232)
Total delivered energy for all uses												4067.0827	(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	1901.0371	0.2160	410.6240 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1835.9765	0.2160	396.5709 (264)
Space and water heating			807.1950 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	255.0690	0.5190	132.3808 (268)
Total CO2, kg/m2/year			978.5008 (272)
Emissions per m2 for space and water heating			14.7030 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4113 (272b)
Emissions per m2 for pumps and fans			0.7090 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7030 * 1.00) + 2.4113 + 0.7090, rounded to 2 d.p.			17.8200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT07			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type FT07		
Property	A207, Tangmere, London, N17				
SAP Rating	87 B	DER	12.18	TER	14.77
Environmental	90 B	% DER<TER	17.56		
CO ₂ Emissions (t/year)	1.02	DFEE	36.08	TFEE	44.67
General Requirements Compliance	Pass	% DFEE<TFEE	19.23		
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 108 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) 14.77 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.18 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 44.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 36.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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: 2.50 (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, 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: 0.54
Maximum 1.5 OK
MVHR efficiency: 88%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 10.44 m², No overhang
Windows facing West: 8.62 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Air permeability 2.5 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	108.1000 (1b)	x 2.5000 (2b)	= 270.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.2500 (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					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					2.5000
Infiltration rate					0.1250 (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) =				0.1063 (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	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												74.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2615	0.2588	0.2562	0.2429	0.2402	0.2269	0.2269	0.2243	0.2323	0.2402	0.2455	0.2508 (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			2.2500	1.2000	2.7000		(26)
Windows (Uw = 0.90)			19.0600	0.8687	16.5579		(27)
External Wall 1 sheltered	76.8700 30.1500	21.3100	55.5600 30.1500	0.1400 0.2700	7.7784 8.1405		(29a) (29a)
Total net area of external elements Aum(A, m2)			107.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1768		(33)
Party Wall 1			21.7500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.1300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4286 (36)
Total fabric heat loss							(33) + (36) = 45.6054 (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	23.3184	23.0815	22.8447	21.6602	21.4233	20.2389	20.2389	20.0020	20.7126	21.4233	21.8971	22.3709 (38)
Heat transfer coeff	68.9239	68.6870	68.4501	67.2656	67.0287	65.8443	65.8443	65.6074	66.3181	67.0287	67.5025	67.9763 (39)
Average = Sum(39)m / 12 =												67.2064 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6376	0.6354	0.6332	0.6223	0.6201	0.6091	0.6091	0.6069	0.6135	0.6201	0.6244	0.6288 (40)
HLP (average)												0.6217 (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	2.8029 (42)
Average daily hot water use (litres/day)	100.7695 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	110.8465	106.8157	102.7849	98.7541	94.7234	90.6926	90.6926	94.7234	98.7541	102.7849	106.8157	110.8465 (44)
Energy conte	164.3821	143.7697	148.3574	129.3416	124.1063	107.0943	99.2386	113.8778	115.2378	134.2986	146.5974	159.1953 (45)
Energy content (annual)												Total = Sum(45)m = 1585.4970 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6573	21.5654	22.2536	19.4012	18.6159	16.0641	14.8858	17.0817	17.2857	20.1448	21.9896	23.8793 (46)
Water storage loss:												

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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												
191.3090 168.0907 175.2843 155.3998 151.0332 133.1526 126.1655 140.8046 141.2961 161.2254 172.6557 186.1222 (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												
191.3090 168.0907 175.2843 155.3998 151.0332 133.1526 126.1655 140.8046 141.2961 161.2254 172.6557 186.1222 (64)												
Total per year (kWh/year) = Sum(64)m =												1902.5389 (64)
Heat gains from water heating, kWh/month												
76.1985 67.2602 70.8703 63.8527 62.8068 56.4555 54.5383 59.4058 59.1632 66.1958 69.5902 74.4739 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
25.1845 22.3686 18.1914 13.7721 10.2948 8.6913 9.3912 12.2071 16.3843 20.8037 24.2809 25.8844 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
268.7974 271.5867 264.5578 249.5942 230.7052 212.9523 201.0922 198.3029 205.3318 220.2955 239.1844 256.9374 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 (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)												
-112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 (71)												
Water heating gains (Table 5)												
102.4174 100.0896 95.2558 88.6843 84.4178 78.4104 73.3042 79.8466 82.1711 88.9728 96.6531 100.0994 (72)												
Total internal gains												
461.4432 459.0889 443.0489 417.0944 390.4617 365.0978 348.8316 355.4005 368.9311 395.1159 425.1624 447.9651 (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												
West												
10.4400 10.6334 10.4000 0.7000 0.7700 21.5409 (74)												
8.6200 19.6403 0.4000 0.7000 0.7700 32.8508 (80)												
Solar gains	54.3917	105.4289	175.7829	266.7086	340.5191	355.6732	335.6319	278.3771	207.1906	125.2560	67.5345	44.9724 (83)
Total gains	515.8349	564.5177	618.8318	683.8030	730.9808	720.7711	684.4635	633.7776	576.1217	520.3719	492.6969	492.9375 (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	92.8535	93.1737	93.4962	95.1425	95.4788	97.1963	97.1963	97.5473	96.5019	95.4788	94.8086	94.1478
alpha	7.1902	7.2116	7.2331	7.3428	7.3653	7.4798	7.4798	7.5032	7.4335	7.3653	7.3206	7.2765
util living area												
	0.9983	0.9961	0.9874	0.9419	0.8000	0.5802	0.4229	0.4752	0.7598	0.9678	0.9957	0.9987 (86)
MIT	20.3006	20.4020	20.5801	20.8126	20.9574	20.9965	20.9997	20.9993	20.9781	20.7864	20.5062	20.2841 (87)
Th 2	20.3963	20.3982	20.4002	20.4100	20.4120	20.4218	20.4218	20.4238	20.4179	20.4120	20.4080	20.4041 (88)
util rest of house												
	0.9978	0.9951	0.9840	0.9273	0.7626	0.5296	0.3675	0.4162	0.7073	0.9567	0.9944	0.9984 (89)
MIT 2	19.4385	19.5881	19.8479	20.1835	20.3691	20.4192	20.4217	20.4234	20.3993	20.1535	19.7483	19.4208 (90)
Living area fraction												
MIT	19.7702	19.9013	20.1297	20.4256	20.5955	20.6414	20.6441	20.6451	20.6220	20.3970	20.0400	19.7530 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7702	19.9013	20.1297	20.4256	20.5955	20.6414	20.6441	20.6451	20.6220	20.3970	20.0400	19.7530 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9972 0.9941 0.9821 0.9277 0.7747 0.5490 0.3888 0.4389 0.7264 0.9564 0.9934 0.9979 (94)												
Useful gains	514.3928	561.1644	607.7581	634.3670	566.2933	395.6850	266.1420	278.1799	418.4756	497.6621	489.4213	491.9151 (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												
1066.2678 1030.3961 932.9527 775.2758 596.2535 397.7887 266.2816 278.5068 432.5265 656.6828 873.4810 1057.2362 (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												
410.5950 315.3237 241.9448 101.4543 22.2904 0.0000 0.0000 0.0000 0.0000 118.3114 276.5229 420.5989 (98)												
Space heating												
Space heating per m2												
(98) / (4) =												17.6415 (99)

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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	1907.0415 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2002.3935 (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	1902.5389 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1997.6659 (310a)
Electricity used for heat distribution	40.0006 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	222.5509 (330a)
Total electricity for the above, kWh/year	222.5509 (331)
Electricity for lighting (calculated in Appendix L)	444.7658 (332)
Total delivered energy for all uses	4667.3760 (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			91.0000 (367a)
Space heating from Boilers	4395.6697	0.2160	949.4647 (367)
Electrical energy for heat distribution	40.0006	0.5190	20.7603 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			970.2250 (373)
Space and water heating			970.2250 (376)
Pumps and fans	222.5509	0.5190	115.5039 (378)
Energy for lighting	444.7658	0.5190	230.8334 (379)
Total CO2, kg/year			1316.5623 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.1800 (384)

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

DER		12.1800 ZC1
Total Floor Area	TFA	108.1000
Assumed number of occupants	N	2.8029
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.7348 ZC2
CO2 emissions from cooking, equation (L16)		1.7231 ZC3
Total CO2 emissions		28.6380 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		28.6380 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	108.1000 (1b)	x 2.5000 (2b)	= 270.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.2500 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) = 0.1480 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3980 (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) =				0.3383 (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	0.4313	0.4229	0.4144	0.3721	0.3637	0.3214	0.3214	0.3129	0.3383	0.3637	0.3806	0.3975 (22b)
	0.5930	0.5894	0.5859	0.5692	0.5661	0.5516	0.5516	0.5490	0.5572	0.5661	0.5724	0.5790 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			19.0600	1.3258	25.2689		(27)					
External Wall 1	76.8700	21.3100	55.5600	0.1800	10.0008		(29a)					
sheltered	30.1500		30.1500	0.1800	5.4270		(29a)					
Total net area of external elements Aum(A, m2)			107.0200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.9467		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9000 (36)					
Total fabric heat loss						(33) + (36) =	50.8467 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 52.8878	Feb 52.5656	Mar 52.2499	Apr 50.7666	May 50.4891	Jun 49.1973	Jul 49.1973	Aug 48.9580	Sep 49.6949	Oct 50.4891	Nov 51.0505	Dec 51.6374 (38)
Heat transfer coeff	103.7346	103.4124	103.0966	101.6134	101.3359	100.0440	100.0440	99.8048	100.5416	101.3359	101.8973	102.4842 (39)
Average = Sum(39)m / 12 =												101.6120 (39)
HLP	Jan 0.9596	Feb 0.9566	Mar 0.9537	Apr 0.9400	May 0.9374	Jun 0.9255	Jul 0.9255	Aug 0.9233	Sep 0.9301	Oct 0.9374	Nov 0.9426	Dec 0.9480 (40)
HLP (average)												0.9400 (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												2.8029 (42)
Average daily hot water use (litres/day)												100.7695 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	110.8465	106.8157	102.7849	98.7541	94.7234	90.6926	90.6926	94.7234	98.7541	102.7849	106.8157	110.8465 (44)
Energy conte	164.3821	143.7697	148.3574	129.3416	124.1063	107.0943	99.2386	113.8778	115.2378	134.2986	146.5974	159.1953 (45)
Energy content (annual)	Total = Sum(45)m =											1585.4970 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6573	21.5654	22.2536	19.4012	18.6159	16.0641	14.8858	17.0817	17.2857	20.1448	21.9896	23.8793 (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												

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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	191.2160	168.0067	175.1913	155.3098	150.9402	133.0626	126.0725	140.7117	141.2061	161.1325	172.5657	186.0292 (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	191.2160	168.0067	175.1913	155.3098	150.9402	133.0626	126.0725	140.7117	141.2061	161.1325	172.5657	186.0292 (64)
	76.1242	67.1931	70.7959	63.7807	62.7325	56.3835	54.4639	59.3315	59.0912	66.1214	69.5183	74.3995 (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	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5583	21.8124	17.7391	13.4296	10.0388	8.4752	9.1577	11.9036	15.9769	20.2864	23.6772	25.2408	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.7974	271.5867	264.5578	249.5942	230.7052	212.9523	201.0922	198.3029	205.3318	220.2955	239.1844	256.9374	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	(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)	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	(71)
Water heating gains (Table 5)	102.3174	99.9897	95.1558	88.5843	84.3178	78.3104	73.2042	79.7466	82.0711	88.8728	96.5531	99.9994	(72)
Total internal gains	463.7170	461.4327	445.4966	419.6520	393.1057	367.7817	351.4981	357.9970	371.4238	397.4986	427.4587	450.2215	(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					10.4400	10.6334	0.6300	0.7000			0.7700	33.9269 (74)
West					8.6200	19.6403	0.6300	0.7000			0.7700	51.7400 (80)
Solar gains	85.6669	166.0505	276.8580	420.0661	536.3176	560.1854	528.6203	438.4439	326.3252	197.2783	106.3669	70.8316 (83)
Total gains	549.3839	627.4832	722.3546	839.7181	929.4233	927.9671	880.1184	796.4409	697.7489	594.7769	533.8256	521.0531 (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	72.3669	72.5923	72.8147	73.8775	74.0798	75.0364	75.0364	75.2163	74.6651	74.0798	73.6717	73.2498	
alpha	5.8245	5.8395	5.8543	5.9252	5.9387	6.0024	6.0024	6.0144	5.9777	5.9387	5.9114	5.8833	
util living area	0.9991	0.9979	0.9926	0.9644	0.8618	0.6651	0.4962	0.5674	0.8542	0.9851	0.9981	0.9994	(86)
MIT	19.9349	20.0646	20.2991	20.6208	20.8721	20.9791	20.9969	20.9934	20.9116	20.5771	20.2022	19.9167	(87)
Th 2	20.1171	20.1196	20.1221	20.1336	20.1358	20.1459	20.1459	20.1478	20.1420	20.1358	20.1314	20.1269	(88)
util rest of house	0.9989	0.9972	0.9900	0.9513	0.8178	0.5866	0.4020	0.4670	0.7912	0.9777	0.9973	0.9992	(89)
MIT 2	18.6776	18.8691	19.2125	19.6803	20.0103	20.1320	20.1447	20.1450	20.0686	19.6264	19.0794	18.6583	(90)
Living area fraction	19.1615	19.3291	19.6307	20.0422	20.3420	20.4580	20.4726	20.4715	20.3930	19.9923	19.5115	19.1426	(92)
Temperature adjustment	19.1615	19.3291	19.6307	20.0422	20.3420	20.4580	20.4726	20.4715	20.3930	19.9923	19.5115	19.1426	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9963	0.9880	0.9497	0.8292	0.6162	0.4384	0.5058	0.8116	0.9761	0.9965	0.9988	(94)
Ext temp.	548.5152	625.1662	713.7156	797.4620	770.6988	571.7993	385.8536	402.8453	566.2943	580.5570	531.9375	520.4478	(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	1541.6480	1492.1512	1353.7271	1132.2006	875.7409	586.0559	387.4337	406.3536	632.7059	951.7727	1264.6991	1531.3798	(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	738.8909	582.6139	476.1685	241.0117	78.1514	0.0000	0.0000	0.0000	0.0000	276.1845	527.5884	752.1334	(98)
												3672.7427	(98)
												33.9754	(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													3928.0671 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	738.8909	582.6139	476.1685	241.0117	78.1514	0.0000	0.0000	0.0000	0.0000	276.1845	527.5884	752.1334	(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)	790.2576	623.1165	509.2712	257.7666	83.5844	0.0000	0.0000	0.0000	0.0000	295.3845	564.2656	804.4207	(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	191.2160	168.0067	175.1913	155.3098	150.9402	133.0626	126.0725	140.7117	141.2061	161.1325	172.5657	186.0292	(64)
Efficiency of water heater (217)m	88.0722	87.8631	87.3498	85.9821	83.1539	79.8000	79.8000	79.8000	79.8000	86.2394	87.6049	88.1561	(217)
Fuel for water heating, kWh/month	217.1128	191.2142	200.5628	180.6305	181.5192	166.7451	157.9856	176.3304	176.9500	186.8433	196.9819	211.0224	(219)
Water heating fuel used												2243.8982	(219)
Annual totals kWh/year													
Space heating fuel - main system												3928.0671	(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)												433.7066	(232)
Total delivered energy for all uses												6680.6719	(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	3928.0671	0.2160	848.4625 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2243.8982	0.2160	484.6820 (264)
Space and water heating			1333.1445 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	433.7066	0.5190	225.0937 (268)
Total CO2, kg/m2/year			1597.1632 (272)
Emissions per m2 for space and water heating			12.3325 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0823 (272b)
Emissions per m2 for pumps and fans			0.3601 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.3325 * 1.00) + 2.0823 + 0.3601, rounded to 2 d.p.			14.7700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT08			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type FT08		
Property	A108, Tangmere, London, N17				
SAP Rating	87 B	DER	11.31	TER	14.91
Environmental	92 A	% DER<TER	24.13		
CO ₂ Emissions (t/year)	0.75	DFEE	26.19	TFEE	36.11
General Requirements Compliance	Pass	% DFEE<TFEE	27.47		
Assessor Details	Mr. Neil Rothern, Neil Rothern, 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 77 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) 14.91 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.31 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 26.2 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.96 (max. 2.00)	1.20 (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: 2.50 (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, 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: 0.54
Maximum 1.5 OK
MVHR efficiency: 88%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 6.54 m², No overhang
Windows facing South: 3.08 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Air permeability 2.5 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	77.0000 (1b)	x 2.5000 (2b)	= 192.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 192.5000 (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					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					2.5000
Infiltration rate					0.1250 (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) =				0.0969 (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	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												74.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2495	0.2471	0.2447	0.2326	0.2301	0.2180	0.2180	0.2156	0.2229	0.2301	0.2350	0.2398 (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			2.2500	1.2000	2.7000		(26)
Windows (Uw = 0.90)			9.6200	0.8687	8.3571		(27)
External Wall 1	51.2900	11.8700	39.4200	0.1400	5.5188		(29a)
Total net area of external elements Aum(A, m2)			51.2900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		16.5759		(33)
Party Wall 1			53.6500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							220.3900 (35)
Total fabric heat loss							6.1859 (36)
							(33) + (36) = 22.7618 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	15.8505	15.6966	15.5428	14.7735	14.6197	13.8504	13.8504	13.6966	14.1581	14.6197	14.9274	15.2351 (38)
Heat transfer coeff	38.6123	38.4585	38.3046	37.5354	37.3815	36.6123	36.6123	36.4584	36.9200	37.3815	37.6892	37.9969 (39)
Average = Sum(39)m / 12 =												37.4969 (39)
HLP	0.5015	0.4995	0.4975	0.4875	0.4855	0.4755	0.4755	0.4735	0.4795	0.4855	0.4895	0.4935 (40)
HLP (average)												0.4870 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

												2.4035 (42)
Average daily hot water use (litres/day)												91.2825 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.4108	96.7595	93.1082	89.4569	85.8056	82.1543	82.1543	85.8056	89.4569	93.1082	96.7595	100.4108 (44)
Energy conte	148.9063	130.2344	134.3902	117.1646	112.4223	97.0119	89.8957	103.1567	104.3887	121.6550	132.7959	144.2078 (45)
Energy content (annual)												Total = Sum(45)m = 1436.2293 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	22.3359	19.5352	20.1585	17.5747	16.8633	14.5518	13.4844	15.4735	15.6583	18.2482	19.9194	21.6312 (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													
	175.8331	154.5554	161.3170	143.2229	139.3491	123.0701	116.8226	130.0835	130.4469	148.5818	158.8542	171.1346	(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	175.8331	154.5554	161.3170	143.2229	139.3491	123.0701	116.8226	130.0835	130.4469	148.5818	158.8542	171.1346	(64)
Total per year (kWh/year) = Sum(64)m =													1753.2713 (64)
Heat gains from water heating, kWh/month													
	71.0528	62.7597	66.2262	59.8038	58.9219	53.1030	51.4318	55.8411	55.5558	61.9918	65.0012	69.4906	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5189	19.1129	15.5437	11.7675	8.7964	7.4263	8.0244	10.4304	13.9996	17.7757	20.7469	22.1170 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.0566	215.2674	209.6961	197.8355	182.8636	168.7921	159.3915	157.1806	162.7519	174.6125	189.5845	203.6559 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174 (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)	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390 (71)
Water heating gains (Table 5)	95.5011	93.3925	89.0137	83.0609	79.1961	73.7542	69.1288	75.0552	77.1609	83.3223	90.2795	93.4013 (72)
Total internal gains	389.1287	386.8249	373.3056	351.7160	329.9081	309.0247	295.5967	301.7183	312.9645	334.7626	359.6629	378.2263 (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					6.5400	10.6334	0.4000	0.7000	0.7700	13.4940 (74)
South					3.0800	46.7521	0.4000	0.7000	0.7700	27.9411 (78)
Solar gains	41.4351	71.5480	102.1101	136.2665	163.4678	167.5713	159.3188	137.8744	113.5767	35.3929 (83)
Total gains	430.5637	458.3729	475.4157	487.9825	493.3759	476.5960	454.9155	439.5927	426.5412	414.8163
									409.4292	413.6192 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	122.0827	122.5711	123.0634	125.5855	126.1023	128.7518	128.7518	129.2951	127.6788	126.1023	125.0728	124.0600
alpha	9.1388	9.1714	9.2042	9.3724	9.4068	9.5835	9.5835	9.6197	9.5119	9.4068	9.3382	9.2707
util living area	0.9916	0.9827	0.9567	0.8681	0.6967	0.4914	0.3541	0.3815	0.5954	0.8721	0.9763	0.9936 (86)
MIT	20.6628	20.7388	20.8442	20.9525	20.9939	20.9998	21.0000	21.0000	20.9988	20.9580	20.8073	20.6475 (87)
Th 2	20.5195	20.5213	20.5232	20.5323	20.5342	20.5434	20.5434	20.5452	20.5397	20.5342	20.5305	20.5268 (88)
util rest of house	0.9896	0.9788	0.9476	0.8462	0.6642	0.4564	0.3174	0.3438	0.5564	0.8468	0.9703	0.9921 (89)
MIT 2	20.0658	20.1764	20.3266	20.4785	20.5284	20.5432	20.5434	20.5452	20.5388	20.4885	20.2830	20.0500 (90)
Living area fraction									fLA = Living area / (4) =			0.3506 (91)
MIT	20.2752	20.3736	20.5081	20.6447	20.6916	20.7033	20.7035	20.7047	20.7001	20.6531	20.4669	20.2595 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2752	20.3736	20.5081	20.6447	20.6916	20.7033	20.7035	20.7047	20.7001	20.6531	20.4669	20.2595 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9884	0.9774	0.9472	0.8517	0.6753	0.4687	0.3302	0.3570	0.5701	0.8536	0.9694	0.9911 (94)
Useful gains	425.5676	448.0358	450.3294	415.6121	333.1692	223.3725	150.2350	156.9362	243.1647	354.0694	396.9045	409.9283 (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	616.8377	595.0923	536.5742	440.8425	336.1207	223.4561	150.2375	156.9412	243.6745	375.8012	503.7865	610.2121 (97a)
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	142.3050	98.8220	64.1661	18.1659	2.1959	0.0000	0.0000	0.0000	0.0000	16.1685	76.9550	149.0111 (98)
Space heating												567.7895 (98)
Space heating per m2												(98) / (4) = 7.3739 (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	567.7895 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	596.1789 (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	1753.2713 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1840.9349 (310a)
Electricity used for heat distribution	24.3711 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	158.5238 (330a)
Total electricity for the above, kWh/year	158.5238 (331)
Electricity for lighting (calculated in Appendix L)	380.0307 (332)
Total delivered energy for all uses	2975.6682 (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			91.0000 (367a)
Space heating from Boilers	2678.1470	0.2160	578.4798 (367)
Electrical energy for heat distribution	24.3711	0.5190	12.6486 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			591.1284 (373)
Space and water heating			591.1284 (376)
Pumps and fans	158.5238	0.5190	82.2738 (378)
Energy for lighting	380.0307	0.5190	197.2359 (379)
Total CO2, kg/year			870.6381 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.3100 (384)

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

DER		11.3100 ZC1
Total Floor Area	TFA	77.0000
Assumed number of occupants	N	2.4035
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.3965 ZC2
CO2 emissions from cooking, equation (L16)		2.2946 ZC3
Total CO2 emissions		30.0011 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		30.0011 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	77.0000 (1b)	x 2.5000 (2b)	= 192.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 192.5000 (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) =				30.0000 / (5) = 0.1558 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4058 (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) =				0.3145 (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	0.4010	0.3932	0.3853	0.3460	0.3381	0.2988	0.2988	0.2909	0.3145	0.3381	0.3538	0.3696 (22b)
Effective ac	0.5804	0.5773	0.5742	0.5599	0.5572	0.5446	0.5446	0.5423	0.5495	0.5572	0.5626	0.5683 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			9.6200	1.3258	12.7538		(27)					
External Wall 1	51.2900	11.8700	39.4200	0.1800	7.0956		(29a)					
Total net area of external elements Aum(A, m2)			51.2900				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	22.0994		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5770 (36)					
Total fabric heat loss						(33) + (36) =	29.6764 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.8706	Feb 36.6722	Mar 36.4778	Apr 35.5646	May 35.3937	Jun 34.5984	Jul 34.5984	Aug 34.4511	Sep 34.9047	Oct 35.3937	Nov 35.7394	Dec 36.1007 (38)
Heat transfer coeff	66.5470	66.3486	66.1542	65.2410	65.0701	64.2747	64.2747	64.1275	64.5811	65.0701	65.4158	65.7771 (39)
Average = Sum(39)m / 12 =												65.2402 (39)
HLP	Jan 0.8642	Feb 0.8617	Mar 0.8591	Apr 0.8473	May 0.8451	Jun 0.8347	Jul 0.8347	Aug 0.8328	Sep 0.8387	Oct 0.8451	Nov 0.8496	Dec 0.8542 (40)
HLP (average)												0.8473 (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												2.4035 (42)
Average daily hot water use (litres/day)												91.2825 (43)
Daily hot water use	Jan 100.4108	Feb 96.7595	Mar 93.1082	Apr 89.4569	May 85.8056	Jun 82.1543	Jul 82.1543	Aug 85.8056	Sep 89.4569	Oct 93.1082	Nov 96.7595	Dec 100.4108 (44)
Energy conte	148.9063	130.2344	134.3902	117.1646	112.4223	97.0119	89.8957	103.1567	104.3887	121.6550	132.7959	144.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1436.2293 (45)
Distribution loss (46)m = 0.15 x (45)m	22.3359	19.5352	20.1585	17.5747	16.8633	14.5518	13.4844	15.4735	15.6583	18.2482	19.9194	21.6312 (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	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)

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 (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	175.7401	154.4714	161.2241	143.1329	139.2561	122.9801	116.7296	129.9906	130.3570	148.4888	158.7642	171.0416 (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	175.7401	154.4714	161.2241	143.1329	139.2561	122.9801	116.7296	129.9906	130.3570	148.4888	158.7642	171.0416 (64)
Heat gains from water heating, kWh/month	70.9784	62.6926	66.1518	59.7319	58.8475	53.0311	51.3574	55.7667	55.4839	61.9174	64.9293	69.4162 (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	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.8953	18.5590	15.0932	11.4265	8.5415	7.2111	7.7918	10.1281	13.5939	17.2606	20.1456	21.4760 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.0566	215.2674	209.6961	197.8355	182.8636	168.7921	159.3915	157.1806	162.7519	174.6125	189.5845	203.6559 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174 (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)	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390 (71)
Water heating gains (Table 5)	95.4011	93.2925	88.9138	82.9609	79.0961	73.6542	69.0288	74.9552	77.0609	83.2223	90.1795	93.3013 (72)
Total internal gains	391.4051	389.1710	375.7552	354.2750	332.5533	311.7095	298.2642	304.3160	315.4588	337.1475	361.9617	380.4854 (73)

6. Solar gains

[Jan]												Gains
	Area			Solar flux		g		FF		Access		W
	m2			Table 6a		Specific data		Specific data		factor		
				W/m2		or Table 6b		or Table 6c		Table 6d		
North	6.5400			10.6334		0.6300		0.7000		0.7700		21.2531 (74)
South	3.0800			46.7521		0.6300		0.7000		0.7700		44.0072 (78)
Solar gains	65.2602	112.6881	160.8234	214.6197	257.4618	263.9248	250.9271	217.1522	178.8833	126.0845	78.3819	55.7438 (83)
Total gains	456.6653	501.8591	536.5786	568.8947	590.0150	575.6343	549.1913	521.4682	494.3421	463.2320	440.3436	436.2292 (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	80.3526	80.5928	80.8297	81.9611	82.1763	83.1932	83.1932	83.3843	82.7986	82.1763	81.7421	81.2930
alpha	6.3568	6.3729	6.3886	6.4641	6.4784	6.5462	6.5462	6.5590	6.5199	6.4784	6.4495	6.4195
util living area	0.9979	0.9957	0.9891	0.9632	0.8770	0.6901	0.5117	0.5597	0.8181	0.9712	0.9952	0.9984 (86)
MIT	20.1565	20.2681	20.4481	20.6883	20.8867	20.9817	20.9977	20.9960	20.9467	20.7071	20.3922	20.1369 (87)
Th 2	20.1980	20.2002	20.2024	20.2125	20.2144	20.2233	20.2233	20.2250	20.2199	20.2144	20.2106	20.2066 (88)
util rest of house	0.9973	0.9943	0.9854	0.9503	0.8375	0.6164	0.4232	0.4686	0.7537	0.9586	0.9933	0.9979 (89)
MIT 2	19.0625	19.2270	19.4898	19.8393	20.1012	20.2108	20.2224	20.2232	20.1770	19.8710	19.4164	19.0406 (90)
Living area fraction	19.4461	19.5921	19.8258	20.1370	20.3766	20.4811	20.4943	20.4942	20.4469	20.1642	19.7586	0.3506 (91)
MIT	19.4461	19.5921	19.8258	20.1370	20.3766	20.4811	20.4943	20.4942	20.4469	20.1642	19.7586	19.4250 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4461	19.5921	19.8258	20.1370	20.3766	20.4811	20.4943	20.4942	20.4469	20.1642	19.7586	19.4250 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	455.0317	498.2927	527.5443	539.7712	499.4223	369.3767	249.5051	261.0950	382.5686	443.5848	436.8014	435.0399 (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	1007.9267	974.8004	881.5604	733.1113	564.5896	378.0092	250.3021	262.5501	409.8918	622.3422	828.0710	1001.4578 (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	411.3538	320.2131	263.3880	139.2049	48.4844	0.0000	0.0000	0.0000	0.0000	132.9955	281.7140	421.4149 (98)
Space heating												2018.7687 (98)
Space heating per m2												26.2178 (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												2159.1109 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	411.3538	320.2131	263.3880	139.2049	48.4844	0.0000	0.0000	0.0000	0.0000	132.9955	281.7140	421.4149 (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)	439.9506	342.4739	281.6984	148.8822	51.8550	0.0000	0.0000	0.0000	0.0000	142.2412	301.2984	450.7111 (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	175.7401	154.4714	161.2241	143.1329	139.2561	122.9801	116.7296	129.9906	130.3570	148.4888	158.7642	171.0416 (64)
Efficiency of water heater (217)m	87.0078	86.7162	86.1157	84.7398	82.3133	79.8000	79.8000	79.8000	79.8000	84.5216	86.3279	79.8000 (216)
Fuel for water heating, kWh/month	201.9821	178.1344	187.2180	168.9087	169.1781	154.1104	146.2777	162.8954	163.3546	175.6816	183.9084	196.3124 (219)
Water heating fuel used												2087.9619 (219)
Annual totals kWh/year												
Space heating fuel - main system												2159.1109 (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)												369.0171 (232)
Total delivered energy for all uses												4691.0900 (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	2159.1109	0.2160	466.3680 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2087.9619	0.2160	450.9998 (264)
Space and water heating			917.3677 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.0171	0.5190	191.5199 (268)
Total CO2, kg/m2/year			1147.8126 (272)
Emissions per m2 for space and water heating			11.9139 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4873 (272b)
Emissions per m2 for pumps and fans			0.5055 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.9139 * 1.00) + 2.4873 + 0.5055, rounded to 2 d.p.			14.9100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT12			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type FT12		
Property	B4.04, Tangmere, London, N17				
SAP Rating	85 B	DER	14.50	TER	16.99
Environmental	90 B	% DER<TER	14.64		
CO ₂ Emissions (t/year)	0.83	DFEE	39.12	TFEE	46.85
General Requirements Compliance	Pass	% DFEE<TFEE	16.50		
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 72 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) 16.99 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.50 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 46.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 39.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.95 (max. 2.00)	1.20 (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: 2.50 (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, 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: 0.54
Maximum 1.5 OK
MVHR efficiency: 88%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 2.73 m², No overhang
Windows facing East: 7.34 m², No overhang
Windows facing West: 2.64 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Air permeability 2.5 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	71.6000 (1b)	x 2.5000 (2b)	= 179.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 179.0000 (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							2.5000					
Infiltration rate							0.1250	(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) =	0.0969 (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)
	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (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) =												74.8000 (23c)
Effective ac	0.2495	0.2471	0.2447	0.2326	0.2301	0.2180	0.2180	0.2156	0.2229	0.2301	0.2350	0.2398 (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				2.2500	1.2000	2.7000		(26)				
Windows (Uw = 0.90)				12.7100	0.8687	11.0415		(27)				
External Wall 1	51.3000		14.9600	36.3400	0.1400	5.0876		(29a)				
Sheltered	29.5000			29.5000	0.2700	7.9650		(29a)				
Total net area of external elements Aum(A, m2)				80.8000				(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =		26.7941		(33)				
Party Wall 1				16.4000	0.0000	0.0000		(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								213.2400 (35)				
Total fabric heat loss								11.3897 (36)				
								(33) + (36) = 38.1838 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 14.7389	Feb 14.5958	Mar 14.4528	Apr 13.7375	May 13.5944	Jun 12.8791	Jul 12.8791	Aug 12.7360	Sep 13.1652	Oct 13.5944	Nov 13.8805	Dec 14.1666 (38)
Heat transfer coeff	52.9227	52.7796	52.6366	51.9213	51.7782	51.0629	51.0629	50.9199	51.3490	51.7782	52.0643	52.3505 (39)
Average = Sum(39)m / 12 =	51.8855 (39)											
HLP	Jan 0.7391	Feb 0.7371	Mar 0.7351	Apr 0.7252	May 0.7232	Jun 0.7132	Jul 0.7132	Aug 0.7112	Sep 0.7172	Oct 0.7232	Nov 0.7272	Dec 0.7312 (40)
HLP (average)	0.7247 (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												2.2843 (42)
Average daily hot water use (litres/day)												88.4529 (43)
Daily hot water use	Jan 97.2982	Feb 93.7601	Mar 90.2220	Apr 86.6839	May 83.1458	Jun 79.6076	Jul 79.6076	Aug 83.1458	Sep 86.6839	Oct 90.2220	Nov 93.7601	Dec 97.2982 (44)
Energy conte	144.2905	126.1974	130.2244	113.5328	108.9374	94.0047	87.1092	99.9590	101.1529	117.8839	128.6795	139.7376 (45)
Energy content (annual)												Total = Sum(45)m = 1391.7090 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.6436	18.9296	19.5337	17.0299	16.3406	14.1007	13.0664	14.9939	15.1729	17.6826	19.3019	20.9606 (46)
Water storage loss:												

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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												
171.2173 150.5184 157.1512 139.5910 135.8642 120.0629 114.0360 126.8859 127.2111 144.8107 154.7377 166.6644 (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												
171.2173 150.5184 157.1512 139.5910 135.8642 120.0629 114.0360 126.8859 127.2111 144.8107 154.7377 166.6644 (64)												
Heat gains from water heating, kWh/month												
69.5181 61.4174 64.8411 58.5962 57.7632 52.1031 50.5053 54.7779 54.4799 60.7379 63.6325 68.0042 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.8066 16.7038 13.5845 10.2843 7.6876 6.4902 7.0129 9.1157 12.2350 15.5352 18.1318 19.3292 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
201.0022 203.0879 197.8319 186.6423 172.5174 159.2421 150.3734 148.2876 153.5437 164.7332 178.8581 192.1334 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 (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)												
-91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 (71)												
Water heating gains (Table 5)												
93.4382 91.3950 87.1520 81.3837 77.6387 72.3655 67.8834 73.6262 75.6666 81.6369 88.3785 91.4035 (72)												
Total internal gains												
370.5120 368.4518 355.8333 335.5753 315.1088 295.3628 282.5347 288.2944 298.7102 319.1703 342.6334 360.1312 (73)												

6. Solar gains

[Jan]				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	W/m2	Specific data	Specific data	factor		W	
							or Table 6b	or Table 6c	Table 6d			
North				2.7300	10.6334		0.4000	0.7000	0.7700		5.6328 (74)	
East				7.3400	19.6403		0.4000	0.7000	0.7700		27.9727 (76)	
West				2.6400	19.6403		0.4000	0.7000	0.7700		10.0610 (80)	
Solar gains	43.6666	85.1667	140.8213	208.0833	258.5853	266.5624	252.9981	214.7261	164.4996	101.0982	54.3724	35.9729 (83)
Total gains	414.1785	453.6184	496.6546	543.6586	573.6941	561.9252	535.5328	503.0205	463.2098	420.2685	397.0058	396.1041 (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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
80.1378 80.3550 80.5734 81.6834 81.9091 83.0565 83.0565 83.2898 82.5937 81.9091 81.4590 81.0138												
alpha	6.3425	6.3570	6.3716	6.4456	6.4606	6.5371	6.5371	6.5527	6.5062	6.4606	6.4306	6.4009
util living area	0.9956	0.9913	0.9764	0.9196	0.7797	0.5744	0.4187	0.4640	0.7286	0.9475	0.9904	0.9967 (86)
MIT	20.2356	20.3510	20.5483	20.7913	20.9443	20.9934	20.9993	20.9986	20.9726	20.7717	20.4626	20.2126 (87)
Th 2	20.3064	20.3081	20.3099	20.3187	20.3204	20.3292	20.3292	20.3310	20.3257	20.3204	20.3169	20.3134 (88)
util rest of house	0.9945	0.9890	0.9702	0.9001	0.7377	0.5171	0.3553	0.3974	0.6697	0.9304	0.9875	0.9958 (89)
MIT 2	19.2728	19.4419	19.7274	20.0721	20.2653	20.3245	20.3289	20.3303	20.3031	20.0528	19.6118	19.2449 (90)
Living area fraction	19.6762	19.8228	20.0714	20.3734	20.5498	20.6048	20.6098	20.6103	20.5836	20.3540	19.9683	19.6504 (92)
MIT	19.6762	19.8228	20.0714	20.3734	20.5498	20.6048	20.6098	20.6103	20.5836	20.3540	19.9683	19.6504 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6762	19.8228	20.0714	20.3734	20.5498	20.6048	20.6098	20.6103	20.5836	20.3540	19.9683	19.6504 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9932 0.9871 0.9677 0.9018 0.7524 0.5409 0.3819 0.4253 0.6930 0.9314 0.9856 0.9947 (94)												
Useful gains	411.3532	447.7519	480.6198	490.2953	431.6673	303.9372	204.5145	213.9279	321.0074	391.4226	391.2990	393.9992 (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	813.7502	787.6188	714.3510	595.7144	458.2264	306.6211	204.7504	214.3889	332.9282	505.0445	669.9792	808.8332 (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	299.3834	228.3906	173.8960	75.9017	19.7600	0.0000	0.0000	0.0000	0.0000	84.5347	200.6498	308.6364 (98)
Space heating												1391.1525 (98)
Space heating per m2												19.4295 (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	1391.1525 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1460.7101 (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	1708.7510 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1794.1885 (310a)
Electricity used for heat distribution	32.5490 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	147.4065 (330a)
Total electricity for the above, kWh/year	147.4065 (331)
Electricity for lighting (calculated in Appendix L)	332.1296 (332)
Total delivered energy for all uses	3734.4347 (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			91.0000 (367a)
Space heating from Boilers	3576.8117	0.2160	772.5913 (367)
Electrical energy for heat distribution	32.5490	0.5190	16.8929 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			789.4842 (373)
Space and water heating			789.4842 (376)
Pumps and fans	147.4065	0.5190	76.5040 (378)
Energy for lighting	332.1296	0.5190	172.3752 (379)
Total CO2, kg/year			1038.3635 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5000 (384)

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

DER	14.5000 ZC1
Total Floor Area	TFA 71.6000
Assumed number of occupants	N 2.2843
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	16.6354 ZC2
CO2 emissions from cooking, equation (L16)	2.4277 ZC3
Total CO2 emissions	33.5631 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	33.5631 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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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	71.6000 (1b)	x 2.5000 (2b)	= 179.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 179.0000 (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) =	0.1676 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4176 (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) =		0.3236 (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	0.4126	0.4045	0.3965	0.3560	0.3479	0.3075	0.3075	0.2994	0.3236	0.3479	0.3641	0.3803 (22b)
Effective ac	0.5851	0.5818	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	0.5605	0.5663	0.5723 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			12.7100	1.3258	16.8504		(27)					
External Wall 1	51.3000	14.9600	36.3400	0.1800	6.5412		(29a)					
Sheltered	29.5000		29.5000	0.1800	5.3100		(29a)					
Total net area of external elements Aum(A, m2)			80.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		30.9516		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0840 (36)					
Total fabric heat loss						(33) + (36) =	41.0356 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.5639	Feb 34.3687	Mar 34.1773	Apr 33.2782	May 33.1100	Jun 32.3269	Jul 32.3269	Aug 32.1819	Sep 32.6285	Oct 33.1100	Nov 33.4503	Dec 33.8060 (38)
Heat transfer coeff	75.5995	75.4042	75.2128	74.3138	74.1456	73.3625	73.3625	73.2175	73.6641	74.1456	74.4858	74.8416 (39)
Average = Sum(39)m / 12 =												74.3130 (39)
HLP	Jan 1.0559	Feb 1.0531	Mar 1.0505	Apr 1.0379	May 1.0356	Jun 1.0246	Jul 1.0246	Aug 1.0226	Sep 1.0288	Oct 1.0356	Nov 1.0403	Dec 1.0453 (40)
HLP (average)												1.0379 (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												2.2843 (42)
Average daily hot water use (litres/day)												88.4529 (43)
Daily hot water use	97.2982	93.7601	90.2220	86.6839	83.1458	79.6076	79.6076	83.1458	86.6839	90.2220	93.7601	97.2982 (44)
Energy conte	144.2905	126.1974	130.2244	113.5328	108.9374	94.0047	87.1092	99.9590	101.1529	117.8839	128.6795	139.7376 (45)
Energy content (annual)										Total = Sum(45)m =		1391.7090 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6436	18.9296	19.5337	17.0299	16.3406	14.1007	13.0664	14.9939	15.1729	17.6826	19.3019	20.9606 (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												

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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	171.1243	150.4344	157.0582	139.5010	135.7713	119.9729	113.9430	126.7929	127.1211	144.7178	154.6478	166.5715 (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	171.1243	150.4344	157.0582	139.5010	135.7713	119.9729	113.9430	126.7929	127.1211	144.7178	154.6478	166.5715 (64)
	69.4437	61.3503	64.7667	58.5243	57.6888	52.0312	50.4309	54.7035	54.4079	60.6635	63.5605	67.9299 (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	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3436	16.2926	13.2500	10.0311	7.4984	6.3305	6.8403	8.8913	11.9338	15.1527	17.6855	18.8534	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.0022	203.0879	197.8319	186.6423	172.5174	159.2421	150.3734	148.2876	153.5437	164.7332	178.8581	192.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	(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)	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)	93.3383	91.2950	87.0520	81.2837	77.5387	72.2655	67.7835	73.5262	75.5666	81.5370	88.2785	91.3036	(72)
Total internal gains	372.9490	370.9406	358.3989	338.2221	317.8195	298.1031	285.2621	290.9700	301.3091	321.6879	345.0871	362.5554	(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				2.7300	10.6334	0.6300	0.7000	0.7700		8.8717 (74)		
East				7.3400	19.6403	0.6300	0.7000	0.7700		44.0570 (76)		
West				2.6400	19.6403	0.6300	0.7000	0.7700		15.8461 (80)		

Solar gains	68.7748	134.1375	221.7936	327.7312	407.2718	419.8358	398.4720	338.1936	259.0868	159.2297	85.6366	56.6573 (83)
Total gains	441.7239	505.0781	580.1925	665.9533	725.0914	717.9389	683.7341	629.1636	560.3959	480.9176	430.7237	419.2127 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.7705	65.9409	66.1087	66.9085	67.0603	67.7761	67.7761	67.9103	67.4986	67.0603	66.7539	66.4366	
alpha	5.3847	5.3961	5.4072	5.4606	5.4707	5.5184	5.5184	5.5274	5.4999	5.4707	5.4503	5.4291	
util living area	0.9977	0.9948	0.9843	0.9412	0.8234	0.6308	0.4681	0.5273	0.8020	0.9702	0.9951	0.9983	(86)
MIT	19.9033	20.0499	20.3060	20.6353	20.8761	20.9777	20.9963	20.9932	20.9211	20.5920	20.1879	19.8783	(87)
Th 2	20.0370	20.0393	20.0415	20.0519	20.0538	20.0629	20.0629	20.0646	20.0594	20.0538	20.0499	20.0458	(88)
util rest of house	0.9970	0.9931	0.9789	0.9213	0.7720	0.5481	0.3706	0.4242	0.7277	0.9562	0.9931	0.9977	(89)
MIT 2	18.5724	18.7877	19.1600	19.6299	19.9368	20.0486	20.0615	20.0618	19.9981	19.5808	18.9975	18.5423	(90)
Living area fraction	19.1300	19.3166	19.6401	20.0511	20.3303	20.4379	20.4532	20.4521	20.3848	20.0045	19.4963	19.1021	(91)
MIT	19.1300	19.3166	19.6401	20.0511	20.3303	20.4379	20.4532	20.4521	20.3848	20.0045	19.4963	19.1021	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1300	19.3166	19.6401	20.0511	20.3303	20.4379	20.4532	20.4521	20.3848	20.0045	19.4963	19.1021	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.9431	500.7239	566.2862	613.5576	571.4788	417.9378	281.4103	294.2056	423.3678	459.4239	427.0963	417.9204	(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	1121.1411	1087.0725	988.3071	828.6829	639.9017	428.2812	282.6814	296.6830	462.9648	697.3003	923.3494	1115.2955	(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	506.8113	394.0263	313.9836	154.8902	50.9066	0.0000	0.0000	0.0000	0.0000	176.9800	357.3022	518.8471	(98)
Space heating												2473.7473	(98)
Space heating per m2												34.5495	(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													2645.7191 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	506.8113	394.0263	313.9836	154.8902	50.9066	0.0000	0.0000	0.0000	0.0000	176.9800	357.3022	518.8471	(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)	542.0442	421.4185	335.8113	165.6580	54.4456	0.0000	0.0000	0.0000	0.0000	189.2835	382.1414	554.9167	(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	171.1243	150.4344	157.0582	139.5010	135.7713	119.9729	113.9430	126.7929	127.1211	144.7178	154.6478	166.5715	(64)
Efficiency of water heater (217)m	87.5372	87.2670	86.6271	85.0933	82.4586	79.8000	79.8000	79.8000	79.8000	85.3517	86.9771	79.8000	(216)
Fuel for water heating, kWh/month	195.4875	172.3841	181.3038	163.9388	164.6539	150.3420	142.7858	158.8884	159.2997	169.5547	177.8029	190.0545	(219)
Water heating fuel used												2026.4960	(219)
Annual totals kWh/year													
Space heating fuel - main system												2645.7191	(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)												323.9535	(232)
Total delivered energy for all uses												5071.1685	(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	2645.7191	0.2160	571.4753 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2026.4960	0.2160	437.7231 (264)
Space and water heating			1009.1985 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.9535	0.5190	168.1319 (268)
Total CO2, kg/m2/year			1216.2553 (272)
Emissions per m2 for space and water heating			14.0950 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3482 (272b)
Emissions per m2 for pumps and fans			0.5436 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0950 * 1.00) + 2.3482 + 0.5436, rounded to 2 d.p.			16.9900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT14			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type FT14		
Property	A506, Tangmere, London, N17				
SAP Rating	87 B	DER	12.16	TER	14.95
Environmental	91 B	% DER<TER	18.69		
CO ₂ Emissions (t/year)	0.90	DFEE	33.70	TFEE	41.42
General Requirements Compliance	Pass	% DFEE<TFEE	18.63		
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 94 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) 14.95 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.16 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 33.7 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.94 (max. 2.00)	1.20 (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: 2.50 (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, 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: 0.47
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 10.02 m², No overhang
Windows facing West: 3.24 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Air permeability 2.5 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	94.0000 (1b)	x 2.5000 (2b)	= 235.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0000 (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												2.5000	
Infiltration rate												0.1250 (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) =		0.1063 (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	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (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	0.2572	0.2546	0.2519	0.2386	0.2360	0.2227	0.2227	0.2200	0.2280	0.2360	0.2413	0.2466 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			13.2600	0.8687	11.5193		(27)					
External Wall 1	57.1300	15.5100	41.6200	0.1400	5.8268		(29a)					
sheltered	29.0000		29.0000	0.2700	7.8300		(29a)					
Total net area of external elements Aum(A, m2)			86.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	27.8761		(33)					
Party Wall 1			22.3300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							211.6800 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2700 (36)					
Total fabric heat loss							(33) + (36) = 36.1461 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 19.9473	Feb 19.7413	Mar 19.5353	Apr 18.5054	May 18.2994	Jun 17.2694	Jul 17.2694	Aug 17.0634	Sep 17.6814	Oct 18.2994	Nov 18.7114	Dec 19.1233 (38)
Heat transfer coeff	56.0935	55.8875	55.6815	54.6515	54.4455	53.4156	53.4156	53.2096	53.8275	54.4455	54.8575	55.2695 (39)
Average = Sum(39)m / 12 =	54.6000 (39)											
HLP	Jan 0.5967	Feb 0.5945	Mar 0.5924	Apr 0.5814	May 0.5792	Jun 0.5683	Jul 0.5683	Aug 0.5661	Sep 0.5726	Oct 0.5792	Nov 0.5836	Dec 0.5880 (40)
HLP (average)	0.5809 (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												2.6766 (42)
Average daily hot water use (litres/day)												97.7695 (43)
Daily hot water use	Jan 107.5465	Feb 103.6357	Mar 99.7249	Apr 95.8141	May 91.9033	Jun 87.9926	Jul 87.9926	Aug 91.9033	Sep 95.8141	Oct 99.7249	Nov 103.6357	Dec 107.5465 (44)
Energy conte	159.4883	139.4895	143.9406	125.4909	120.4115	103.9060	96.2842	110.4875	111.8071	130.3004	142.2331	154.4559 (45)
Energy content (annual)												Total = Sum(45)m = 1538.2950 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.9232	20.9234	21.5911	18.8236	18.0617	15.5859	14.4426	16.5731	16.7711	19.5451	21.3350	23.1684 (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												
186.4151 163.8105 170.8675 151.5492 147.3384 129.9643 123.2110 137.4144 137.8653 157.2272 168.2913 181.3827 (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												
186.4151 163.8105 170.8675 151.5492 147.3384 129.9643 123.2110 137.4144 137.8653 157.2272 168.2913 181.3827 (64)												
Heat gains from water heating, kWh/month												
74.5713 65.8371 69.4017 62.5723 61.5783 55.3953 53.5560 58.2786 58.0225 64.8664 68.1391 72.8981 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
24.2154 21.5079 17.4914 13.2421 9.8986 8.3569 9.0299 11.7374 15.7539 20.0032 23.3467 24.8884 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
246.2474 248.8027 242.3634 228.6551 211.3508 195.0872 184.2221 181.6668 188.1061 201.8144 219.1187 235.3823 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 (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)												
-107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 (71)												
Water heating gains (Table 5)												
100.2303 97.9718 93.2819 86.9060 82.7666 76.9380 71.9838 78.3314 80.5867 87.1860 94.6376 97.9813 (72)												
Total internal gains												
433.8422 431.4316 416.2859 391.9524 367.1652 343.5312 328.3850 334.8848 347.5958 372.1527 400.2521 421.4012 (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					10.0200	10.6334	0.4000	0.7000	0.7700		20.6743 (74)	
West					3.2400	19.6403	0.4000	0.7000	0.7700		12.3476 (80)	

Solar gains	33.0219	63.6642	106.9157	165.8540	216.3685	228.2978	214.4853	174.7132	126.9847	75.6925	40.9005	27.3892 (83)
Total gains	466.8642	495.0958	523.2016	557.8065	583.5337	571.8290	542.8703	509.5980	474.5805	447.8452	441.1526	448.7904 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	98.5356	98.8987	99.2646	101.1354	101.5180	103.4755	103.4755	103.8761	102.6835	101.5180	100.7556	100.0045
alpha	7.5690	7.5932	7.6176	7.7424	7.7679	7.8984	7.8984	7.9251	7.8456	7.7679	7.7170	7.6670
util living area												
0.9974 0.9952 0.9868 0.9459 0.8142 0.5937 0.4326 0.4796 0.7545 0.9612 0.9938 0.9980 (86)												
MIT	20.3951	20.4770	20.6258	20.8277	20.9597	20.9969	20.9998	20.9995	20.9828	20.8250	20.5825	20.3816 (87)
Th 2	20.4329	20.4349	20.4369	20.4468	20.4487	20.4587	20.4587	20.4606	20.4547	20.4487	20.4448	20.4408 (88)
util rest of house												
0.9968 0.9939 0.9833 0.9323 0.7790 0.5451 0.3796 0.4237 0.7044 0.9488 0.9919 0.9975 (89)												
MIT 2	19.6061	19.7271	19.9444	20.2373	20.4077	20.4564	20.4585	20.4604	20.4400	20.2385	19.8893	19.5929 (90)
Living area fraction												
fLA = Living area / (4) =												0.3485 (91)
MIT	19.8811	19.9885	20.1819	20.4431	20.6001	20.6447	20.6472	20.6483	20.6292	20.4429	20.1309	19.8677 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8811	19.9885	20.1819	20.4431	20.6001	20.6447	20.6472	20.6483	20.6292	20.4429	20.1309	19.8677 (93)

8. Space heating requirement

Utilisation	0.9959	0.9927	0.9814	0.9322	0.7890	0.5619	0.3981	0.4432	0.7210	0.9486	0.9906	0.9969 (94)
Useful gains	464.9664	491.4741	513.4560	520.0046	460.4368	321.3344	216.0913	225.8482	342.1590	424.8252	437.0173	447.3850 (95)
Ext temp.	4.3000	4.9000	6.5000	8.0000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
873.9973 843.2564 761.8275 630.8455 484.5684 322.8834 216.1816 226.0487 351.4507 535.9015 714.8406 865.9478 (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												
304.3189 236.3977 184.7884 79.8054 17.9539 0.0000 0.0000 0.0000 0.0000 82.6407 200.0327 311.4107 (98)												
Space heating												1417.3485 (98)
Space heating per m2												(98) / (4) = 15.0782 (99)

FULL SAP CALCULATION PRINTOUT

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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	1417.3485	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1488.2160	(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	1855.3370	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1948.1038	(310a)
Electricity used for heat distribution	34.3632	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	168.4363	(330a)
Total electricity for the above, kWh/year	168.4363	(331)
Electricity for lighting (calculated in Appendix L)	427.6519	(332)
Total delivered energy for all uses	4032.4079	(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			91.0000 (367a)
Space heating from Boilers	3776.1756	0.2160	815.6539 (367)
Electrical energy for heat distribution	34.3632	0.5190	17.8345 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			833.4884 (373)
Space and water heating			833.4884 (376)
Pumps and fans	168.4363	0.5190	87.4184 (378)
Energy for lighting	427.6519	0.5190	221.9513 (379)
Total CO2, kg/year			1142.8582 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.1600 (384)

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

DER	12.1600	ZC1
Total Floor Area	94.0000	TFA
Assumed number of occupants	2.6766	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	15.5235	ZC2
CO2 emissions from cooking, equation (L16)	1.9493	ZC3
Total CO2 emissions	29.6329	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	29.6329	ZC8

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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	94.0000 (1b)	x 2.5000 (2b)	= 235.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0000 (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) = 0.1277 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3777 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3210 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4093	0.4013	0.3932	0.3531	0.3451	0.3050	0.3050	0.2969	0.3210	0.3451	0.3611	0.3772 (22b)
Effective ac	0.5838	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.2500	1.0000	2.2500			(26)					
TER Opening Type (Uw = 1.40)			13.2600	1.3258	17.5795			(27)					
External Wall 1	57.1300	15.5100	41.6200	0.1800	7.4916			(29a)					
sheltered	29.0000		29.0000	0.1800	5.2200			(29a)					
Total net area of external elements Aum(A, m2)			86.1300					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.5411		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.6020 (36)					
Total fabric heat loss						(33) + (36) =	39.1431	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 45.2705	Feb 45.0182	Mar 44.7710	Apr 43.6098	May 43.3925	Jun 42.3811	Jul 42.3811	Aug 42.1938	Sep 42.7707	Oct 43.3925	Nov 43.8320	Dec 44.2915	(38)
Heat transfer coeff	84.4136	84.1614	83.9142	82.7529	82.5357	81.5242	81.5242	81.3369	81.9138	82.5357	82.9752	83.4347	(39)
Average = Sum(39)m / 12 =												82.7519	(39)
HLP	Jan 0.8980	Feb 0.8953	Mar 0.8927	Apr 0.8804	May 0.8780	Jun 0.8673	Jul 0.8673	Aug 0.8653	Sep 0.8714	Oct 0.8780	Nov 0.8827	Dec 0.8876	(40)
HLP (average)												0.8803	(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												2.6766 (42)	
Average daily hot water use (litres/day)												97.7695 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	107.5465	103.6357	99.7249	95.8141	91.9033	87.9926	87.9926	91.9033	95.8141	99.7249	103.6357	107.5465 (44)	
Energy conte	159.4883	139.4895	143.9406	125.4909	120.4115	103.9060	96.2842	110.4875	111.8071	130.3004	142.2331	154.4559 (45)	
Energy content (annual)											Total = Sum(45)m =	1538.2950 (45)	
Distribution loss (46)m = 0.15 x (45)m	23.9232	20.9234	21.5911	18.8236	18.0617	15.5859	14.4426	16.5731	16.7711	19.5451	21.3350	23.1684 (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													

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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	186.3222	163.7265	170.7745	151.4592	147.2454	129.8743	123.1181	137.3214	137.7754	157.1343	168.2013	181.2898 (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	186.3222	163.7265	170.7745	151.4592	147.2454	129.8743	123.1181	137.3214	137.7754	157.1343	168.2013	181.2898 (64)
	74.4970	65.7699	69.3274	62.5004	61.5039	55.3234	53.4816	58.2042	57.9505	64.7920	68.0671	72.8237 (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	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.5130	20.8840	16.9840	12.8580	9.6115	8.1144	8.7679	11.3969	15.2969	19.4229	22.6694	24.1665	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.2474	248.8027	242.3634	228.6551	211.3508	195.0872	184.2221	181.6668	188.1061	201.8144	219.1187	235.3823	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	(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)	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	(71)
Water heating gains (Table 5)	100.1303	97.8719	93.1819	86.8060	82.6666	76.8380	71.8839	78.2315	80.4868	87.0860	94.5376	97.8813	(72)
Total internal gains	436.0398	433.7077	418.6786	394.4683	369.7781	346.1888	331.0231	337.4443	350.0389	374.4724	402.4749	423.5792	(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						10.0200	10.6334	0.6300	0.7000	0.7700	32.5620	
West						3.2400	19.6403	0.6300	0.7000	0.7700	19.4475 (84)	

Solar gains	52.0095	100.2712	168.3922	261.2201	340.7805	359.5690	337.8144	275.1734	200.0009	119.2157	64.4182	43.1380 (83)
Total gains	488.0494	533.9789	587.0708	655.6884	710.5585	705.7578	668.8375	612.6177	550.0398	493.6882	466.8931	466.7172 (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	77.3309	77.5626	77.7911	78.8828	79.0904	80.0716	80.0716	80.2560	79.6908	79.0904	78.6715	78.2382	
alpha	6.1554	6.1708	6.1861	6.2589	6.2727	6.3381	6.3381	6.3504	6.3127	6.2727	6.2448	6.2159	
util living area	0.9990	0.9981	0.9943	0.9744	0.8934	0.7074	0.5315	0.6001	0.8747	0.9865	0.9979	0.9993	(86)
MIT	20.0344	20.1387	20.3364	20.6192	20.8605	20.9763	20.9966	20.9931	20.9115	20.6097	20.2780	20.0186	(87)
Th 2	20.1692	20.1715	20.1737	20.1842	20.1862	20.1954	20.1954	20.1971	20.1919	20.1862	20.1822	20.1781	(88)
util rest of house	0.9987	0.9974	0.9922	0.9647	0.8562	0.6314	0.4369	0.5009	0.8178	0.9798	0.9971	0.9990	(89)
MIT 2	18.8622	19.0165	19.3064	19.7206	20.0445	20.1791	20.1940	20.1940	20.1161	19.7128	19.2286	18.8459	(90)
Living area fraction	19.2707	19.4076	19.6654	20.0338	20.3289	20.4569	20.4737	20.4725	20.3933	20.0254	19.5943	19.2546	(92)
Temperature adjustment	19.2707	19.4076	19.6654	20.0338	20.3289	20.4569	20.4737	20.4725	20.3933	20.0254	19.5943	19.2546	(93)
adjusted MIT	19.2707	19.4076	19.6654	20.0338	20.3289	20.4569	20.4737	20.4725	20.3933	20.0254	19.5943	19.2546	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9982	0.9966	0.9905	0.9625	0.8635	0.6571	0.4700	0.5356	0.8337	0.9781	0.9962	0.9987	(94)
Ext temp.	487.1911	532.1488	581.5043	631.1184	613.5583	463.7213	314.3643	328.1477	458.5841	482.8832	465.1263	466.0934	(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	1263.7337	1220.9794	1104.7604	921.3549	712.1916	477.4809	315.8033	331.2466	515.5076	777.9301	1036.7170	1256.0751	(97)
Space heating kWh	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	577.7477	462.8942	389.3025	208.9703	73.3832	0.0000	0.0000	0.0000	0.0000	219.5148	411.5453	587.7464	(98)
Space heating per m2												2931.1044	(98)
												31.1820	(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													3134.8710 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	577.7477	462.8942	389.3025	208.9703	73.3832	0.0000	0.0000	0.0000	0.0000	219.5148	411.5453	587.7464	(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)	617.9120	495.0740	416.3663	223.4977	78.4847	0.0000	0.0000	0.0000	0.0000	234.7752	440.1554	628.6058	(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	186.3222	163.7265	170.7745	151.4592	147.2454	129.8743	123.1181	137.3214	137.7754	157.1343	168.2013	181.2898	(64)
Efficiency of water heater (217)m	87.6346	87.4367	86.9453	85.6728	83.0666	79.8000	79.8000	79.8000	79.8000	85.7057	87.1112	87.7271	(216)
Fuel for water heating, kWh/month	212.6126	187.2515	196.4160	176.7881	177.2619	162.7497	154.2833	172.0819	172.6508	183.3417	193.0881	206.6521	(219)
Water heating fuel used												2195.1776	(219)
Annual totals kWh/year													
Space heating fuel - main system												3134.8710	(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)												415.2465	(232)
Total delivered energy for all uses												5820.2951	(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	3134.8710	0.2160	677.1321 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2195.1776	0.2160	474.1584 (264)
Space and water heating			1151.2905 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	415.2465	0.5190	215.5129 (268)
Total CO2, kg/m2/year			1405.7284 (272)
Emissions per m2 for space and water heating			12.2478 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2927 (272b)
Emissions per m2 for pumps and fans			0.4141 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2478 * 1.00) + 2.2927 + 0.4141, rounded to 2 d.p.			14.9500 (273)

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Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT16			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type FT16		
Property	A2.11, Tangmere, London, N17				
SAP Rating	88 B	DER	11.01	TER	13.94
Environmental	91 B	% DER<TER	20.99		
CO ₂ Emissions (t/year)	1.06	DFEE	33.40	TFEE	43.78
General Requirements Compliance	Pass	% DFEE<TFEE	23.71		
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 123 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) 13.94 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.01 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)33.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54
Maximum	1.5 OK
MVHR efficiency:	88%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	5.28 m ² , No overhang
Windows facing East:	14.42 m ² , No overhang
Windows facing South:	4.14 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 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	122.8000 (1b)	x 2.5000 (2b)	= 307.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 307.0000 (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							2.5000					
Infiltration rate							0.1250	(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) =	0.1063 (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	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (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) =												74.8000 (23c)
Effective ac	0.2615	0.2588	0.2562	0.2429	0.2402	0.2269	0.2269	0.2243	0.2323	0.2402	0.2455	0.2508 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			23.8400	0.8687	20.7104		(27)					
External Wall 1	122.6600	26.0900	96.5700	0.1400	13.5198		(29a)					
Total net area of external elements Aum(A, m2)			122.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.9302		(33)					
Party Wall 1			31.9000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.7000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0750 (36)					
Total fabric heat loss							(33) + (36) = 49.0052 (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	26.4894	26.2203	25.9512	24.6057	24.3366	22.9910	22.9910	22.7219	23.5292	24.3366	24.8748	25.4130 (38)
	75.4946	75.2255	74.9564	73.6109	73.3418	71.9963	71.9963	71.7272	72.5345	73.3418	73.8800	74.4182 (39)
Average = Sum(39)m / 12 =												73.5436 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6148	0.6126	0.6104	0.5994	0.5972	0.5863	0.5863	0.5841	0.5907	0.5972	0.6016	0.6060 (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												2.8735 (42)
Average daily hot water use (litres/day)												102.4460 (43)
Daily hot water use	Jan 112.6906	Feb 108.5927	Mar 104.4949	Apr 100.3970	May 96.2992	Jun 92.2014	Jul 92.2014	Aug 96.2992	Oct 100.3970	Nov 104.4949	Dec 108.5927	112.6906 (44)
Energy conte	167.1168	146.1614	150.8255	131.4933	126.1710	108.8760	100.8896	115.7723	117.1550	136.5328	149.0363	161.8437 (45)
Energy content (annual)												Total = Sum(45)m = 1611.8738 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.0675	21.9242	22.6238	19.7240	18.9256	16.3314	15.1334	17.3658	17.5732	20.4799	22.3554	24.2766 (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												
	194.0437	170.4825	177.7524	157.5516	153.0978	134.9342	127.8164	142.6991	143.2132	163.4597	175.0945	188.7706 (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	194.0437	170.4825	177.7524	157.5516	153.0978	134.9342	127.8164	142.6991	143.2132	163.4597	175.0945	188.7706 (64)
								Total per year (kWh/year) = Sum(64)m =			1928.9158 (64)	
Heat gains from water heating, kWh/month												
	77.1078	68.0555	71.6910	64.5681	63.4933	57.0479	55.0873	60.0358	59.8006	66.9386	70.4012	75.3545 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.5594	23.5898	19.1845	14.5239	10.8568	9.1658	9.9039	12.8735	17.2788	21.9394	25.6065	27.2975 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8149	291.8119	284.2596	268.1816	247.8859	228.8109	216.0677	213.0707	220.6230	236.7010	256.9966	276.0716 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676 (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)	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406 (71)
Water heating gains (Table 5)	103.6396	101.2731	96.3588	89.6780	85.3405	79.2331	74.0420	80.6932	83.0564	89.9713	97.7794	101.2830 (72)
Total internal gains	485.1165	482.7775	465.9056	438.4861	410.1860	383.3125	366.1163	372.7401	387.0609	414.7144	446.4852	470.7548 (73)

[Jan]				Area	Solar flux	g	FF	Access		Gains		
				m2	Table 6a	Specific data	Specific data	factor		W		
					W/m2	or Table 6b	or Table 6c	Table 6d				
North				5.2800	10.6334	0.4000	0.7000	0.7700		10.8942 (74)		
East				14.4200	19.6403	0.4000	0.7000	0.7700		54.9546 (76)		
South				4.1400	46.7521	0.4000	0.7000	0.7700		37.5571 (78)		
Solar gains	103.4059	189.8312	290.7706	403.5841	485.2673	494.6859	471.6741	409.8726	330.2893	218.6871	126.4794	86.7268 (83)
Total gains	588.5225	672.6086	756.6762	842.0703	895.4532	877.9984	837.7905	782.6127	717.3502	633.4015	572.9646	557.4816 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	94.2980	94.6353	94.9750	96.7111	97.0659	98.8800	98.8800	99.2510	98.1463	97.0659	96.3588	95.6619
alpha	7.2865	7.3090	7.3317	7.4474	7.4711	7.5920	7.5920	7.6167	7.5431	7.4711	7.4239	7.3775
util living area												
	0.9979	0.9939	0.9775	0.9048	0.7353	0.5229	0.3780	0.4213	0.6831	0.9466	0.9941	0.9986 (86)
MIT	20.3328	20.4621	20.6557	20.8720	20.9765	20.9984	20.9999	20.9997	20.9895	20.8377	20.5455	20.3114 (87)
Th 2	20.4167	20.4187	20.4207	20.4305	20.4325	20.4424	20.4424	20.4443	20.4384	20.4325	20.4285	20.4246 (88)
util rest of house												
	0.9974	0.9924	0.9720	0.8851	0.6975	0.4781	0.3301	0.3705	0.6327	0.9308	0.9924	0.9982 (89)
MIT 2	19.5029	19.6929	19.9733	20.2798	20.4094	20.4412	20.4423	20.4442	20.4298	20.2407	19.8229	19.4781 (90)
Living area fraction												
MIT	19.8692	20.0324	20.2745	20.5412	20.6597	20.6871	20.6884	20.6894	20.6769	20.5042	20.1418	19.8459 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8692	20.0324	20.2745	20.5412	20.6597	20.6871	20.6884	20.6894	20.6769	20.5042	20.1418	19.8459 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9968	0.9911	0.9704	0.8892	0.7130	0.4979	0.3513	0.3929	0.6544	0.9330	0.9913	0.9977 (94)
Useful gains	586.6147	666.6526	734.2922	748.7510	638.4363	437.1217	294.2812	307.5135	469.4505	590.9644	568.0034	556.2096 (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	1175.3888	1138.3423	1032.4869	856.9171	657.1202	438.2475	294.3491	307.6659	477.0486	726.3928	963.5284	1164.3388 (97)
Month fracti	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	438.0479	316.9755	221.8568	77.8796	13.9008	0.0000	0.0000	0.0000	0.0000	100.7587	284.7780	452.4481 (98)
Space heating												1906.6456 (98)
Space heating per m2												15.5264 (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	1906.6456	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2001.9779	(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	1928.9158	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2025.3615	(310a)
Electricity used for heat distribution	40.2734	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	252.8145	(330a)
Total electricity for the above, kWh/year	252.8145	(331)
Electricity for lighting (calculated in Appendix L)	469.0467	(332)
Total delivered energy for all uses	4749.2006	(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			91.0000 (367a)
Space heating from Boilers	4425.6477	0.2160	955.9399 (367)
Electrical energy for heat distribution	40.2734	0.5190	20.9019 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			976.8418 (373)
Space and water heating			976.8418 (376)
Pumps and fans	252.8145	0.5190	131.2107 (378)
Energy for lighting	469.0467	0.5190	243.4352 (379)
Total CO2, kg/year			1351.4877 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.0100 (384)

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

DER		11.0100	ZC1
Total Floor Area	TFA	122.8000	
Assumed number of occupants	N	2.8735	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		13.9369	ZC2
CO2 emissions from cooking, equation (L16)		1.5307	ZC3
Total CO2 emissions		26.4776	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		26.4776	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	122.8000 (1b)	x 2.5000 (2b)	= 307.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 307.0000 (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					4 * 10 = 40.0000 (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) =					40.0000 / (5) = 0.1303 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3803 (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) = 0.3232 (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	0.4121	0.4041	0.3960	0.3556	0.3475	0.3071	0.3071	0.2990	0.3232	0.3475	0.3637	0.3798 (22b)
Effective ac	0.5849	0.5816	0.5784	0.5632	0.5604	0.5472	0.5472	0.5447	0.5522	0.5604	0.5661	0.5721 (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			2.2500	1.0000	2.2500		(26)
TER Opening Type (Uw = 1.40)			23.8400	1.3258	31.6061		(27)
External Wall 1	122.6600	26.0900	96.5700	0.1800	17.3826		(29a)
Total net area of external elements Aum(A, m2)			122.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	51.2387		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9720 (36)
Total fabric heat loss							(33) + (36) = 61.2107 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 59.2593	Feb 58.9252	Mar 58.5977	Apr 57.0595	May 56.7717	Jun 55.4319	Jul 55.4319
Heat transfer coeff	Aug 55.1838	Sep 55.9479	Oct 56.7717	Nov 57.3539	Dec 57.9626	(38)	
Average = Sum(39)m / 12 =	120.4700	120.1359	119.8084	118.2701	117.9823	116.6425	116.6425
	116.3944	117.1586	117.9823	118.5645	119.1732	(39)	
						118.2687	(39)
HLP	Jan 0.9810	Feb 0.9783	Mar 0.9756	Apr 0.9631	May 0.9608	Jun 0.9499	Jul 0.9499
HLP (average)	Aug 0.9478	Sep 0.9541	Oct 0.9608	Nov 0.9655	Dec 0.9705	(40)	
Days in month	31	28	31	30	31	30	31
							31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy											2.8735 (42)	
Average daily hot water use (litres/day)											102.4460 (43)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	112.6906	108.5927	104.4949	100.3970	96.2992	92.2014	92.2014	96.2992	100.3970	104.4949	108.5927	112.6906 (44)
Energy conte	167.1168	146.1614	150.8255	131.4933	126.1710	108.8760	100.8896	115.7723	117.1550	136.5328	149.0363	161.8437 (45)
Energy content (annual)	Total = Sum(45)m =										1611.8738 (45)	
Distribution loss (46)m = 0.15 x (45)m	25.0675	21.9242	22.6238	19.7240	18.9256	16.3314	15.1334	17.3658	17.5732	20.4799	22.3554	24.2766 (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	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)

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 (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	193.9507	170.3985	177.6594	157.4616	153.0049	134.8442	127.7235	142.6062	143.1232	163.3667	175.0045	188.6776 (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	193.9507	170.3985	177.6594	157.4616	153.0049	134.8442	127.7235	142.6062	143.1232	163.3667	175.0045	188.6776 (64)
Heat gains from water heating, kWh/month	77.0334	67.9883	71.6166	64.4962	63.4190	56.9759	55.0129	59.9614	59.7286	66.8643	70.3292	75.2801 (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	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0172	23.1082	18.7929	14.2274	10.6351	8.9786	9.7017	12.6107	16.9260	21.4915	25.0837	26.7403 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8149	291.8119	284.2596	268.1816	247.8859	228.8109	216.0677	213.0707	220.6230	236.7010	256.9966	276.0716 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676 (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)	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406 (71)
Water heating gains (Table 5)	103.5396	101.1731	96.2589	89.5780	85.2405	79.1332	73.9421	80.5933	82.9565	89.8713	97.6794	101.1830 (72)
Total internal gains	487.4744	485.1959	468.4140	441.0897	412.8643	386.0255	368.8142	375.3773	389.6082	417.1665	448.8625	473.0976 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	5.2800	10.6334	0.6300	0.7000	0.7700	17.1584 (74)
East	14.4200	19.6403	0.6300	0.7000	0.7700	86.5535 (76)
South	4.1400	46.7521	0.6300	0.7000	0.7700	59.1525 (78)

Solar gains	162.8644	298.9841	457.9637	635.6450	764.2960	779.1302	742.8868	645.5493	520.2056	344.4322	199.2050	136.5947 (83)
Total gains	650.3387	784.1800	926.3777	1076.7347	1177.1603	1165.1557	1111.7009	1020.9266	909.8138	761.5987	648.0675	609.6922 (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	70.7876	70.9844	71.1785	72.1042	72.2801	73.1104	73.1104	73.2662	72.7883	72.2801	71.9252	71.5578
alpha	5.7192	5.7323	5.7452	5.8069	5.8187	5.8740	5.8740	5.8844	5.8526	5.8187	5.7950	5.7705
util living area	0.9989	0.9966	0.9872	0.9445	0.8217	0.6230	0.4590	0.5188	0.7992	0.9754	0.9973	0.9993 (86)
MIT	19.9251	20.0900	20.3502	20.6722	20.8971	20.9837	20.9976	20.9954	20.9355	20.6165	20.2072	19.8987 (87)
Th 2	20.0992	20.1015	20.1037	20.1142	20.1162	20.1253	20.1253	20.1270	20.1218	20.1162	20.1122	20.1080 (88)
util rest of house	0.9986	0.9955	0.9828	0.9260	0.7721	0.5454	0.3692	0.4233	0.7278	0.9638	0.9962	0.9990 (89)
MIT 2	18.6500	18.8924	19.2714	19.7324	20.0186	20.1148	20.1245	20.1251	20.0714	19.6652	19.0722	18.6180 (90)
Living area fraction									fLA = Living area / (4) =			0.4414 (91)
MIT	19.2128	19.4210	19.7476	20.1472	20.4063	20.4983	20.5099	20.5093	20.4528	20.0851	19.5732	19.1833 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2128	19.4210	19.7476	20.1472	20.4063	20.4983	20.5099	20.5093	20.4528	20.0851	19.5732	19.1833 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	649.0954	779.7480	908.4121	997.9304	929.3378	674.8805	454.6178	475.3438	688.3543	733.6530	645.0029	608.8774 (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	1796.5458	1744.4936	1587.1695	1330.2073	1027.1951	687.9922	456.0552	478.2939	744.2878	1119.0720	1478.8789	1785.6051 (97)
Month fracti	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 kWh	853.7031	648.3091	504.9955	239.2394	72.8059	0.0000	0.0000	0.0000	0.0000	286.7518	600.3907	875.4854 (98)
Space heating												4081.6808 (98)
Space heating per m2												33.2384 (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													4365.4341 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	853.7031	648.3091	504.9955	239.2394	72.8059	0.0000	0.0000	0.0000	0.0000	286.7518	600.3907	875.4854	(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)	913.0514	693.3787	540.1022	255.8710	77.8672	0.0000	0.0000	0.0000	0.0000	306.6864	642.1291	936.3480	(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	193.9507	170.3985	177.6594	157.4616	153.0049	134.8442	127.7235	142.6062	143.1232	163.3667	175.0045	188.6776	(64)
Efficiency of water heater (217)m	88.3079	88.0430	87.4485	85.9268	82.9626	79.8000	79.8000	79.8000	79.8000	86.3002	87.8417	88.3985	(216)
Fuel for water heating, kWh/month	219.6300	193.5402	203.1590	183.2509	184.4264	168.9778	160.0545	178.7045	179.3524	189.3005	199.2272	213.4399	(219)
Water heating fuel used												2273.0633	(219)
Annual totals kWh/year													
Space heating fuel - main system												4365.4341	(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)												459.4711	(232)
Total delivered energy for all uses												7172.9684	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4365.4341	0.2160	942.9338 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2273.0633	0.2160	490.9817 (264)
Space and water heating			1433.9154 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	459.4711	0.5190	238.4655 (268)
Total CO2, kg/m2/year			1711.3059 (272)
Emissions per m2 for space and water heating			11.6768 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.9419 (272b)
Emissions per m2 for pumps and fans			0.3170 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.6768 * 1.00) + 1.9419 + 0.3170, rounded to 2 d.p.			13.9400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type MA01			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Flat Type MA01		
Property	B0.01, Tangmere, London, N17				
SAP Rating	86 B	DER	13.48	TER	14.93
Environmental	88 B	% DER<TER	9.70		
CO ₂ Emissions (t/year)	1.46	DFEE	46.13	TFEE	51.77
General Requirements Compliance	Pass	% DFEE<TFEE	10.89		
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

Ground-floor flat, total floor area 143 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) 14.93 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.48 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)46.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing East:	11.81 m ² , No overhang
Windows facing South:	2.52 m ² , No overhang
Windows facing West:	8.89 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Floor U-value	0.09 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 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	71.3000 (1b)	x 2.5000 (2b)	= 178.2500 (1b) - (3b)
First floor	71.3000 (1c)	x 2.9000 (2c)	= 206.7700 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	385.0200 (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								2.5000				
Infiltration rate								0.1250 (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) =	0.0969 (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)
	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (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) =												74.8000 (23c)
Effective ac	0.2495	0.2471	0.2447	0.2326	0.2301	0.2180	0.2180	0.2156	0.2229	0.2301	0.2350	0.2398 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			23.2200	0.8687	20.1718		(27)					
Heat Loss Floor 1			71.3000	0.0900	6.4170		(28a)					
External Wall 1	96.1200	25.4700	70.6500	0.1400	9.8910		(29a)					
Sheltered	52.7800		52.7800	0.2700	14.2506		(29a)					
Total net area of external elements Aum(A, m2)			220.2000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.4304		(33)					
Party Wall 1			43.7400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							265.5200 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							25.4088 (36)					
Total fabric heat loss							(33) + (36) = 78.8392 (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	31.7026	31.3949	31.0872	29.5486	29.2409	27.7023	27.7023	27.3946	28.3177	29.2409	29.8563	30.4717 (38)
Heat transfer coeff	110.5418	110.2341	109.9264	108.3878	108.0801	106.5415	106.5415	106.2338	107.1570	108.0801	108.6955	109.3110 (39)
Average = Sum(39)m / 12 =												108.3109 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7752	0.7730	0.7709	0.7601	0.7579	0.7471	0.7471	0.7450	0.7515	0.7579	0.7622	0.7666 (40)
HLP (average)												0.7595 (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												2.9219 (42)
Average daily hot water use (litres/day)												103.5946 (43)
Daily hot water use	Jan 113.9541	Feb 109.8103	Mar 105.6665	Apr 101.5227	May 97.3789	Jun 93.2351	Jul 93.2351	Aug 97.3789	Sep 101.5227	Oct 105.6665	Nov 109.8103	Dec 113.9541 (44)
Energy conte	168.9906	147.8002	152.5166	132.9677	127.5856	110.0967	102.0208	117.0703	118.4685	138.0637	150.7073	163.6583 (45)
Energy content (annual)										Total = Sum(45)m =		1629.9464 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	25.3486	22.1700	22.8775	19.9452	19.1378	16.5145	15.3031	17.5606	17.7703	20.7095	22.6061	24.5488 (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												
195.9174 172.1213 179.4435 159.0259 154.5125 136.1550 128.9476 143.9972 144.5268 164.9905 176.7655 190.5852 (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												
195.9174 172.1213 179.4435 159.0259 154.5125 136.1550 128.9476 143.9972 144.5268 164.9905 176.7655 190.5852 (64)												
Total per year (kWh/year) = Sum(64)m =												1946.9884 (64)
Heat gains from water heating, kWh/month												
77.7308 68.6004 72.2533 65.0583 63.9637 57.4538 55.4634 60.4674 60.2374 67.4476 70.9568 75.9579 (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)												
146.0939 146.0939 146.0939 146.0939 146.0939 146.0939 146.0939 146.0939 146.0939 146.0939 146.0939 146.0939 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
29.7604 26.4329 21.4967 16.2744 12.1653 10.2704 11.0976 14.4250 19.3613 24.5836 28.6927 30.5875 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
312.3493 315.5905 307.4227 290.0346 268.0852 247.4558 233.6741 230.4329 238.6007 255.9888 277.9382 298.5676 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 (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)												
-116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 (71)												
Water heating gains (Table 5)												
104.4769 102.0839 97.1146 90.3588 85.9727 79.7969 74.5476 81.2733 83.6630 90.6554 98.5511 102.0939 (72)												
Total internal gains												
513.4147 510.9355 492.8622 463.4959 433.0513 404.3513 386.1475 392.9595 408.4531 438.0560 472.0101 498.0772 (73)												

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
East		11.8100	19.6403	0.4000	0.7000	0.7700	45.0079 (76)
South		2.5200	46.7521	0.4000	0.7000	0.7700	22.8609 (78)
West		8.8900	19.6403	0.4000	0.7000	0.7700	33.8798 (80)

Solar gains	101.7485	191.7611	301.8368	424.5573	510.4211	519.0628	495.5214	431.5691	345.4008	223.4976	125.4615	84.6272 (83)
Total gains	615.1632	702.6966	794.6990	888.0532	943.4724	923.4141	881.6689	824.5286	753.8539	661.5536	597.4716	582.7044 (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 95.1454 95.4110 95.6780 97.0362 97.3125 98.7178 98.7178 99.0037 98.1508 97.3125 96.7615 96.2167												
alpha 7.3430 7.3607 7.3785 7.4691 7.4875 7.5812 7.5812 7.6002 7.5434 7.4875 7.4508 7.4144												
util living area												
0.9998 0.9993 0.9970 0.9818 0.9081 0.7175 0.5296 0.5881 0.8742 0.9921 0.9994 0.9999 (86)												
MIT												
20.1734 20.2795 20.4613 20.7040 20.9001 20.9869 20.9988 20.9974 20.9458 20.6850 20.3849 20.1567 (87)												
Th 2												
20.2749 20.2768 20.2786 20.2881 20.2899 20.2994 20.2994 20.3013 20.2956 20.2899 20.2862 20.2824 (88)												
util rest of house												
0.9997 0.9991 0.9959 0.9744 0.8750 0.6479 0.4465 0.5013 0.8198 0.9879 0.9991 0.9998 (89)												
MIT 2												
19.1430 19.2998 19.5668 19.9242 20.1884 20.2906 20.2989 20.3002 20.2503 19.9015 19.4617 19.1246 (90)												
Living area fraction												
19.4392 19.5815 19.8240 20.1484 20.3930 20.4908 20.5001 20.5007 20.4503 20.1267 19.7271 19.4213 (91)												
MIT												
19.4392 19.5815 19.8240 20.1484 20.3930 20.4908 20.5001 20.5007 20.4503 20.1267 19.7271 19.4213 (92)												
Temperature adjustment												0.0000
adjusted MIT												19.4213 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9996 0.9988 0.9949 0.9727 0.8803 0.6676 0.4705 0.5264 0.8331 0.9867 0.9988 0.9997 (94)												
Useful gains	614.9129	701.8397	790.6824	863.7806	830.5676	616.4457	414.7911	434.0115	628.0111	652.7312	596.7841	582.5460 (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												
1673.5201 1618.4002 1464.6602 1219.1862 939.5433 627.6142 415.5250 435.6281 680.4752 1029.6517 1372.5135 1663.8595 (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												
787.6037 615.9286 501.4395 255.8920 81.0779 0.0000 0.0000 0.0000 0.0000 280.4289 558.5252 804.4972 (98)												
Space heating												3885.3930 (98)
Space heating per m2												27.2468 (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	3885.3930	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	4079.6626	(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	1946.9884	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2044.3378	(310a)
Electricity used for heat distribution	61.2400	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	317.0640	(330a)
Total electricity for the above, kWh/year	317.0640	(331)
Electricity for lighting (calculated in Appendix L)	525.5772	(332)
Total delivered energy for all uses	6966.6416	(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			91.0000 (367a)
Space heating from Boilers	6729.6708	0.2160	1453.6089 (367)
Electrical energy for heat distribution	61.2400	0.5190	31.7836 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1485.3924 (373)
Space and water heating			1485.3924 (376)
Pumps and fans	317.0640	0.5190	164.5562 (378)
Energy for lighting	525.5772	0.5190	272.7746 (379)
Total CO2, kg/year			1922.7232 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4800 (384)

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

DER		13.4800	ZC1
Total Floor Area	TFA	142.6000	
Assumed number of occupants	N	2.9219	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		12.9798	ZC2
CO2 emissions from cooking, equation (L16)		1.3263	ZC3
Total CO2 emissions		27.7860	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		27.7860	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	71.3000 (1b)	x 2.5000 (2b)	= 178.2500 (1b) - (3b)
First floor	71.3000 (1c)	x 2.9000 (2c)	= 206.7700 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 385.0200 (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) =	0.1039 (8)
Pressure test											Yes	
Measured/design AP50											5.0000	
Infiltration rate											0.3539 (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) =	0.2743 (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	0.3497	0.3428	0.3360	0.3017	0.2948	0.2606	0.2606	0.2537	0.2743	0.2948	0.3085	0.3223 (22b)
Effective ac	0.5611	0.5588	0.5564	0.5455	0.5435	0.5339	0.5339	0.5322	0.5376	0.5435	0.5476	0.5519 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			23.2200	1.3258	30.7841		(27)					
Heat Loss Floor 1			71.3000	0.1300	9.2690		(28a)					
External Wall 1	96.1200	25.4700	70.6500	0.1800	12.7170		(29a)					
Sheltered	52.7800		52.7800	0.1800	9.5004		(29a)					
Total net area of external elements Aum(A, m2)			220.2000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.5205		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.0250 (36)					
Total fabric heat loss						(33) + (36) =	81.5455 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 71.2967	Feb 70.9950	Mar 70.6993	Apr 69.3105	May 69.0507	Jun 67.8411	Jul 67.8411	Aug 67.6171	Sep 68.3070	Oct 69.0507	Nov 69.5763	Dec 70.1259 (38)
Heat transfer coeff	152.8422	152.5405	152.2448	150.8560	150.5962	149.3866	149.3866	149.1626	149.8525	150.5962	151.1218	151.6714 (39)
Average = Sum(39)m / 12 =												150.8548 (39)
HLP	Jan 1.0718	Feb 1.0697	Mar 1.0676	Apr 1.0579	May 1.0561	Jun 1.0476	Jul 1.0476	Aug 1.0460	Sep 1.0509	Oct 1.0561	Nov 1.0598	Dec 1.0636 (40)
HLP (average)												1.0579 (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													2.9219 (42)
Average daily hot water use (litres/day)													103.5946 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
Energy conte	113.9541	109.8103	105.6665	101.5227	97.3789	93.2351	93.2351	97.3789	101.5227	105.6665	109.8103	113.9541 (44)	
Energy content (annual)	168.9906	147.8002	152.5166	132.9677	127.5856	110.0967	102.0208	117.0703	118.4685	138.0637	150.7073	163.6583 (45)	
Distribution loss	Total = Sum(45)m = 1629.9464 (45)												
	(46)m = 0.15 x (45)m												
Water storage loss:	25.3486	22.1700	22.8775	19.9452	19.1378	16.5145	15.3031	17.5606	17.7703	20.7095	22.6061	24.5488 (46)	
Store volume													
a) If manufacturer declared loss factor is known (kWh/day):													
Temperature factor from Table 2b													
	1.0000 (47)												
	0.2134 (48)												
	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 (58)
Total heat required for water heating calculated for each month	195.8245	172.0373	179.3505	158.9359	154.4195	136.0650	128.8547	143.9042	144.4368	164.8975	176.6756	190.4922 (59)
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	195.8245	172.0373	179.3505	158.9359	154.4195	136.0650	128.8547	143.9042	144.4368	164.8975	176.6756	190.4922 (64)
								Total per year (kWh/year) =	Sum(64)m =			1945.8937 (64)
Heat gains from water heating, kWh/month	77.6565	68.5332	72.1789	64.9864	63.8893	57.3818	55.3890	60.3930	60.1654	67.3733	70.8848	75.8835 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9520	25.7149	20.9128	15.8323	11.8348	9.9915	10.7961	14.0332	18.8354	23.9158	27.9133	29.7566 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.3493	315.5905	307.4227	290.0346	268.0852	247.4558	233.6741	230.4329	238.6007	255.9888	277.9382	298.5676 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094 (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)	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751 (71)
Water heating gains (Table 5)	104.3770	101.9840	97.0146	90.2588	85.8728	79.6969	74.4476	81.1734	83.5631	90.5555	98.4511	101.9940 (72)
Total internal gains	515.5064	513.1175	495.1783	465.9539	435.6209	406.9724	388.7460	395.4677	410.8273	440.2883	474.1308	500.1464 (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	11.8100	19.6403	0.6300	0.7000	0.7700	70.8874 (76)
South	2.5200	46.7521	0.6300	0.7000	0.7700	36.0059 (78)
West	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (80)

MIT	19.7459	19.9023	20.1684	20.5139	20.8007	20.9538	20.9913	20.9846	20.8671	20.4747	20.0426	19.7187 (87)
Th 2	20.0239	20.0256	20.0274	20.0354	20.0369	20.0439	20.0439	20.0452	20.0412	20.0369	20.0338	20.0307 (88)
util rest of house												
	0.9992	0.9975	0.9904	0.9571	0.8487	0.6380	0.4371	0.4994	0.8129	0.9805	0.9979	0.9994 (89)
MIT 2	18.3329	18.5629	18.9518	19.4528	19.8371	20.0124	20.0405	20.0385	19.9291	19.4045	18.7743	18.2980 (90)
Living area fraction									fLA = Living area / (4) =			0.2875 (91)
MIT	18.7392	18.9480	19.3016	19.7578	20.1142	20.2830	20.3139	20.3105	20.1988	19.7122	19.1389	18.7064 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7392	18.9480	19.3016	19.7578	20.1142	20.2830	20.3139	20.3105	20.1988	19.7122	19.1389	18.7064 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9987	0.9964	0.9877	0.9528	0.8525	0.6610	0.4701	0.5333	0.8248	0.9774	0.9970	0.9991 (94)
Useful gains	674.8950	812.2049	958.6238	1081.0398	1056.6932	809.4299	549.6303	573.4473	787.5747	774.3589	669.7154	632.8590 (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	2206.9112	2142.8945	1948.9792	1637.9711	1267.1452	848.9689	554.8047	583.3062	913.9186	1372.2642	1819.3472	2200.2123 (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	1139.8200	894.2234	736.8244	400.9905	156.5763	0.0000	0.0000	0.0000	0.0000	444.8416	827.7349	1166.1108 (98)
Space heating												5767.1220 (98)
Space heating per m2										(98) / (4) =		

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

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												6168.0449 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1139.8200	894.2234	736.8244	400.9905	156.5763	0.0000	0.0000	0.0000	0.0000	444.8416	827.7349	1166.1108 (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)	1219.0589	956.3886	788.0475	428.8668	167.4613	0.0000	0.0000	0.0000	0.0000	475.7664	885.2779	1247.1774 (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	195.8245	172.0373	179.3505	158.9359	154.4195	136.0650	128.8547	143.9042	144.4368	164.8975	176.6756	190.4922 (64)
Efficiency of water heater (217)m	88.7552	88.5836	88.1853	87.1818	84.8508	79.8000	79.8000	79.8000	79.8000	87.3331	88.4147	79.8000 (216)
Fuel for water heating, kWh/month	220.6344	194.2090	203.3792	182.3040	181.9894	170.5075	161.4720	180.3311	180.9985	188.8144	199.8260	214.4517 (219)
Water heating fuel used												2278.9173 (219)
Annual totals kWh/year												
Space heating fuel - main system												6168.0449 (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)												511.3010 (232)
Total delivered energy for all uses												9033.2631 (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	6168.0449	0.2160	1332.2977 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2278.9173	0.2160	492.2461 (264)
Space and water heating			1824.5438 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	511.3010	0.5190	265.3652 (268)
Total CO2, kg/m2/year			2128.8340 (272)
Emissions per m2 for space and water heating			12.7948 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.8609 (272b)
Emissions per m2 for pumps and fans			0.2730 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7948 * 1.00) + 1.8609 + 0.2730, rounded to 2 d.p.			14.9300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Townhouse Type TH01			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Townhouse Type TH01		
Property	TH0.10, Tangmere, London, N17				
SAP Rating	85 B	DER	14.48	TER	15.62
Environmental	87 B	% DER<TER	7.29		
CO ₂ Emissions (t/year)	1.48	DFEE	47.12	TFEE	53.22
General Requirements Compliance	Pass	% DFEE<TFEE	11.46		
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 House, total floor area 129 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) 15.62 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.48 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 47.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	0.91 (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: 1.80 (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, 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: 0.85

Maximum 1.5 OK

MVHR efficiency: 87% OK

Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading: Average

Windows facing North: 8.96 m², No overhang

Windows facing South: 12.76 m², No overhang

Air change rate: 6.00 ach

Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.11 W/m²K

Floor U-value 0.11 W/m²K

Door U-value 1.00 W/m²K

Window U-value 0.90 W/m²K

Air permeability 1.8 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	52.7000 (1b)	x 2.5000 (2b)	= 131.7500 (1b) - (3b)
First floor	38.2500 (1c)	x 3.1000 (2c)	= 118.5750 (1c) - (3c)
Second floor	38.2500 (1d)	x 3.1000 (2d)	= 118.5750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 368.9000 (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												1.8000
Infiltration rate												0.0900 (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) =	0.0698 (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				0.0767	0.0750	0.0663	0.0663	0.0645	0.0698	0.0750	0.0785	0.0820 (22b)
Balanced mechanical ventilation with heat recovery	0.0889	0.0872	0.0854									
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.9500 (23c)
Effective ac	0.2192	0.2174	0.2157	0.2070	0.2052	0.1965	0.1965	0.1948	0.2000	0.2052	0.2087	0.2122 (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			2.2500	1.0000	2.2500		(26)
Windows (Uw = 0.90)			21.7200	0.8687	18.8687		(27)
Heat Loss Floor 1			52.7000	0.1100	5.7970		(28a)
External Wall 1	93.9800	23.9700	70.0100	0.1400	9.8014		(29a)
Main Roof	38.2500		38.2500	0.1100	4.2075		(30)
Terrace	14.4600		14.4600	0.1800	2.6028		(30)
Total net area of external elements Aum(A, m ²)				199.3900			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.5274		(32)
Party Wall 1			147.2800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.2300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							33.8926 (36)
Total fabric heat loss							(33) + (36) = 77.4200 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.6825	26.4702	26.2579	25.1965	24.9842	23.9228	23.9228	23.7106	24.3474	24.9842	25.4088	25.8334 (38)
Heat transfer coeff	104.1025	103.8902	103.6779	102.6165	102.4043	101.3429	101.3429	101.1306	101.7674	102.4043	102.8288	103.2534 (39)
Average = Sum(39)m / 12 =												102.5635 (39)
HLP	0.8057	0.8041	0.8025	0.7942	0.7926	0.7844	0.7844	0.7827	0.7877	0.7926	0.7959	0.7992 (40)
HLP (average)												0.7938 (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												2.8929 (42)
Average daily hot water use (litres/day)												102.9060 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	113.1967	109.0804	104.9642	100.8479	96.7317	92.6154	92.6154	96.7317	100.8479	104.9642	109.0804	113.1967 (44)
	167.8674	146.8179	151.5029	132.0839	126.7376	109.3649	101.3427	116.2922	117.6811	137.1460	149.7056	162.5706 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1619.1129	(45)
Distribution loss (46)m = 0.15 x (45)m														
25.1801	22.0227	22.7254	19.8126	19.0106	16.4047	15.2014	17.4438	17.6522	20.5719	22.4558	24.3856	(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														
194.7942	171.1389	178.4297	158.1421	153.6645	135.4232	128.2696	143.2191	143.7394	164.0729	175.7638	189.4974	(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														
194.7942	171.1389	178.4297	158.1421	153.6645	135.4232	128.2696	143.2191	143.7394	164.0729	175.7638	189.4974	(64)		
												Total per year (kWh/year) = Sum(64)m =	1936.1548	(64)
Heat gains from water heating, kWh/month														
77.3574	68.2738	71.9162	64.7645	63.6817	57.2104	55.2379	60.2086	59.9756	67.1425	70.6237	75.5962	(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 144.6443 144.6443 144.6443 144.6443 144.6443 144.6443 144.6443 144.6443 144.6443 144.6443 144.6443 144.6443	(66)										
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
28.0819 24.9421 20.2843 15.3565 11.4791 9.6912 10.4717 13.6115 18.2693 23.1970 27.0744 28.8623	(67)										
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
296.7538 299.8331 292.0732 275.5532 254.6998 235.1004 222.0068 218.9275 226.6874 243.2074 264.0609 283.6602	(68)										
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
37.4644 37.4644 37.4644 37.4644 37.4644 37.4644 37.4644 37.4644 37.4644 37.4644 37.4644 37.4644	(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)											
-115.7155 -115.7155 -115.7155 -115.7155 -115.7155 -115.7155 -115.7155 -115.7155 -115.7155 -115.7155 -115.7155 -115.7155	(71)										
Water heating gains (Table 5)											
103.9750 101.5979 96.6615 89.9507 85.5937 79.4589 74.2445 80.9256 83.2994 90.2453 98.0885 101.6078	(72)										
Total internal gains											
495.2039 492.7664 475.4123 447.2537 418.1659 390.6438 373.1163 379.8578 394.6494 423.0430 455.6170 480.5236	(73)										

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	or Table 6b	or Table 6c	factor	W
		W/m2			Table 6d	
North	8.9600	10.6334	0.4000	0.7000	0.7700	18.4872 (74)
South	12.7600	46.7521	0.4000	0.7000	0.7700	115.7558 (78)
Solar gains	134.2430	224.9081	301.5232	369.3654	414.3157	412.7733
Total gains	629.4469	717.6745	776.9355	816.6191	832.4817	803.4171
						770.3811
						742.5771
						719.0938
						669.5766
						615.6334
						595.9591 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)										
Utilisation factor for gains for living area, nil,m (see Table 9a)											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec											
tau 71.7864 71.9331 72.0804 72.8259 72.9769 73.7412 73.7412 73.8960 73.4335 72.9769 72.6756 72.3767											
alpha 5.7858 5.7955 5.8054 5.8551 5.8651 5.9161 5.9161 5.9264 5.8956 5.8651 5.8450 5.8251											
util living area 0.9982 0.9958 0.9894 0.9688 0.9052 0.7505 0.5690 0.6112 0.8446 0.9745 0.9958 0.9987	(86)										
MIT 19.9978 20.1348 20.3363 20.5922 20.8200 20.9586 20.9931 20.9897 20.9140 20.6265 20.2615 19.9698	(87)										
Th 2 20.2484 20.2498 20.2512 20.2583 20.2597 20.2669 20.2669 20.2683 20.2640 20.2597 20.2569 20.2540	(88)										
util rest of house 0.9977 0.9946 0.9864 0.9592 0.8754 0.6838 0.4790 0.5212 0.7907 0.9648 0.9945 0.9983	(89)										
MIT 2 18.8835 19.0846 19.3788 19.7515 20.0638 20.2338 20.2634 20.2627 20.1861 19.8047 19.2754 18.8469	(90)										
Living area fraction fLA = Living area / (4) =	0.2124 (91)										
MIT 19.1202 19.3077 19.5821 19.9301 20.2244 20.3877 20.4184 20.4171 20.3407 19.9792 19.4848 19.0854	(92)										
Temperature adjustment	0.0000										
adjusted MIT 19.1202 19.3077 19.5821 19.9301 20.2244 20.3877 20.4184 20.4171 20.3407 19.9792 19.4848 19.0854	(93)										

8. Space heating requirement

Utilisation 0.9967 0.9926 0.9828 0.9539 0.8738 0.6955 0.4980 0.5400 0.7970 0.9602 0.9926 0.9975	(94)										
Useful gains 627.3597 712.3638 763.5658 778.9692 727.4257 558.7788 383.6633 401.0175 573.1083 642.8963 611.0594 594.4933	(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 1542.8163 1496.8161 1356.3281 1131.8695 872.9324 586.5447 386.9691 406.2553 635.1024 960.4705 1273.5184 1536.9667	(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 681.0997 527.1520 441.0152 254.0882 108.2570 0.0000 0.0000 0.0000 0.0000 236.2753 476.9705 701.2002	(98)										
Space heating	3426.0580 (98)										

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2 (98) / (4) = 26.5175 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community 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	3426.0580 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	3597.3609 (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	1936.1548 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2032.9626 (310a)
Electricity used for heat distribution	56.3032 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0625)	
mechanical ventilation fans (SFP = 1.0625)	478.1866 (330a)
Total electricity for the above, kWh/year	478.1866 (331)
Electricity for lighting (calculated in Appendix L)	495.9345 (332)
Total delivered energy for all uses	6604.4446 (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			91.0000 (367a)
Space heating from Boilers	6187.1686	0.2160	1336.4284 (367)
Electrical energy for heat distribution	56.3032	0.5190	29.2214 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1365.6498 (373)
Space and water heating			1365.6498 (376)
Pumps and fans	478.1866	0.5190	248.1789 (378)
Energy for lighting	495.9345	0.5190	257.3900 (379)
Total CO2, kg/year			1871.2187 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4800 (384)

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

DER		14.4800 ZC1
Total Floor Area	TFA	129.2000
Assumed number of occupants	N	2.8929
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		13.6107 ZC2
CO2 emissions from cooking, equation (L16)		1.4584 ZC3
Total CO2 emissions		29.5491 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		29.5491 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)
First floor	38.2500 (1c)	x 3.1000 (2c)	= 118.5750 (1c) - (3c)
Second floor	38.2500 (1d)	x 3.1000 (2d)	= 118.5750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 368.9000 (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					4 * 10 = 40.0000 (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 40.0000 / (5) = 0.1084 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3584 (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) =		0.2778 (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	0.3542	0.3472	0.3403	0.3056	0.2986	0.2639	0.2639	0.2569	0.2778	0.2986	0.3125	0.3264 (22b)
Effective ac	0.5627	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5488	0.5533 (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			2.2500	1.0000	2.2500		(26)
TER Opening Type (Uw = 1.40)			21.7200	1.3258	28.7955		(27)
Heat Loss Floor 1			52.7000	0.1300	6.8510		(28a)
External Wall 1	93.9800	23.9700	70.0100	0.1800	12.6018		(29a)
Main Roof	38.2500		38.2500	0.1300	4.9725		(30)
Terrace	14.4600		14.4600	0.1300	1.8798		(30)
Total net area of external elements Aum(A, m ²)			199.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.3506		(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)							22.3210 (36)
Total fabric heat loss						(33) + (36) =	79.6716 (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	68.5038	68.2073	67.9167	66.5517	66.2963	65.1074	65.1074	64.8872	65.5653	66.2963	66.8129	67.3531 (38)
Heat transfer coeff	148.1754	147.8789	147.5883	146.2232	145.9678	144.7790	144.7790	144.5588	145.2369	145.9678	146.4845	147.0246 (39)
Average = Sum(39)m / 12 =												146.2220 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1469	1.1446	1.1423	1.1318	1.1298	1.1206	1.1206	1.1189	1.1241	1.1298	1.1338	1.1380 (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												2.8929 (42)
Average daily hot water use (litres/day)												102.9060 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.1967	109.0804	104.9642	100.8479	96.7317	92.6154	92.6154	96.7317	100.8479	104.9642	109.0804	113.1967 (44)
Energy conte	167.8674	146.8179	151.5029	132.0839	126.7376	109.3649	101.3427	116.2922	117.6811	137.1460	149.7056	162.5706 (45)
Energy content (annual)										Total = Sum(45)m =		1619.1129 (45)
Distribution loss (46)m = 0.15 x (45)m	25.1801	22.0227	22.7254	19.8126	19.0106	16.4047	15.2014	17.4438	17.6522	20.5719	22.4558	24.3856 (46)
Water storage loss:												
Store volume												1.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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												
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	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
194.7012	171.0549	178.3368	158.0522	153.5715	135.3332	128.1766	143.1261	143.6494	163.9799	175.6739	189.4045	(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	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
194.7012	171.0549	178.3368	158.0522	153.5715	135.3332	128.1766	143.1261	143.6494	163.9799	175.6739	189.4045	(64)
Heat gains from water heating, kWh/month												
77.2830	68.2066	71.8418	64.6925	63.6074	57.1385	55.1636	60.1343	59.9036	67.0682	70.5517	75.5218	(65)
Total per year (kWh/year) = Sum(64)m =												1935.0601 (64)

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	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
27.3413	24.2843	19.7493	14.9515	11.1764	9.4356	10.1955	13.2525	17.7875	22.5853	26.3604	28.1012	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
296.7538	299.8331	292.0732	275.5532	254.6998	235.1004	222.0068	218.9275	226.6874	243.2074	264.0609	283.6602	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	(71)
Water heating gains (Table 5)												
103.8750	101.4979	96.5616	89.8507	85.4938	79.3590	74.1446	80.8256	83.1994	90.1454	97.9885	101.5078	(72)
Total internal gains												
497.3634	495.0086	477.7774	449.7488	420.7632	393.2883	375.7402	382.3989	397.0676	425.3313	457.8030	482.6625	(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					8.9600	10.6334	0.6300	0.7000			0.7700			29.1173
South					12.7600	46.7521	0.6300	0.7000			0.7700			182.3154 (78)
Solar gains	211.4327	354.2303	474.8991	581.7505	652.5473	650.1180	625.6919	571.2828	510.9999	388.2904	252.0259	181.8109 (83)		
Total gains	708.7961	849.2390	952.6765	1031.4992	1073.3105	1043.4062	1001.4322	953.6817	908.0675	813.6217	709.8289	664.4734 (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	60.5514	60.6728	60.7923	61.3598	61.4671	61.9719	61.9719	62.0663	61.7765	61.4671	61.2503	61.0253
alpha	5.0368	5.0449	5.0528	5.0907	5.0978	5.1315	5.1315	5.1378	5.1184	5.0978	5.0834	5.0684
util living area												
	0.9987	0.9964	0.9906	0.9722	0.9170	0.7835	0.6119	0.6601	0.8749	0.9803	0.9969	0.9991 (86)
MIT	19.7151	19.8834	20.1292	20.4410	20.7276	20.9203	20.9823	20.9741	20.8483	20.4743	20.0315	19.6842 (87)
Th 2	19.9627	19.9646	19.9664	19.9750	19.9766	19.9841	19.9841	19.9854	19.9812	19.9766	19.9733	19.9700 (88)
util rest of house												
	0.9982	0.9952	0.9872	0.9610	0.8812	0.6963	0.4828	0.5324	0.8099	0.9701	0.9956	0.9987 (89)
MIT 2	18.2442	18.4912	18.8501	19.3039	19.6963	19.9273	19.9771	19.9741	19.8542	19.3575	18.7144	18.2041 (90)
Living area fraction									fLA = Living area / (4) =			0.2124 (91)
MIT	18.5566	18.7869	19.1218	19.5454	19.9153	20.1382	20.1906	20.1865	20.0653	19.5947	18.9941	18.5185 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5566	18.7869	19.1218	19.5454	19.9153	20.1382	20.1906	20.1865	20.0653	19.5947	18.9941	18.5185 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9973	0.9931	0.9832	0.9548	0.8786	0.7110	0.5103	0.5594	0.8163	0.9649	0.9938	0.9980 (94)
Useful gains	706.8694	843.4212	936.6833	984.8613	943.0588	741.8221	511.0424	533.4560	741.2483	785.0950	705.4294	663.1555 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	2112.4705	2053.5738	1862.8277	1556.6100	1199.1757	801.8143	519.8452	547.3730	866.3880	1312.9349	1742.3023	2105.1690 (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												
	1045.7672	813.2226	689.0514	411.6591	190.5510	0.0000	0.0000	0.0000	0.0000	392.7129	746.5484	1072.8580 (98)
Space heating												5362.3707 (98)
Space heating per m2											(98) / (4) =	41.5044 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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													5735.1558	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1045.7672	813.2226	689.0514	411.6591	190.5510	0.0000	0.0000	0.0000	0.0000	392.7129	746.5484	1072.8580	(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)	1118.4676	869.7568	736.9534	440.2771	203.7979	0.0000	0.0000	0.0000	0.0000	420.0138	798.4475	1147.4417	(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	194.7012	171.0549	178.3368	158.0522	153.5715	135.3332	128.1766	143.1261	143.6494	163.9799	175.6739	189.4045	(64)	
Efficiency of water heater (217)m	88.6346	88.4392	88.0720	87.2543	85.3904	79.8000	79.8000	79.8000	79.8000	87.0614	88.2460	88.7151	(217)	
Fuel for water heating, kWh/month	219.6673	193.4154	202.4897	181.1398	179.8464	169.5905	160.6223	179.3560	180.0118	188.3497	199.0728	213.4975	(219)	
Water heating fuel used												2267.0590	(219)	
Annual totals kWh/year														
Space heating fuel - main system												5735.1558	(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)												482.8560	(232)	
Total delivered energy for all uses												8560.0709	(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	5735.1558	0.2160	1238.7937 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2267.0590	0.2160	489.6848 (264)
Space and water heating			1728.4784 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	482.8560	0.5190	250.6022 (268)
Total CO2, kg/m2/year			2018.0057 (272)
Emissions per m2 for space and water heating			13.3783 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.9396 (272b)
Emissions per m2 for pumps and fans			0.3013 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3783 * 1.00) + 1.9396 + 0.3013, rounded to 2 d.p.			15.6200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Townhouse Type TH04			Issued on Date	20/03/2026
Assessment Reference	Be Lean	Prop Type Ref	Townhouse Type TH04		
Property	TH0.15, Tangmere, London, N17				
SAP Rating	84 B	DER	15.64	TER	17.38
Environmental	86 B	% DER<TER	10.03		
CO ₂ Emissions (t/year)	1.67	DFEE	52.55	TFEE	64.79
General Requirements Compliance	Pass	% DFEE<TFEE	18.90		
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 House, total floor area 134 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) 17.38 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.64 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 64.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 52.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	0.91 (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: 1.80 (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, 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: 0.85

Maximum 1.5 OK

MVHR efficiency: 87% OK

Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading: Average

Windows facing North: 12.86 m², No overhang

Windows facing East: 3.78 m², No overhang

Windows facing South: 14.73 m², No overhang

Air change rate: 6.00 ach

Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.11 W/m²K

Floor U-value 0.11 W/m²K

Door U-value 1.00 W/m²K

Window U-value 0.90 W/m²K

Air permeability 1.8 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	49.0000 (1b)	x 2.5000 (2b)	= 122.5000 (1b) - (3b)
First floor	49.9000 (1c)	x 3.1000 (2c)	= 154.6900 (1c) - (3c)
Second floor	35.2900 (1d)	x 3.1000 (2d)	= 109.3990 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.5890 (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							1.8000					
Infiltration rate							0.0900	(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) =	0.0698	(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)
	0.0889	0.0872	0.0854	0.0767	0.0750	0.0663	0.0663	0.0645	0.0698	0.0750	0.0785	0.0820 (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)											
	73.9500 (23c)											
Effective ac	0.2192	0.2174	0.2157	0.2070	0.2052	0.1965	0.1965	0.1948	0.2000	0.2052	0.2087	0.2122 (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			2.2500	1.0000	2.2500		(26)
Windows (Uw = 0.90)			31.3700	0.8687	27.2519		(27)
Heat Loss Floor 1			49.0000	0.1100	5.3900		(28a)
External Wall 1	190.4400	33.6200	156.8200	0.1400	21.9548		(29a)
Main Roof	35.2900		35.2900	0.1100	3.8819		(30)
Terrace	14.0000		14.0000	0.1800	2.5200		(30)
Total net area of external elements Aum(A, m ²)			288.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.2486		(32)
Party Wall 1			58.3600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.5200 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							35.7650 (36)
Total fabric heat loss						(33) + (36) =	99.0136 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.9619	27.7395	27.5170	26.4047	26.1822	25.0700	25.0700	24.8475	25.5149	26.1822	26.6272	27.0721 (38)
Heat transfer coeff	126.9755	126.7530	126.5306	125.4183	125.1958	124.0835	124.0835	123.8611	124.5285	125.1958	125.6408	126.0857 (39)
Average = Sum(39)m / 12 =												125.3627 (39)
HLP	0.9462	0.9446	0.9429	0.9346	0.9330	0.9247	0.9247	0.9230	0.9280	0.9330	0.9363	0.9396 (40)
HLP (average)												0.9342 (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												2.9051 (42)
Average daily hot water use (litres/day)												103.1960 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	113.5156	109.3878	105.2599	101.1321	97.0043	92.8764	92.8764	97.0043	101.1321	105.2599	109.3878	113.5156 (44)
	168.3404	147.2316	151.9298	132.4561	127.0948	109.6731	101.6283	116.6199	118.0127	137.5325	150.1274	163.0287 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	Total = Sum (45)m = 1623.6753 (45)										
Distribution loss (46)m = 0.15 x (45)m											
25.2511 22.0847 22.7895 19.8684 19.0642 16.4510 15.2442 17.4930 17.7019 20.6299 22.5191 24.4543 (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											
195.2672 171.5526 178.8567 158.5143 154.0216 135.7314 128.5551 143.5468 144.0710 164.4593 176.1857 189.9555 (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											
195.2672 171.5526 178.8567 158.5143 154.0216 135.7314 128.5551 143.5468 144.0710 164.4593 176.1857 189.9555 (64)											
Total per year (kWh/year) = Sum (64)m =	1940.7172 (64)										
Heat gains from water heating, kWh/month											
77.5147 68.4113 72.0581 64.8882 63.8005 57.3129 55.3329 60.3176 60.0858 67.2710 70.7640 75.7485 (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 145.2548 145.2548 145.2548 145.2548 145.2548 145.2548 145.2548 145.2548 145.2548 145.2548 145.2548 145.2548 (66)											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
27.1171 24.0851 19.5874 14.8289 11.0848 9.3582 10.1119 13.1438 17.6416 22.4001 26.1442 27.8707 (67)											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
302.7029 305.8440 297.9285 281.0774 259.8058 239.8136 226.4575 223.3164 231.2319 248.0830 269.3546 289.3468 (68)											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
37.5255 37.5255 37.5255 37.5255 37.5255 37.5255 37.5255 37.5255 37.5255 37.5255 37.5255 37.5255 (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)											
-116.2038 -116.2038 -116.2038 -116.2038 -116.2038 -116.2038 -116.2038 -116.2038 -116.2038 -116.2038 -116.2038 -116.2038 (71)											
Water heating gains (Table 5)											
104.1864 101.8026 96.8523 90.1226 85.7533 79.6013 74.3722 81.0721 83.4525 90.4180 98.2833 101.8125 (72)											
Total internal gains											
500.5828 498.3082 480.9446 452.6053 423.2204 395.3495 377.5180 384.1087 398.9025 427.4776 460.3585 485.6066 (73)											

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	12.8600	10.6334	0.4000	0.7000	0.7700	26.5341 (74)
East	3.7800	19.6403	0.4000	0.7000	0.7700	14.4056 (76)
South	14.7300	46.7521	0.4000	0.7000	0.7700	133.6272 (78)
Solar gains	174.5668	297.7352	411.3464	521.1613	597.7180	600.4749
Total gains	675.1496	796.0434	892.2911	973.7666	1020.9384	995.8244

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	62.3875	62.4970	62.6069	63.1621	63.2743	63.8415	63.8415	63.9562	63.6134	63.2743	63.0503	62.8278
alpha	5.1592	5.1665	5.1738	5.2108	5.2183	5.2561	5.2561	5.2637	5.2409	5.2183	5.2034	5.1885
util living area	0.9981	0.9953	0.9875	0.9621	0.8889	0.7326	0.5592	0.6102	0.8454	0.9744	0.9958	0.9986 (86)
MIT	19.8010	19.9648	20.2091	20.5175	20.7865	20.9462	20.9893	20.9834	20.8813	20.5311	20.1031	19.7681 (87)
Th 2	20.1284	20.1298	20.1312	20.1382	20.1396	20.1466	20.1466	20.1480	20.1438	20.1396	20.1368	20.1340 (88)
util rest of house	0.9976	0.9939	0.9838	0.9500	0.8532	0.6571	0.4573	0.5074	0.7860	0.9639	0.9944	0.9983 (89)
MIT 2	18.5061	18.7463	19.1022	19.5486	19.9137	20.1053	20.1416	20.1395	20.0385	19.5743	18.9539	18.4622 (90)
Living area fraction									fLA = Living area / (4) =			0.1139 (91)
MIT	18.6536	18.8850	19.2283	19.6589	20.0131	20.2010	20.2381	20.2356	20.1345	19.6832	19.0847	18.6109 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6536	18.8850	19.2283	19.6589	20.0131	20.2010	20.2381	20.2356	20.1345	19.6832	19.0847	18.6109 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9962 0.9911 0.9784 0.9414 0.8471 0.6623 0.4685 0.5184 0.7852 0.9565 0.9918 0.9972 (94)												
Useful gains 672.6124 788.9825 873.0412 916.7216 864.8824 659.5573 446.7131 467.2117 665.6386 724.3686 663.9346 633.2698 (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												
1822.5514 1772.6449 1610.5153 1349.3641 1040.7663 694.9960 451.4274 475.0786 751.4651 1137.1804 1505.7708 1817.0072 (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	855.5546	661.0211	548.6807	311.5026	130.8576	0.0000	0.0000	0.0000	0.0000	307.1320	606.1221	880.7006 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating			4301.5714 (98)
Space heating per m2	(98) / (4) =		32.0558 (99)

8c. Space cooling requirement			
Not applicable			

9b. Energy requirements			

Fraction of space heat from secondary/supplementary system (Table 11)			0.0000 (301)
Fraction of space heat from community system			1.0000 (302)
Fraction of heat from community 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			4301.5714 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05			4516.6500 (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			1940.7172 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05			2037.7531 (310a)
Electricity used for heat distribution			65.5440 (313)
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0625)			
mechanical ventilation fans (SFP = 1.0625)			501.1160 (330a)
Total electricity for the above, kWh/year			501.1160 (331)
Electricity for lighting (calculated in Appendix L)			478.8961 (332)
Total delivered energy for all uses			7534.4151 (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			91.0000 (367a)
Space heating from Boilers	7202.6407	0.2160	1555.7704 (367)
Electrical energy for heat distribution	65.5440	0.5190	34.0174 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1589.7878 (373)
Space and water heating			1589.7878 (376)
Pumps and fans	501.1160	0.5190	260.0792 (378)
Energy for lighting	478.8961	0.5190	248.5471 (379)
Total CO2, kg/year			2098.4140 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES			
DER			15.6400 ZC1
Total Floor Area		TFA	134.1900
Assumed number of occupants		N	2.9051
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			13.3673 ZC2
CO2 emissions from cooking, equation (L16)			1.4064 ZC3
Total CO2 emissions			30.4136 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			30.4136 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	49.0000 (1b)	x 2.5000 (2b)	= 122.5000 (1b) - (3b)
First floor	49.9000 (1c)	x 3.1000 (2c)	= 154.6900 (1c) - (3c)
Second floor	35.2900 (1d)	x 3.1000 (2d)	= 109.3990 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.5890 (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					4 * 10 = 40.0000 (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 40.0000 / (5) = 0.1035 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3535 (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) =		0.2739 (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	0.3493	0.3424	0.3356	0.3013	0.2945	0.2602	0.2602	0.2534	0.2739	0.2945	0.3082	0.3219 (22b)
Effective ac	0.5610	0.5586	0.5563	0.5454	0.5434	0.5339	0.5339	0.5321	0.5375	0.5434	0.5475	0.5518 (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			2.2500	1.0000	2.2500		(26)
TER Opening Type (Uw = 1.40)			31.3000	1.3258	41.4962		(27)
Heat Loss Floor 1			49.0000	0.1300	6.3700		(28a)
External Wall 1	190.4400	33.5500	156.8900	0.1800	28.2402		(29a)
Main Roof	35.2900		35.2900	0.1300	4.5877		(30)
Terrace	14.0000		14.0000	0.1300	1.8200		(30)
Total net area of external elements Aum(A, m ²)			288.7300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		84.7641		(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)							30.8680 (36)
Total fabric heat loss						(33) + (36) =	115.6321 (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	71.5686	71.2665	70.9703	69.5791	69.3189	68.1072	68.1072	67.8828	68.5739	69.3189	69.8454	70.3959 (38)
Heat transfer coeff	187.2007	186.8986	186.6024	185.2112	184.9510	183.7393	183.7393	183.5149	184.2060	184.9510	185.4775	186.0280 (39)
Average = Sum(39)m / 12 =												185.2100 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3950	1.3928	1.3906	1.3802	1.3783	1.3692	1.3692	1.3676	1.3727	1.3783	1.3822	1.3863 (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												2.9051 (42)
Average daily hot water use (litres/day)												103.1960 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.5156	109.3878	105.2599	101.1321	97.0043	92.8764	92.8764	97.0043	101.1321	105.2599	109.3878	113.5156 (44)
Energy conte	168.3404	147.2316	151.9298	132.4561	127.0948	109.6731	101.6283	116.6199	118.0127	137.5325	150.1274	163.0287 (45)
Energy content (annual)										Total = Sum(45)m =		1623.6753 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2511	22.0847	22.7895	19.8684	19.0642	16.4510	15.2442	17.4930	17.7019	20.6299	22.5191	24.4543 (46)
Water storage loss:												
Store volume												1.0000 (47)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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												
	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	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
	195.1743	171.4686	178.7637	158.4244	153.9286	135.6414	128.4621	143.4538	143.9810	164.3663	176.0957	189.8626 (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												
	195.1743	171.4686	178.7637	158.4244	153.9286	135.6414	128.4621	143.4538	143.9810	164.3663	176.0957	189.8626 (64)
								Total per year (kWh/year) = Sum(64)m =				1939.6225 (64)
Heat gains from water heating, kWh/month												
	77.4403	68.3441	71.9838	64.8163	63.7261	57.2409	55.2585	60.2432	60.0139	67.1966	70.6920	75.6741 (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	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	26.9862	23.9689	19.4928	14.7573	11.0313	9.3131	10.0631	13.0804	17.5565	22.2920	26.0180	27.7362 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	302.7029	305.8440	297.9285	281.0774	259.8058	239.8136	226.4575	223.3164	231.2319	248.0830	269.3546	289.3468 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255 (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)												
	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038 (71)
Water heating gains (Table 5)												
	104.0864	101.7026	96.7524	90.0226	85.6534	79.5013	74.2722	80.9721	83.3526	90.3181	98.1833	101.7126 (72)
Total internal gains												
	503.3519	501.0919	483.7501	455.4337	426.0669	398.2043	380.3692	386.9453	401.7174	430.2695	463.1324	488.3720 (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					12.8300	10.6334	0.6300	0.7000	0.7700	41.6937 (74)		
East					3.7700	19.6403	0.6300	0.7000	0.7700	22.6287 (76)		
South					14.7000	46.7521	0.6300	0.7000	0.7700	210.0342 (78)		
Solar gains	274.3566	467.9273	646.4664	819.0278	939.3220	943.6473	905.0419	812.6274	705.2960	518.3900	328.6120	234.8556 (83)
Total gains	777.7085	969.0192	1130.2165	1274.4616	1365.3889	1341.8517	1285.4111	1199.5727	1107.0134	948.6595	791.7444	723.2276 (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	49.7795	49.8599	49.9391	50.3142	50.3850	50.7172	50.7172	50.7792	50.5887	50.3850	50.2419	50.0933	50.0933
alpha	4.3186	4.3240	4.3293	4.3543	4.3590	4.3811	4.3811	4.3853	4.3726	4.3590	4.3495	4.3396	4.3396
util living area													
	0.9982	0.9949	0.9866	0.9612	0.8938	0.7568	0.5956	0.6511	0.8654	0.9762	0.9959	0.9987	0.9987 (86)
MIT	19.4256	19.6294	19.9335	20.3175	20.6643	20.8921	20.9711	20.9575	20.7895	20.3298	19.7983	19.3876	19.3876 (87)
Th 2	19.7671	19.7689	19.7706	19.7785	19.7800	19.7870	19.7870	19.7883	19.7843	19.7800	19.7770	19.7739	19.7739 (88)
util rest of house													
	0.9975	0.9931	0.9815	0.9453	0.8482	0.6556	0.4475	0.5039	0.7905	0.9635	0.9942	0.9982	0.9982 (89)
MIT 2	17.6871	17.9856	18.4281	18.9815	19.4490	19.7147	19.7768	19.7712	19.6149	19.0086	18.2387	17.6361	17.6361 (90)
Living area fraction													
	17.8851	18.1728	18.5995	19.1337	19.5874	19.8488	19.9128	19.9063	19.7487	19.1591	18.4163	17.8355	17.8355 (92)
MIT													
Temperature adjustment													0.0000
adjusted MIT	17.8851	18.1728	18.5995	19.1337	19.5874	19.8488	19.9128	19.9063	19.7487	19.1591	18.4163	17.8355	17.8355 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9958	0.9895	0.9744	0.9339	0.8393	0.6615	0.4639	0.5196	0.7878	0.9540	0.9910	0.9969	0.9969 (94)
Useful gains	774.4657	958.8114	1101.2708	1190.2549	1145.9303	887.6007	596.3536	623.3305	872.1286	905.0578	784.6046	720.9935	720.9935 (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	4.2000 (96)
Heat loss rate W													
	2543.1389	2480.6599	2257.7989	1895.3886	1458.7836	964.4085	608.6932	643.4615	1040.5182	1583.0069	2098.9129	2536.5875	2536.5875 (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	1.0000 (97a)
Space heating kWh													
	1315.8929	1022.6822	860.4569	507.6962	232.7628	0.0000	0.0000	0.0000	0.0000	504.3942	946.3020	1350.8019	1350.8019 (98)
Space heating													6740.9891 (98)
Space heating per m2													(98) / (4) = 50.2347 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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													7209.6140 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1315.8929	1022.6822	860.4569	507.6962	232.7628	0.0000	0.0000	0.0000	0.0000	504.3942	946.3020	1350.8019	(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)	1407.3721	1093.7778	920.2748	542.9906	248.9442	0.0000	0.0000	0.0000	0.0000	539.4590	1012.0877	1444.7079	(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	195.1743	171.4686	178.7637	158.4244	153.9286	135.6414	128.4621	143.4538	143.9810	164.3663	176.0957	189.8626	(64)
Efficiency of water heater (217)m	88.9593	88.7905	88.4597	87.7032	85.9143	79.8000	79.8000	79.8000	79.8000	87.6127	88.6354	79.8000	(216)
Fuel for water heating, kWh/month	219.3972	193.1160	202.0849	180.6370	179.1652	169.9767	160.9801	179.7667	180.4273	187.6056	198.6743	213.2595	(219)
Water heating fuel used												2265.0905	(219)
Annual totals kWh/year													
Space heating fuel - main system												7209.6140	(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)												476.5844	(232)
Total delivered energy for all uses												10026.2889	(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	7209.6140	0.2160	1557.2766	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2265.0905	0.2160	489.2595	(264)
Space and water heating			2046.5362	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	476.5844	0.5190	247.3473	(268)
Total CO2, kg/m2/year			2332.8085	(272)
Emissions per m2 for space and water heating			15.2510	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			1.8433	(272b)
Emissions per m2 for pumps and fans			0.2901	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2510 * 1.00) + 1.8433 + 0.2901, rounded to 2 d.p.			17.3800	(273)

Appendix 3



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT03			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT03		
Property	B0.04, Tangmere, London, N17				
SAP Rating	86 B	DER	8.25	TER	24.33
Environmental	94 A	% DER<TER	66.10		
CO ₂ Emissions (t/year)	0.52	DFEE	41.88	TFEE	50.45
General Requirements Compliance	Pass	% DFEE<TFEE	16.99		
Assessor Details	Mr. Neil Rothern, Neil Rothern, 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

Ground-floor flat, total floor area 97 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) 24.33 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.25 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 41.9 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.95 (max. 2.00)	1.20 (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: 2.50 (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, 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: 0.47
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 8.72 m², No overhang
Windows facing South: 3.74 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Floor U-value 0.09 W/m²K
Window U-value 0.90 W/m²K
Air permeability 2.5 m³/m²h
Photovoltaic array 0.94 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	97.3000 (1b)	x 2.5000 (2b)	= 243.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 243.2500 (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											2.5000	
Infiltration rate											0.1250	(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) =										0.0969	(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)
	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (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	0.2453	0.2428	0.2404	0.2283	0.2259	0.2138	0.2138	0.2114	0.2186	0.2259	0.2307	0.2356 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			12.4600	0.8687	10.8243		(27)					
Heat Loss Floor 1			97.3000	0.0900	8.7570		(28a)					
External Wall 1	52.5000	14.7100	37.7900	0.1400	5.2906		(29a)					
Total net area of external elements Aum(A, m2)			149.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.5719		(33)					
Party Wall 1			76.5500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							226.6600 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							23.5682 (36)					
Total fabric heat loss							(33) + (36) = 51.1401 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 19.6881	Feb 19.4937	Mar 19.2993	Apr 18.3272	May 18.1328	Jun 17.1608	Jul 17.1608	Aug 16.9663	Sep 17.5496	Oct 18.1328	Nov 18.5216	Dec 18.9104 (38)
Heat transfer coeff	70.8282	70.6338	70.4394	69.4673	69.2729	68.3009	68.3009	68.1065	68.6897	69.2729	69.6617	70.0506 (39)
Average = Sum(39)m / 12 =	69.4187 (39)											
HLP	Jan 0.7279	Feb 0.7259	Mar 0.7239	Apr 0.7140	May 0.7120	Jun 0.7020	Jul 0.7020	Aug 0.7000	Sep 0.7060	Oct 0.7120	Nov 0.7159	Dec 0.7199 (40)
HLP (average)	0.7135 (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												2.7131 (42)
Average daily hot water use (litres/day)												98.6358 (43)
Daily hot water use	Jan 108.4994	Feb 104.5539	Mar 100.6085	Apr 96.6631	May 92.7176	Jun 88.7722	Jul 88.7722	Aug 92.7176	Sep 96.6631	Oct 100.6085	Nov 104.5539	Dec 108.4994 (44)
Energy conte	160.9014	140.7254	145.2160	126.6028	121.4784	104.8267	97.1373	111.4665	112.7978	131.4549	143.4933	155.8244 (45)
Energy content (annual)												Total = Sum(45)m = 1551.9250 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.1352	21.1088	21.7824	18.9904	18.2218	15.7240	14.5706	16.7200	16.9197	19.7182	21.5240	23.3737 (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												
187.8283 165.0464 172.1429 152.6611 148.4053 130.8849 124.0642 138.3933 138.8560 158.3818 169.5515 182.7513 (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												
187.8283 165.0464 172.1429 152.6611 148.4053 130.8849 124.0642 138.3933 138.8560 158.3818 169.5515 182.7513 (64)												
Heat gains from water heating, kWh/month												
75.0412 66.2480 69.8258 62.9420 61.9331 55.7015 53.8396 58.6041 58.3518 65.2502 68.5581 73.3531 (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 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 135.6543 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
25.3044 22.4751 18.2780 13.8376 10.3438 8.7327 9.4359 12.2652 16.4623 20.9027 24.3965 26.0076 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
251.8875 254.5013 247.9146 233.8923 216.1916 199.5555 188.4416 185.8278 192.4145 206.4368 224.1374 240.7735 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 36.5654 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 -108.5234 (71)												
Water heating gains (Table 5)												
100.8618 98.5834 93.8519 87.4195 83.2434 77.3631 72.3651 78.7689 81.0442 87.7019 95.2196 98.5929 (72)												
Total internal gains												
441.7500 439.2560 423.7407 398.8457 373.4751 349.3476 333.9389 340.5582 353.6173 378.7377 407.4498 429.0704 (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 8.7200 10.6334 0.4000 0.7000 0.7700 17.9920 (74)												
South 3.7400 46.7521 0.4000 0.7000 0.7700 33.9284 (78)												
Solar gains	51.9204	89.9497	129.2075	173.8457	209.7842	215.5632	204.7402	176.3695	144.1866	100.8624	62.4122	44.3163 (83)
Total gains	493.6704	529.2057	552.9482	572.6913	583.2592	564.9108	538.6791	516.9277	497.8039	479.6001	469.8620	473.3867 (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 86.4926 86.7307 86.9700 88.1870 88.4345 89.6931 89.6931 89.9491 89.1854 88.4345 87.9409 87.4528												
alpha 6.7662 6.7820 6.7980 6.8791 6.8956 6.9795 6.9795 6.9966 6.9457 6.8956 6.8627 6.8302												
util living area												
0.9984 0.9970 0.9929 0.9761 0.9123 0.7402 0.5537 0.5987 0.8517 0.9789 0.9964 0.9988 (86)												
MIT												
20.2159 20.3069 20.4627 20.6791 20.8722 20.9783 20.9974 20.9957 20.9429 20.7138 20.4302 20.1985 (87)												
Th 2												
20.3162 20.3180 20.3197 20.3285 20.3303 20.3391 20.3391 20.3409 20.3356 20.3303 20.3268 20.3232 (88)												
util rest of house												
0.9980 0.9961 0.9906 0.9681 0.8839 0.6764 0.4727 0.5167 0.7998 0.9704 0.9952 0.9985 (89)												
MIT 2												
19.2480 19.3823 19.6106 19.9287 20.1928 20.3225 20.3379 20.3387 20.2851 19.9818 19.5694 19.2281 (90)												
Living area fraction												
fLA = Living area / (4) =												
MIT												
19.6459 19.7624 19.9609 20.2372 20.4721 20.5921 20.6090 20.6088 20.5555 20.2827 19.9233 19.6271 (92)												
Temperature adjustment												
adjusted MIT												
19.6459 19.7624 19.9609 20.2372 20.4721 20.5921 20.6090 20.6088 20.5555 20.2827 19.9233 19.6271 (93)												

8. Space heating requirement

Utilisation												
0.9974 0.9952 0.9892 0.9668 0.8905 0.7017 0.5061 0.5505 0.8183 0.9697 0.9942 0.9980 (94)												
Useful gains												
492.3755 526.6728 546.9635 553.6899 519.3999 396.3933 272.6157 284.5620 407.3457 465.0458 467.1350 472.4380 (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												
1086.9251 1049.7905 948.1769 787.5633 607.6676 409.2678 273.8181 286.6433 443.4281 670.7516 893.2920 1080.6751 (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												
442.3449 351.5351 298.5028 168.3889 65.6711 0.0000 0.0000 0.0000 0.0000 153.0452 306.8330 452.5284 (98)												
Space heating												
Space heating per m2												
(98) / (4) =												23.0098 (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	2238.8493	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	2350.7918	(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	1868.9670	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1962.4153	(310a)
Electricity used for heat distribution	43.1321	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	174.3494	(330a)
Total electricity for the above, kWh/year	174.3494	(331)
Electricity for lighting (calculated in Appendix L)	446.8828	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.94 * 951 * 1.00) =	-714.8632	(333)
Total delivered energy for all uses	4219.5762	(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			270.0000 (367a)
Space heating from Heat pump	1597.4841	0.5190	829.0943 (367)
Electrical energy for heat distribution	43.1321	0.5190	22.3855 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			851.4798 (373)
Space and water heating			851.4798 (376)
Pumps and fans	174.3494	0.5190	90.4874 (378)
Energy for lighting	446.8828	0.5190	231.9322 (379)
Energy saving/generation technologies			
PV Unit	-714.8632	0.5190	-371.0140 (380)
Total CO2, kg/year			802.8853 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			8.2500 (384)

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

DER	8.2500	ZC1
Total Floor Area	97.3000	TFA
Assumed number of occupants	2.7131	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	15.3405	ZC2
CO2 emissions from cooking, equation (L16)	1.8922	ZC3
Total CO2 emissions	25.4827	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	25.4827	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	97.3000 (1b)	x 2.5000 (2b)	= 243.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	97.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 243.2500 (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) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1233 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3733 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2893 (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	0.3689	0.3617	0.3544	0.3183	0.3110	0.2749	0.2749	0.2676	0.2893	0.3110	0.3255	0.3400 (22b)
	0.5680	0.5654	0.5628	0.5506	0.5484	0.5378	0.5378	0.5358	0.5419	0.5484	0.5530	0.5578 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			12.4600	1.3258	16.5189		(27)					
Heat Loss Floor 1			97.3000	0.1300	12.6490		(28a)					
External Wall 1	52.5000	14.7100	37.7900	0.1800	6.8022		(29a)					
Total net area of external elements Aum(A, m2)			149.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.2201		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.2350 (36)					
Total fabric heat loss						(33) + (36) =	55.4551 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 45.5982	Feb 45.3861	Mar 45.1782	Apr 44.2017	May 44.0190	Jun 43.1686	Jul 43.1686	Aug 43.0111	Sep 43.4961	Oct 44.0190	Nov 44.3886	Dec 44.7750 (38)
Heat transfer coeff	101.0533	100.8412	100.6333	99.6569	99.4742	98.6237	98.6237	98.4662	98.9513	99.4742	99.8438	100.2301 (39)
Average = Sum(39)m / 12 =												99.6560 (39)
HLP	Jan 1.0386	Feb 1.0364	Mar 1.0343	Apr 1.0242	May 1.0223	Jun 1.0136	Jul 1.0136	Aug 1.0120	Sep 1.0170	Oct 1.0223	Nov 1.0261	Dec 1.0301 (40)
HLP (average)												1.0242 (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												2.7131 (42)	
Average daily hot water use (litres/day)												98.6358 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	108.4994	104.5539	100.6085	96.6631	92.7176	88.7722	88.7722	92.7176	96.6631	100.6085	104.5539	108.4994 (44)	
Energy conte	160.9014	140.7254	145.2160	126.6028	121.4784	104.8267	97.1373	111.4665	112.7978	131.4549	143.4933	155.8244 (45)	
Energy content (annual)	Total = Sum(45)m =											1551.9250 (45)	
Distribution loss (46)m = 0.15 x (45)m	24.1352	21.1088	21.7824	18.9904	18.2218	15.7240	14.5706	16.7200	16.9197	19.7182	21.5240	23.3737 (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	187.7353	164.9625	172.0499	152.5711	148.3123	130.7949	123.9712	138.3004	138.7660	158.2888	169.4616	182.6583 (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	187.7353	164.9625	172.0499	152.5711	148.3123	130.7949	123.9712	138.3004	138.7660	158.2888	169.4616	182.6583 (64)
	74.9668	66.1808	69.7514	62.8701	61.8587	55.6295	53.7653	58.5297	58.2799	65.1759	68.4861	73.2787 (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	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	135.6543	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5687	21.8217	17.7466	13.4353	10.0430	8.4788	9.1616	11.9086	15.9837	20.2950	23.6872	25.2515	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	251.8875	254.5013	247.9146	233.8923	216.1916	199.5555	188.4416	185.8278	192.4145	206.4368	224.1374	240.7735	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	36.5654	(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)	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	-108.5234	(71)
Water heating gains (Table 5)	100.7619	98.4834	93.7519	87.3195	83.1434	77.2632	72.2651	78.6690	80.9443	87.6020	95.1196	98.4929	(72)
Total internal gains	443.9143	441.5026	426.1094	401.3434	376.0744	351.9937	336.5646	343.1016	356.0387	381.0300	409.6406	431.2142	(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	8.7200	10.6334	0.6300	0.7000	0.7700	28.3374	(74)
South	3.7400	46.7521	0.6300	0.7000	0.7700	53.4373	(78)

Solar gains	81.7747	141.6707	203.5017	273.8069	330.4101	339.5120	322.4658	277.7819	227.0939	158.8583	98.2992	69.7982	(83)
Total gains	525.6890	583.1733	629.6111	675.1503	706.4845	691.5057	659.0304	620.8836	583.1326	539.8883	507.9398	501.0124	(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	66.8651	67.0058	67.1442	67.8021	67.9266	68.5124	68.5124	68.6220	68.2856	67.9266	67.6752	67.4143	
alpha	5.4577	5.4671	5.4763	5.5201	5.5284	5.5675	5.5675	5.5748	5.5524	5.5284	5.5117	5.4943	
util living area	0.9988	0.9976	0.9943	0.9817	0.9357	0.8065	0.6350	0.6906	0.9057	0.9867	0.9975	0.9991	(86)
MIT	19.8547	19.9732	20.1785	20.4635	20.7391	20.9273	20.9847	20.9761	20.8470	20.5041	20.1299	19.8324	(87)
Th 2	20.0513	20.0531	20.0549	20.0632	20.0648	20.0720	20.0720	20.0734	20.0692	20.0648	20.0616	20.0583	(88)
util rest of house	0.9984	0.9968	0.9921	0.9740	0.9069	0.7268	0.5130	0.5702	0.8528	0.9797	0.9965	0.9988	(89)
MIT 2	18.5118	18.6864	18.9871	19.4051	19.7878	20.0183	20.0657	20.0623	19.9339	19.4677	18.9219	18.4843	(90)
Living area fraction	19.0639	19.2154	19.4769	19.8402	20.1789	20.3920	20.4435	20.4379	20.3093	19.8937	19.4185	19.0385	(92)
Temperature adjustment	19.0639	19.2154	19.4769	19.8402	20.1789	20.3920	20.4435	20.4379	20.3093	19.8937	19.4185	19.0385	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	524.5404	580.7174	623.5568	656.0677	643.6468	523.2604	371.4519	385.0101	506.5220	528.0538	505.6543	500.1700	(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	1491.9378	1443.5843	1305.9042	1090.2663	843.4290	571.2239	379.0597	397.6005	614.4177	924.4864	1229.9257	1487.2642	(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	719.7437	579.8466	507.6665	312.6230	148.6379	0.0000	0.0000	0.0000	0.0000	294.9458	521.4754	734.3981	(98)
Space heating												3819.3370	(98)
Space heating per m2												39.2532	(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													4084.8525 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	719.7437	579.8466	507.6665	312.6230	148.6379	0.0000	0.0000	0.0000	0.0000	294.9458	521.4754	734.3981	(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)	769.7793	620.1568	542.9588	334.3562	158.9710	0.0000	0.0000	0.0000	0.0000	315.4501	557.7277	785.4525	(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	187.7353	164.9625	172.0499	152.5711	148.3123	130.7949	123.9712	138.3004	138.7660	158.2888	169.4616	182.6583	(64)
Efficiency of water heater (217)m	88.0574	87.8899	87.5293	86.6878	84.8197	79.8000	79.8000	79.8000	79.8000	86.4516	87.6186	88.1459	(216)
Fuel for water heating, kWh/month	213.1966	187.6922	196.5627	176.0007	174.8560	163.9034	155.3524	173.3087	173.8923	183.0952	193.4083	207.2227	(219)
Water heating fuel used												2198.4912	(219)
Annual totals kWh/year													
Space heating fuel - main system												4084.8525	(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)												433.8902	(232)
Total delivered energy for all uses												6792.2339	(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	4084.8525	0.2160	882.3281 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2198.4912	0.2160	474.8741 (264)
Space and water heating			1357.2022 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	433.8902	0.5190	225.1890 (268)
Total CO2, kg/m2/year			1621.3163 (272)
Emissions per m2 for space and water heating			13.9486 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3144 (272b)
Emissions per m2 for pumps and fans			0.4001 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9486 * 1.55) + 2.3144 + 0.4001, rounded to 2 d.p.			24.3300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT04			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT04		
Property	A201, Tangmere, London, N17				
SAP Rating	87 B	DER	5.20	TER	20.36
Environmental	96 A	% DER<TER	74.46		
CO ₂ Emissions (t/year)	0.30	DFEE	28.90	TFEE	37.57
General Requirements Compliance	Pass	% DFEE<TFEE	23.07		
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 90 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) 20.36 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 5.20 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 37.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 28.9 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing East:	3.12 m ² , No overhang
Windows facing South:	7.14 m ² , No overhang
Windows facing West:	7.48 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 m ³ /m ² h
Photovoltaic array	1.05 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	89.7000 (1b)	x 2.5000 (2b)	= 224.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 224.2500 (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							2.5000					
Infiltration rate							0.1250	(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) =	0.1063 (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	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (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) =												74.8000 (23c)
Effective ac	0.2615	0.2588	0.2562	0.2429	0.2402	0.2269	0.2269	0.2243	0.2323	0.2402	0.2455	0.2508 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			17.7400	0.8687	15.4112		(27)					
External Wall 1	85.5000	19.9900	65.5100	0.1400	9.1714		(29a)					
Total net area of external elements Aum(A, m2)			85.5000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.2826		(33)					
Party Wall 1			29.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							215.1000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1386 (36)					
Total fabric heat loss							(33) + (36) = 35.4212 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	19.3493	19.1528	18.9562	17.9734	17.7768	16.7939	16.7939	16.5974	17.1871	17.7768	18.1699	18.5631 (38)
Heat transfer coeff	54.7705	54.5740	54.3774	53.3946	53.1980	52.2151	52.2151	52.0186	52.6083	53.1980	53.5911	53.9843 (39)
Average = Sum(39)m / 12 =												53.3454 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6106	0.6084	0.6062	0.5953	0.5931	0.5821	0.5821	0.5799	0.5865	0.5931	0.5974	0.6018 (40)
HLP (average)												0.5947 (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												2.6216 (42)
Average daily hot water use (litres/day)												96.4628 (43)
Daily hot water use	Jan 106.1091	Feb 102.2506	Mar 98.3921	Apr 94.5336	May 90.6750	Jun 86.8165	Jul 86.8165	Aug 90.6750	Sep 94.5336	Oct 98.3921	Nov 102.2506	Dec 106.1091 (44)
Energy conte	157.3567	137.6252	142.0169	123.8137	118.8022	102.5173	94.9973	109.0108	110.3128	128.5589	140.3321	152.3916 (45)
Energy content (annual)												Total = Sum(45)m = 1517.7356 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.6035	20.6438	21.3025	18.5721	17.8203	15.3776	14.2496	16.3516	16.5469	19.2838	21.0498	22.8587 (46)
Water storage loss:												
Store volume												1.0000 (47)

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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 (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 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month											
Solar input	184.2836	161.9462	168.9437	149.8720	145.7291	128.5755	121.9242	135.9377	136.3710	155.4858	179.3184 (62)
	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											
	184.2836	161.9462	168.9437	149.8720	145.7291	128.5755	121.9242	135.9377	136.3710	155.4858	179.3184 (64)
Heat gains from water heating, kWh/month											Total per year (kWh/year) = Sum(64)m = 1834.7776 (64)
	73.8626	65.2172	68.7621	62.0147	61.0432	54.9336	53.1281	57.7876	57.5256	64.2873	72.2117 (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	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.8625	19.4180	15.7918	11.9554	8.9368	7.5448	8.1525	10.5969	14.2231	18.0595	21.0781	22.4701 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.5247	240.9999	234.7626	221.4842	204.7226	188.9690	178.4447	175.9695	182.2068	195.4852	212.2468	228.0004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080 (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)	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637 (71)
Water heating gains (Table 5)	99.2777	97.0494	92.4222	86.1315	82.0473	76.2967	71.4087	77.6715	79.8967	86.4077	93.7597	97.0587 (72)
Total internal gains	421.9887	419.7912	405.3005	381.8950	358.0306	335.1344	320.3297	326.5618	338.6504	362.2763	389.4086	409.8531 (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			3.1200	19.6403	0.4000	0.7000	0.7700	11.8903 (76)				
South			7.1400	46.7521	0.4000	0.7000	0.7700	64.7724 (78)				
West			7.4800	19.6403	0.4000	0.7000	0.7700	28.5063 (80)				
Solar gains	105.1690	185.1048	265.2695	342.5277	391.7594	391.2775	376.3442	340.0572	292.5171	208.1868	127.1472	89.1895 (83)
Total gains	527.1578	604.8960	670.5700	724.4226	749.7900	726.4119	696.6739	666.6190	631.1676	570.4631	516.5558	499.0426 (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	97.8551	98.2075	98.5625	100.3768	100.7477	102.6441	102.6441	103.0320	101.8770	100.7477	100.0086	99.2803
alpha	7.5237	7.5472	7.5708	7.6918	7.7165	7.8429	7.8429	7.8688	7.7918	7.7165	7.6672	7.6187
util living area	0.9932	0.9806	0.9415	0.8284	0.6505	0.4595	0.3297	0.3589	0.5718	0.8713	0.9807	0.9952 (86)
MIT	20.4826	20.6221	20.7919	20.9390	20.9907	20.9995	21.0000	20.9999	20.9972	20.9253	20.6837	20.4561 (87)
Th 2	20.4205	20.4224	20.4244	20.4343	20.4362	20.4461	20.4461	20.4481	20.4422	20.4362	20.4323	20.4284 (88)
util rest of house												
	0.9916	0.9761	0.9295	0.8018	0.6139	0.4200	0.2883	0.3159	0.5269	0.8436	0.9755	0.9940 (89)
MIT 2	19.7225	19.9249	20.1647	20.3662	20.4275	20.4457	20.4461	20.4481	20.4400	20.3545	20.0230	19.6905 (90)
Living area fraction												
	fLA = Living area / (4) =											0.3456 (91)
MIT	19.9852	20.1658	20.3815	20.5641	20.6222	20.6371	20.6375	20.6388	20.6326	20.5517	20.2513	19.9551 (92)
Temperature adjustment												
												0.0000
adjusted MIT	19.9852	20.1658	20.3815	20.5641	20.6222	20.6371	20.6375	20.6388	20.6326	20.5517	20.2513	19.9551 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9900	0.9738	0.9285	0.8081	0.6261	0.4336	0.3026	0.3307	0.5423	0.8496	0.9736	0.9928 (94)
Useful gains	521.9094	589.0767	622.6416	585.4414	469.4312	314.9723	210.8073	220.4717	342.2893	484.6644	502.8931	495.4563 (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												
	859.0861	833.1173	754.8401	622.8013	474.6413	315.2283	210.8198	220.4961	343.6686	529.4126	704.7947	850.5279 (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												
	250.8595	163.9953	98.3557	26.8991	3.8763	0.0000	0.0000	0.0000	0.0000	33.2927	145.3691	264.1733 (98)
Space heating												986.8209 (98)
Space heating per m2												(98) / (4) = 11.0013 (99)

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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	986.8209	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1036.1619	(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	1834.7776	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1926.5164	(310a)
Electricity used for heat distribution	29.6268	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	184.6699	(330a)
Total electricity for the above, kWh/year	184.6699	(331)
Electricity for lighting (calculated in Appendix L)	386.0978	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.05 * 951 * 1.00) =	-798.5174	(333)
Total delivered energy for all uses	2734.9286	(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			270.0000 (367a)
Space heating from Heat pump	1097.2883	0.5190	569.4926 (367)
Electrical energy for heat distribution	29.6268	0.5190	15.3763 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			584.8689 (373)
Space and water heating			584.8689 (376)
Pumps and fans	184.6699	0.5190	95.8437 (378)
Energy for lighting	386.0978	0.5190	200.3848 (379)
Energy saving/generation technologies			
PV Unit	-798.5174	0.5190	-414.4306 (380)
Total CO2, kg/year			466.6668 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			5.2000 (384)

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

DER		5.2000	ZC1
Total Floor Area	TFA	89.7000	
Assumed number of occupants	N	2.6216	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.7575	ZC2
CO2 emissions from cooking, equation (L16)		2.0281	ZC3
Total CO2 emissions		22.9856	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		22.9856	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	89.7000 (1b)	x 2.5000 (2b)	= 224.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 224.2500 (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) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1338 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3838 (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) =				0.3262 (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												
	0.4159	0.4078	0.3996	0.3588	0.3507	0.3099	0.3099	0.3017	0.3262	0.3507	0.3670	0.3833 (22b)
Effective ac	0.5865	0.5831	0.5798	0.5644	0.5615	0.5480	0.5480	0.5455	0.5532	0.5615	0.5673	0.5735 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			17.7400	1.3258	23.5189		(27)					
External Wall 1	85.5000	19.9900	65.5100	0.1800	11.7918		(29a)					
Total net area of external elements Aum(A, m2)			85.5000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	37.5607		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5950 (36)					
Total fabric heat loss						(33) + (36) =	44.1557 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.4021	Feb 43.1535	Mar 42.9099	Apr 41.7656	May 41.5515	Jun 40.5548	Jul 40.5548	Aug 40.3702	Sep 40.9387	Oct 41.5515	Nov 41.9846	Dec 42.4374 (38)
Heat transfer coeff	87.5578	87.3093	87.0657	85.9213	85.7072	84.7106	84.7106	84.5260	85.0945	85.7072	86.1403	86.5932 (39)
Average = Sum(39)m / 12 =												85.9203 (39)
HLP	Jan 0.9761	Feb 0.9733	Mar 0.9706	Apr 0.9579	May 0.9555	Jun 0.9444	Jul 0.9444	Aug 0.9423	Sep 0.9487	Oct 0.9555	Nov 0.9603	Dec 0.9654 (40)
HLP (average)												0.9579 (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												2.6216 (42)
Average daily hot water use (litres/day)												96.4628 (43)
Daily hot water use	Jan 106.1091	Feb 102.2506	Mar 98.3921	Apr 94.5336	May 90.6750	Jun 86.8165	Jul 86.8165	Aug 90.6750	Sep 94.5336	Oct 98.3921	Nov 102.2506	Dec 106.1091 (44)
Energy conte	157.3567	137.6252	142.0169	123.8137	118.8022	102.5173	94.9973	109.0108	110.3128	128.5589	140.3321	152.3916 (45)
Energy content (annual)												Total = Sum(45)m = 1517.7356 (45)
Distribution loss (46)m = 0.15 x (45)m	23.6035	20.6438	21.3025	18.5721	17.8203	15.3776	14.2496	16.3516	16.5469	19.2838	21.0498	22.8587 (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	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)

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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	184.1906	161.8622	168.8507	149.7820	145.6361	128.4856	121.8312	135.8447	136.2810	155.3928	166.3004	179.2255 (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	184.1906	161.8622	168.8507	149.7820	145.6361	128.4856	121.8312	135.8447	136.2810	155.3928	166.3004	179.2255 (64)
Heat gains from water heating, kWh/month	73.7882	65.1500	68.6877	61.9427	60.9688	54.8616	53.0537	57.7132	57.4536	64.2129	67.4350	72.1373 (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	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796	131.0796 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.4404	19.0431	15.4869	11.7246	8.7643	7.3992	7.9951	10.3923	13.9485	17.7108	20.6711	22.0362 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	238.5247	240.9999	234.7626	221.4842	204.7226	188.9690	178.4447	175.9695	182.2068	195.4852	212.2468	228.0004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080	36.1080 (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)	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637	-104.8637 (71)
Water heating gains (Table 5)	99.1777	96.9494	92.3222	86.0315	81.9474	76.1967	71.3088	77.5715	79.7967	86.3077	93.6598	96.9587 (72)
Total internal gains	424.4667	422.3163	407.8956	384.5642	360.7581	337.8887	323.0724	329.2572	341.2759	364.8276	391.9016	412.3193 (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	3.1200	19.6403	0.6300	0.7000	0.7700	18.7272 (76)
South	7.1400	46.7521	0.6300	0.7000	0.7700	102.0166 (78)
West	7.4800	19.6403	0.6300	0.7000	0.7700	44.8974 (80)

Solar gains	165.6412	291.5401	417.7995	539.4811	617.0211	616.2621	592.7421	535.5901	460.7145	327.8942	200.2568	140.4735 (83)
Total gains	590.1079	713.8564	825.6951	924.0452	977.7792	954.1508	915.8144	864.8473	801.9904	692.7218	592.1585	552.7928 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	71.1434	71.3460	71.5456	72.4985	72.6796	73.5347	73.5347	73.6953	73.2030	72.6796	72.3142	71.9360
alpha	5.7429	5.7564	5.7697	5.8332	5.8453	5.9023	5.9023	5.9130	5.8802	5.8453	5.8209	5.7957
util living area	0.9967	0.9899	0.9684	0.8989	0.7546	0.5593	0.4058	0.4474	0.6966	0.9379	0.9915	0.9977 (86)
MIT	20.0550	20.2438	20.4990	20.7732	20.9357	20.9908	20.9988	20.9979	20.9691	20.7377	20.3383	20.0214 (87)
Th 2	20.1033	20.1056	20.1079	20.1186	20.1206	20.1299	20.1299	20.1317	20.1263	20.1206	20.1165	20.1123 (88)
util rest of house	0.9957	0.9868	0.9587	0.8711	0.7007	0.4872	0.3262	0.3641	0.6220	0.9140	0.9884	0.9970 (89)
MIT 2	18.8425	19.1182	19.4845	19.8659	20.0624	20.1242	20.1295	20.1309	20.1041	19.8299	19.2652	18.8003 (90)
Living area fraction	19.2615	19.5072	19.8351	20.1795	20.3642	20.4237	20.4299	20.4305	20.4030	20.1436	19.6361	19.2223 (92)
Temperature adjustment	19.2615	19.5072	19.8351	20.1795	20.3642	20.4237	20.4299	20.4305	20.4030	20.1436	19.6361	19.2223 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9943	0.9841	0.9551	0.8732	0.7163	0.5119	0.3538	0.3930	0.6466	0.9147	0.9861	0.9960 (94)
Ext temp.	586.7663	702.4982	788.6334	806.8723	700.4064	488.4209	323.9773	339.8452	518.5547	633.6249	583.9239	550.5565 (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	1309.9977	1275.3468	1161.0318	969.1469	742.5842	493.3271	324.4360	340.6832	536.3518	817.9564	1079.8598	1300.8313 (97)
Space heating kWh	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 per m2	538.0841	384.9543	277.0645	116.8378	31.3802	0.0000	0.0000	0.0000	0.0000	137.1427	357.0738	558.2044 (98)
Space heating	2400.7418 (98)											
Space heating per m2	(98) / (4) = 26.7641 (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													2567.6383 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	538.0841	384.9543	277.0645	116.8378	31.3802	0.0000	0.0000	0.0000	0.0000	137.1427	357.0738	558.2044	(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)	575.4911	411.7158	296.3256	124.9602	33.5617	0.0000	0.0000	0.0000	0.0000	146.6766	381.8972	597.0101	(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	184.1906	161.8622	168.8507	149.7820	145.6361	128.4856	121.8312	135.8447	136.2810	155.3928	166.3004	179.2255	(64)
Efficiency of water heater (217)m	87.5078	87.0451	86.1271	84.1605	81.5084	79.8000	79.8000	79.8000	79.8000	84.4827	86.8018	87.6438	(216)
Fuel for water heating, kWh/month	210.4848	185.9521	196.0484	177.9719	178.6763	161.0095	152.6707	170.2315	170.7783	183.9344	191.5863	204.4929	(219)
Water heating fuel used												2183.8370	(219)
Annual totals kWh/year													
Space heating fuel - main system												2567.6383	(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)												378.6434	(232)
Total delivered energy for all uses												5205.1187	(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	2567.6383	0.2160	554.6099 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2183.8370	0.2160	471.7088 (264)
Space and water heating			1026.3187 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	378.6434	0.5190	196.5159 (268)
Total CO2, kg/m2/year			1261.7596 (272)
Emissions per m2 for space and water heating			11.4417 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.1908 (272b)
Emissions per m2 for pumps and fans			0.4339 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.4417 * 1.55) + 2.1908 + 0.4339, rounded to 2 d.p.			20.3600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT05			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT05		
Property	A202, Tangmere, London, N17				
SAP Rating	87 B	DER	5.54	TER	20.30
Environmental	96 A	% DER<TER	72.71		
CO ₂ Emissions (t/year)	0.36	DFEE	35.31	TFEE	42.03
General Requirements Compliance	Pass	% DFEE<TFEE	15.99		
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 116 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) 20.30 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 5.54 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 35.3 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	1.89 m ² , No overhang
Windows facing East:	3.38 m ² , No overhang
Windows facing South:	1.89 m ² , No overhang
Windows facing West:	12.41 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 m ³ /m ² h
Photovoltaic array	1.35 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	115.6000 (1b)	x 2.5000 (2b)	= 289.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 289.0000 (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											2.5000	
Infiltration rate											0.1250	(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) =										0.1063	(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)
	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (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) =												74.8000 (23c)
Effective ac	0.2615	0.2588	0.2562	0.2429	0.2402	0.2269	0.2269	0.2243	0.2323	0.2402	0.2455	0.2508 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			19.5700	0.8687	17.0010		(27)					
External Wall 1	85.5000	21.8200	63.6800	0.1400	8.9152		(29a)					
sheltered	29.3000		29.3000	0.2700	7.9110		(29a)					
Total net area of external elements Aum(A, m2)			114.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	36.5272		(33)					
Party Wall 1			29.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							211.4100 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.2932 (36)					
Total fabric heat loss							(33) + (36) = 48.8204 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.9363	Feb 24.6829	Mar 24.4296	Apr 23.1630	May 22.9097	Jun 21.6430	Jul 21.6430	Aug 21.3897	Sep 22.1497	Oct 22.9097	Nov 23.4163	Dec 23.9230 (38)
Heat transfer coeff	73.7566	73.5033	73.2500	71.9834	71.7300	70.4634	70.4634	70.2101	70.9700	71.7300	72.2367	72.7433 (39)
Average = Sum(39)m / 12 =												71.9200 (39)
HLP	Jan 0.6380	Feb 0.6358	Mar 0.6337	Apr 0.6227	May 0.6205	Jun 0.6095	Jul 0.6095	Aug 0.6074	Sep 0.6139	Oct 0.6205	Nov 0.6249	Dec 0.6293 (40)
HLP (average)												0.6221 (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												2.8446 (42)
Average daily hot water use (litres/day)												101.7588 (43)
Daily hot water use	Jan 111.9347	Feb 107.8644	Mar 103.7940	Apr 99.7237	May 95.6533	Jun 91.5830	Jul 91.5830	Aug 95.6533	Sep 99.7237	Oct 103.7940	Nov 107.8644	Dec 111.9347 (44)
Energy conte	165.9960	145.1811	149.8139	130.6114	125.3248	108.1457	100.2129	114.9958	116.3692	135.6171	148.0367	160.7582 (45)
Energy content (annual)												Total = Sum(45)m = 1601.0629 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.8994	21.7772	22.4721	19.5917	18.7987	16.2219	15.0319	17.2494	17.4554	20.3426	22.2055	24.1137 (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												
192.9228 169.5022 176.7408 156.6697 152.2516 134.2040 127.1398 141.9226 142.4275 162.5439 174.0949 187.6851 (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												
192.9228 169.5022 176.7408 156.6697 152.2516 134.2040 127.1398 141.9226 142.4275 162.5439 174.0949 187.6851 (64)												
Total per year (kWh/year) = Sum(64)m =												1918.1048 (64)
Heat gains from water heating, kWh/month												
76.7351 67.7295 71.3546 64.2749 63.2120 56.8051 54.8623 59.7776 59.5394 66.6342 70.0688 74.9936 (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 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 142.2291 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
26.3976 23.4461 19.0677 14.4355 10.7907 9.1099 9.8436 12.7951 17.1736 21.8058 25.4506 27.1313 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
279.3690 282.2679 274.9626 259.4104 239.7786 221.3275 209.0010 206.1020 213.4073 228.9595 248.5913 267.0425 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 37.2229 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 -113.7833 (71)												
Water heating gains (Table 5)												
103.1386 100.7880 95.9067 89.2707 84.9623 78.8959 73.7396 80.3462 82.6936 89.5621 97.3178 100.7978 (72)												
Total internal gains												
474.5740 472.1708 455.6058 428.7853 401.2004 375.0021 358.2530 364.9121 378.9432 405.9961 437.0284 460.6403 (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												3.8996 (74)
East												12.8812 (76)
South												17.1456 (78)
West												47.2945 (80)
Solar gains	81.2209	153.2489	242.2946	343.5039	416.0320	424.5836	404.6951	350.2728	278.0602	178.8385	100.1661	67.5519 (83)
Total gains	555.7949	625.4197	697.9004	772.2892	817.2324	799.5857	762.9481	715.1849	657.0034	584.8346	537.1945	528.1922 (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 92.0407 92.3579 92.6773 94.3081 94.6411 96.3424 96.3424 96.6900 95.6546 94.6411 93.9773 93.3228												
alpha 7.1360 7.1572 7.1785 7.2872 7.3094 7.4228 7.4228 7.4460 7.3770 7.3094 7.2652 7.2215												
util living area	0.9981	0.9951	0.9826	0.9252	0.7745	0.5605	0.4061	0.4509	0.7216	0.9580	0.9950	0.9987 (86)
MIT	20.2991	20.4188	20.6100	20.8375	20.9645	20.9971	20.9998	20.9995	20.9838	20.8069	20.5124	20.2794 (87)
Th 2	20.3959	20.3978	20.3998	20.4096	20.4116	20.4214	20.4214	20.4234	20.4175	20.4116	20.4077	20.4037 (88)
util rest of house	0.9976	0.9938	0.9781	0.9079	0.7363	0.5112	0.3528	0.3947	0.6689	0.9444	0.9935	0.9983 (89)
MIT 2	19.4365	19.6126	19.8905	20.2158	20.3763	20.4193	20.4213	20.4231	20.4040	20.1810	19.7573	19.4140 (90)
Living area fraction									fLA = Living area / (4) =			0.4491 (91)
MIT	19.8239	19.9747	20.2136	20.4950	20.6405	20.6788	20.6811	20.6820	20.6644	20.4621	20.0964	19.8027 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8239	19.9747	20.2136	20.4950	20.6405	20.6788	20.6811	20.6820	20.6644	20.4621	20.0964	19.8027 (93)

8. Space heating requirement

Utilisation	0.9970	0.9927	0.9765	0.9106	0.7516	0.5333	0.3767	0.4200	0.6918	0.9457	0.9925	0.9979 (94)
Useful gains	554.1442	620.8320	681.4675	703.2430	614.2200	426.3869	287.4404	300.3646	454.5045	553.0825	533.1742	527.0633 (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												
1144.9930 1108.0395 1004.5230 834.6476 641.3022 428.3306 287.5686 300.6394 465.8742 707.4086 938.8186 1134.9899 (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												
439.5915 327.4035 240.3533 94.6113 20.1492 0.0000 0.0000 0.0000 0.0000 114.8186 292.0640 452.2974 (98)												
Space heating												1981.2888 (98)
Space heating per m2												(98) / (4) = 17.1392 (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	1981.2888 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	2080.3533 (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	1918.1048 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2014.0101 (310a)
Electricity used for heat distribution	40.9436 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	237.9915 (330a)
Total electricity for the above, kWh/year	237.9915 (331)
Electricity for lighting (calculated in Appendix L)	466.1903 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 1.35 * 951 * 1.00) =	-1026.6653 (333)
Total delivered energy for all uses	3771.8798 (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			270.0000 (367a)
Space heating from Heat pump	1516.4309	0.5190	787.0276 (367)
Electrical energy for heat distribution	40.9436	0.5190	21.2497 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			808.2774 (373)
Space and water heating			808.2774 (376)
Pumps and fans	237.9915	0.5190	123.5176 (378)
Energy for lighting	466.1903	0.5190	241.9527 (379)
Energy saving/generation technologies			
PV Unit	-1026.6653	0.5190	-532.8393 (380)
Total CO2, kg/year			640.9084 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			5.5400 (384)

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

DER		5.5400 ZC1
Total Floor Area	TFA	115.6000
Assumed number of occupants	N	2.8446
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.3208 ZC2
CO2 emissions from cooking, equation (L16)		1.6200 ZC3
Total CO2 emissions		21.4808 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		21.4808 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	115.6000 (1b)	x 2.5000 (2b)	= 289.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 289.0000 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) =	0.1384 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3884 (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) =		0.3301 (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	0.4209	0.4127	0.4044	0.3632	0.3549	0.3136	0.3136	0.3054	0.3301	0.3549	0.3714	0.3879 (22b)
	0.5886	0.5852	0.5818	0.5659	0.5630	0.5492	0.5492	0.5466	0.5545	0.5630	0.5690	0.5752 (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			2.2500	1.0000	2.2500		(26)
TER Opening Type (Uw = 1.40)			19.5700	1.3258	25.9451		(27)
External Wall 1	85.5000	21.8200	63.6800	0.1800	11.4624		(29a)
sheltered	29.3000		29.3000	0.1800	5.2740		(29a)
Total net area of external elements Aum(A, m ²)			114.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.9315		(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)							7.8322 (36)
Total fabric heat loss						(33) + (36) =	52.7637 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	56.1342	55.8061	55.4845	53.9740	53.6914	52.3758	52.3758
Heat transfer coeff	108.8979	108.5698	108.2482	106.7377	106.4551	105.1394	105.1394
Average = Sum(39)m / 12 =							
HLP	0.9420	0.9392	0.9364	0.9233	0.9209	0.9095	0.9095
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8446 (42)
Average daily hot water use (litres/day)													101.7588 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	111.9347	107.8644	103.7940	99.7237	95.6533	91.5830	91.5830	95.6533	99.7237	103.7940	107.8644	111.9347	(44)
Energy conte	165.9960	145.1811	149.8139	130.6114	125.3248	108.1457	100.2129	114.9958	116.3692	135.6171	148.0367	160.7582	(45)
Energy content (annual)										Total = Sum(45)m =		1601.0629	(45)
Distribution loss (46)m = 0.15 x (45)m													
	24.8994	21.7772	22.4721	19.5917	18.7987	16.2219	15.0319	17.2494	17.4554	20.3426	22.2055	24.1137	(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	192.8299	169.4182	176.6478	156.5797	152.1586	134.1140	127.0468	141.8297	142.3375	162.4510	174.0049	187.5921 (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	192.8299	169.4182	176.6478	156.5797	152.1586	134.1140	127.0468	141.8297	142.3375	162.4510	174.0049	187.5921 (64)
	76.6608	67.6624	71.2802	64.2029	63.1376	56.7331	54.7879	59.7032	59.4674	66.5598	69.9968	74.9192 (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	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	142.2291	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.7066	22.8324	18.5686	14.0576	10.5082	8.8715	9.5859	12.4602	16.7240	21.2350	24.7844	26.4211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.3690	282.2679	274.9626	259.4104	239.7786	221.3275	209.0010	206.1020	213.4073	228.9595	248.5913	267.0425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	37.2229	(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)	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	-113.7833	(71)
Water heating gains (Table 5)	103.0387	100.6880	95.8068	89.1707	84.8623	78.7959	73.6397	80.2462	82.5936	89.4621	97.2178	100.6979	(72)
Total internal gains	476.7830	474.4572	458.0067	431.3075	403.8179	377.6636	360.8953	367.4772	381.3937	408.3253	439.2622	462.8302	(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					1.8900	10.6334	0.6300	0.7000	0.7700	6.1419 (74)			
East					3.3800	19.6403	0.6300	0.7000	0.7700	20.2878 (76)			
South					1.8900	46.7521	0.6300	0.7000	0.7700	27.0044 (78)			
West					12.4100	19.6403	0.6300	0.7000	0.7700	74.4888 (80)			

Solar gains	127.9230	241.3670	381.6140	541.0186	655.2504	668.7192	637.3948	551.6797	437.9448	281.6707	157.7616	106.3942	(83)
Total gains	604.7060	715.8241	839.6207	972.3261	1059.0684	1046.3828	998.2902	919.1569	819.3385	689.9960	597.0238	569.2244	(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	73.7184	73.9412	74.1608	75.2103	75.4100	76.3536	76.3536	76.5310	75.9874	75.4100	75.0072	74.5906	
alpha	5.9146	5.9294	5.9441	6.0140	6.0273	6.0902	6.0902	6.1021	6.0658	6.0273	6.0005	5.9727	
util living area	0.9990	0.9970	0.9886	0.9481	0.8272	0.6268	0.4611	0.5200	0.8038	0.9774	0.9975	0.9993	(86)
MIT	19.9745	20.1262	20.3748	20.6867	20.9034	20.9855	20.9980	20.9961	20.9402	20.6331	20.2444	19.9514	(87)
Th 2	20.1319	20.1343	20.1367	20.1477	20.1498	20.1594	20.1594	20.1612	20.1557	20.1498	20.1456	20.1412	(88)
util rest of house	0.9987	0.9960	0.9846	0.9307	0.7793	0.5514	0.3743	0.4278	0.7346	0.9667	0.9965	0.9991	(89)
MIT 2	18.7466	18.9699	19.3326	19.7808	20.0576	20.1500	20.1587	20.1596	20.1086	19.7157	19.1515	18.7197	(90)
Living area fraction	19.2981	19.4892	19.8007	20.1877	20.4375	20.5253	20.5357	20.5353	20.4821	20.1277	19.6424	19.2729	(92)
Temperature adjustment	19.2981	19.4892	19.8007	20.1877	20.4375	20.5253	20.5357	20.5353	20.4821	20.1277	19.6424	19.2729	(93)
adjusted MIT	19.2981	19.4892	19.8007	20.1877	20.4375	20.5253	20.5357	20.5353	20.4821	20.1277	19.6424	19.2729	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	603.6370	712.2747	825.0906	905.8735	843.6078	611.9876	412.6569	431.4225	625.2890	666.8132	594.4503	568.5142	(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	1633.2572	1583.9493	1439.7782	1204.8238	930.1512	622.9786	413.7940	433.7777	674.2485	1014.2771	1342.3682	1622.2142	(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	766.0374	585.7653	457.3276	215.2443	64.3883	0.0000	0.0000	0.0000	0.0000	258.5132	538.5008	783.9528	(98)
Space heating												3669.7297	(98)
Space heating per m2												31.7451	(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													3924.8446 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	766.0374	585.7653	457.3276	215.2443	64.3883	0.0000	0.0000	0.0000	0.0000	258.5132	538.5008	783.9528	(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)	819.2914	626.4870	489.1204	230.2078	68.8645	0.0000	0.0000	0.0000	0.0000	276.4847	575.9367	838.4522	(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	192.8299	169.4182	176.6478	156.5797	152.1586	134.1140	127.0468	141.8297	142.3375	162.4510	174.0049	187.5921	(64)
Efficiency of water heater (217)m	88.1238	87.8572	87.2406	85.6630	82.7076	79.8000	79.8000	79.8000	79.8000	86.0476	87.6305	88.2161	(216)
Fuel for water heating, kWh/month	218.8171	192.8336	202.4834	182.7856	183.9718	168.0627	159.2065	177.7314	178.3678	188.7920	198.5667	212.6507	(219)
Water heating fuel used												2264.2693	(219)
Annual totals kWh/year													
Space heating fuel - main system												3924.8446	(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)												453.9873	(232)
Total delivered energy for all uses												6718.1012	(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	3924.8446	0.2160	847.7664 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2264.2693	0.2160	489.0822 (264)
Space and water heating			1336.8486 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	453.9873	0.5190	235.6194 (268)
Total CO2, kg/m2/year			1611.3930 (272)
Emissions per m2 for space and water heating			11.5644 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.0382 (272b)
Emissions per m2 for pumps and fans			0.3367 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.5644 * 1.55) + 2.0382 + 0.3367, rounded to 2 d.p.			20.3000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT06			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT06		
Property	A203, Tangmere, London, N17				
SAP Rating	84 B	DER	8.98	TER	25.91
Environmental	95 A	% DER<TER	65.34		
CO ₂ Emissions (t/year)	0.34	DFEE	40.60	TFEE	45.31
General Requirements Compliance	Pass	% DFEE<TFEE	10.40		
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 55 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) 25.91 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 8.98 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 40.6 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.95 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	2.10 m ² , No overhang
Windows facing East:	3.38 m ² , No overhang
Windows facing West:	4.97 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 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	54.9000 (1b)	x 2.5000 (2b)	= 137.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2500 (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					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					2.5000
Number of sides sheltered					0.1250 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.0969 (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	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (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) =												74.8000 (23c)
Effective ac	0.2495	0.2471	0.2447	0.2326	0.2301	0.2180	0.2180	0.2156	0.2229	0.2301	0.2350	0.2398 (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			2.2500	1.2000	2.7000		(26)
Windows (Uw = 0.90)			10.4500	0.8687	9.0782		(27)
External Wall 1	41.7600	12.7000	29.0600	0.1400	4.0684		(29a)
sheltered	29.0000		29.0000	0.2700	7.8300		(29a)
Total net area of external elements Aum(A, m ²)			70.7600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.6766	(33)
Party Wall 1			23.7800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							216.8900 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.3492 (36)
Total fabric heat loss						(33) + (36) =	32.0258 (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	11.3012	11.1915	11.0818	10.5333	10.4236	9.8752	9.8752	9.7655	10.0946	10.4236	10.6430	10.8624 (38)
Heat transfer coeff	43.3270	43.2173	43.1076	42.5591	42.4494	41.9010	41.9010	41.7913	42.1204	42.4494	42.6688	42.8882 (39)
Average = Sum(39)m / 12 =												42.5317 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7892	0.7872	0.7852	0.7752	0.7732	0.7632	0.7632	0.7612	0.7672	0.7732	0.7772	0.7812 (40)
HLP (average)												0.7747 (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	1.8344 (42)
Average daily hot water use (litres/day)	77.7677 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	85.5445	82.4337	79.3230	76.2123	73.1016	69.9909	69.9909	73.1016	76.2123	79.3230	82.4337	85.5445 (44)
Energy conte	126.8600	110.9525	114.4931	99.8178	95.7776	82.6488	76.5862	87.8838	88.9334	103.6433	113.1348	122.8571 (45)
Energy content (annual)										Total = Sum(45)m =		1223.5885 (45)
Distribution loss (46)m = 0.15 x (45)m	19.0290	16.6429	17.1740	14.9727	14.3666	12.3973	11.4879	13.1826	13.3400	15.5465	16.9702	18.4286 (46)
Water storage loss:												

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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												
153.7868 135.2735 141.4199 125.8761 122.7044 108.7070 103.5131 114.8107 114.9917 130.5702 139.1931 149.7839 (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												
153.7868 135.2735 141.4199 125.8761 122.7044 108.7070 103.5131 114.8107 114.9917 130.5702 139.1931 149.7839 (64)												
Heat gains from water heating, kWh/month												
63.7224 56.3485 59.6104 54.0360 53.3875 48.3273 47.0064 50.7629 50.4170 56.0029 58.4639 62.3915 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
14.7604 13.1100 10.6618 8.0717 6.0337 5.0939 5.5041 7.1545 9.6027 12.1928 14.2308 15.1706 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
159.9279 161.5874 157.4054 148.5024 137.2639 126.7014 119.6449 117.9854 122.1674 131.0704 142.3089 152.8714 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 32.1721 (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)												
-73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 -73.3772 (71)												
Water heating gains (Table 5)												
85.6484 83.8520 80.1215 75.0500 71.7574 67.1213 63.1807 68.2296 70.0236 75.2727 81.1999 83.8595 (72)												
Total internal gains												
310.8531 309.0659 298.7052 282.1405 265.5715 249.4330 238.8461 243.8859 252.3101 269.0524 288.2560 302.4180 (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				2.1000	10.6334	0.4000	0.7000	0.7700	4.3329 (74)			
East				3.3800	19.6403	0.4000	0.7000	0.7700	12.8812 (76)			
West				4.9700	19.6403	0.4000	0.7000	0.7700	18.9407 (80)			
Solar gains	36.1548	70.5307	116.5878	172.1162	213.6821	220.1681	209.0089	177.5390	136.1492	83.7220	45.0233	29.7809 (83)
Total gains	347.0079	379.5966	415.2930	454.2568	479.2536	469.6010	447.8550	421.4249	388.4593	352.7743	333.2793	332.1989 (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)												
tau	76.3398	76.5336	76.7283	77.7171	77.9179	78.9379	78.9379	79.1451	78.5267	77.9179	77.5173	77.1208
alpha	6.0893	6.1022	6.1152	6.1811	6.1945	6.2625	6.2625	6.2763	6.2351	6.1945	6.1678	6.1414
util living area	0.9940	0.9886	0.9709	0.9086	0.7657	0.5636	0.4107	0.4544	0.7130	0.9375	0.9873	0.9953 (86)
MIT	20.2193	20.3387	20.5421	20.7885	20.9424	20.9927	20.9991	20.9984	20.9717	20.7708	20.4541	20.1946 (87)
Th 2	20.2627	20.2644	20.2662	20.2749	20.2766	20.2853	20.2853	20.2871	20.2818	20.2766	20.2731	20.2697 (88)
util rest of house												
0.9925 0.9856 0.9633 0.8866 0.7211 0.5037 0.3445 0.3849 0.6510 0.9174 0.9834 0.9941 (89)												
MIT 2	19.2140	19.3886	19.6816	20.0284	20.2205	20.2802	20.2849	20.2863	20.2591	20.0125	19.5635	19.1836 (90)
Living area fraction												
MIT	19.7201	19.8669	20.1148	20.4111	20.5840	20.6389	20.6445	20.6448	20.6178	20.3943	20.0119	19.6926 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7201	19.8669	20.1148	20.4111	20.5840	20.6389	20.6445	20.6448	20.6178	20.3943	20.0119	19.6926 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9910	0.9836	0.9614	0.8911	0.7406	0.5336	0.3779	0.4199	0.6808	0.9210	0.9817	0.9929 (94)
Ext temp.	343.8899	373.3890	399.2789	404.7679	354.9576	250.5814	169.2287	176.9458	264.4717	324.9124	327.1827	329.8300 (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	668.1068	646.8305	586.9018	489.9008	377.1193	253.0371	169.4685	177.3966	274.5338	415.7610	550.9341	664.4509 (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	241.2174	183.7527	139.5915	61.2957	16.4883	0.0000	0.0000	0.0000	0.0000	67.5914	161.1011	248.9579 (98)
Space heating per m2												1119.9959 (98)
										(98) / (4) =		20.4007 (99)

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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	1119.9959 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1175.9957 (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	1540.6304 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1617.6620 (310a)
Electricity used for heat distribution	27.9366 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	113.0254 (330a)
Total electricity for the above, kWh/year	113.0254 (331)
Electricity for lighting (calculated in Appendix L)	260.6731 (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	2680.6407 (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			270.0000 (367a)
Space heating from Heat pump	1034.6880	0.5190	537.0031 (367)
Electrical energy for heat distribution	27.9366	0.5190	14.4991 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			551.5022 (373)
Space and water heating			551.5022 (376)
Pumps and fans	113.0254	0.5190	58.6602 (378)
Energy for lighting	260.6731	0.5190	135.2893 (379)
Energy saving/generation technologies			
PV Unit	-486.7154	0.5190	-252.6053 (380)
Total CO2, kg/year			492.8464 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			8.9800 (384)

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

DER	8.9800 ZC1
Total Floor Area	TFA 54.9000
Assumed number of occupants	N 1.8344
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	17.2623 ZC2
CO2 emissions from cooking, equation (L16)	2.9695 ZC3
Total CO2 emissions	29.2118 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	29.2118 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	54.9000 (1b)	x 2.5000 (2b)	= 137.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	54.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 137.2500 (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					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) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1457 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3957 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3067 (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												
	0.3910	0.3834	0.3757	0.3374	0.3297	0.2913	0.2913	0.2837	0.3067	0.3297	0.3450	0.3604 (22b)
Effective ac	0.5764	0.5735	0.5706	0.5569	0.5543	0.5424	0.5424	0.5402	0.5470	0.5543	0.5595	0.5649 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			10.4500	1.3258	13.8542		(27)					
External Wall 1	41.7600	12.7000	29.0600	0.1800	5.2308		(29a)					
sheltered	29.0000		29.0000	0.1800	5.2200		(29a)					
Total net area of external elements Aum(A, m2)			70.7600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	26.5550	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2010 (36)					
Total fabric heat loss						(33) + (36) =	31.7560 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	26.1088	25.9743	25.8425	25.2235	25.1077	24.5686	24.5686	24.4687	24.7762	25.1077	25.3420	25.5869 (38)
Heat transfer coeff	57.8648	57.7303	57.5985	56.9795	56.8637	56.3245	56.3245	56.2247	56.5322	56.8637	57.0980	57.3429 (39)
Average = Sum(39)m / 12 =												56.9789 (39)
HLP	1.0540	1.0516	1.0492	1.0379	1.0358	1.0259	1.0259	1.0241	1.0297	1.0358	1.0400	1.0445 (40)
HLP (average)												1.0379 (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												1.8344 (42)
Average daily hot water use (litres/day)												77.7677 (43)
Daily hot water use	85.5445	82.4337	79.3230	76.2123	73.1016	69.9909	69.9909	73.1016	76.2123	79.3230	82.4337	85.5445 (44)
Energy conte	126.8600	110.9525	114.4931	99.8178	95.7776	82.6488	76.5862	87.8838	88.9334	103.6433	113.1348	122.8571 (45)
Energy content (annual)												Total = Sum(45)m = 1223.5885 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.0290	16.6429	17.1740	14.9727	14.3666	12.3973	11.4879	13.1826	13.3400	15.5465	16.9702	18.4286 (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												

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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	153.6938	135.1896	141.3269	125.7861	122.6115	108.6170	103.4201	114.7177	114.9017	130.4772	139.1031	149.6910 (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	153.6938	135.1896	141.3269	125.7861	122.6115	108.6170	103.4201	114.7177	114.9017	130.4772	139.1031	149.6910 (64)
	63.6480	56.2814	59.5360	53.9640	53.3131	48.2553	46.9320	50.6885	50.3450	55.9285	58.3919	62.3171 (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	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	91.7214	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4431	12.8282	10.4326	7.8981	5.9040	4.9844	5.3858	7.0006	9.3963	11.9307	13.9249	14.8445	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	159.9279	161.5874	157.4054	148.5024	137.2639	126.7014	119.6449	117.9854	122.1674	131.0704	142.3089	152.8714	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	32.1721	(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)	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	-73.3772	(71)
Water heating gains (Table 5)	85.5484	83.7520	80.0216	74.9501	71.6575	67.0213	63.0807	68.1297	69.9236	75.1727	81.0999	83.7595	(72)
Total internal gains	313.4358	311.6841	301.3760	284.8670	268.3418	252.2235	241.6278	246.6321	255.0037	271.6903	290.8501	304.9919	(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					2.1000	10.6334	0.6300	0.7000	0.7700		6.8244 (74)	
East					3.3800	19.6403	0.6300	0.7000	0.7700		20.2878 (76)	
West					4.9700	19.6403	0.6300	0.7000	0.7700		29.8315 (80)	
Solar gains	56.9437	111.0859	183.6258	271.0830	336.5493	346.7647	329.1890	279.6239	214.4349	131.8621	70.9117	46.9049 (83)
Total gains	370.3796	422.7699	485.0018	555.9501	604.8911	598.9882	570.8168	526.2560	469.4386	403.5524	361.7618	351.8967 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.8864	66.0398	66.1909	66.9100	67.0463	67.6881	67.6881	67.8083	67.4395	67.0463	66.7712	66.4860	
alpha	5.3924	5.4027	5.4127	5.4607	5.4698	5.5125	5.5125	5.5206	5.4960	5.4698	5.4514	5.4324	
util living area	0.9965	0.9922	0.9772	0.9204	0.7835	0.5867	0.4317	0.4865	0.7584	0.9571	0.9924	0.9973	(86)
MIT	19.9601	20.1117	20.3705	20.6896	20.9041	20.9841	20.9975	20.9954	20.9404	20.6416	20.2413	19.9318	(87)
Th 2	20.0386	20.0406	20.0426	20.0519	20.0536	20.0618	20.0618	20.0633	20.0586	20.0536	20.0501	20.0464	(88)
util rest of house	0.9953	0.9897	0.9697	0.8957	0.7284	0.5072	0.3410	0.3900	0.6806	0.9384	0.9895	0.9965	(89)
MIT 2	18.6563	18.8781	19.2520	19.7003	19.9656	20.0519	20.0609	20.0615	20.0142	19.6471	19.0748	18.6209	(90)
Living area fraction									fLA = Living area / (4) =			0.5035	(91)
MIT	19.3127	19.4991	19.8151	20.1984	20.4381	20.5212	20.5324	20.5317	20.4805	20.1478	19.6621	19.2809	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3127	19.4991	19.8151	20.1984	20.4381	20.5212	20.5324	20.5317	20.4805	20.1478	19.6621	19.2809	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	368.2280	417.6395	469.2421	500.3468	454.8551	327.5196	220.7575	230.8735	336.7405	379.5907	357.4129	350.3134	(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	868.7062	842.8132	766.9296	643.7753	496.8811	333.5110	221.4930	232.3012	360.7036	542.9239	717.2701	864.7821	(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	372.3557	285.7167	221.4796	103.2685	31.2674	0.0000	0.0000	0.0000	0.0000	121.5199	259.0972	382.7647	(98)
Space heating												1777.4697	(98)
Space heating per m2												32.3765	(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													1901.0371 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	372.3557	285.7167	221.4796	103.2685	31.2674	0.0000	0.0000	0.0000	0.0000	121.5199	259.0972	382.7647	(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)	398.2414	305.5794	236.8765	110.4476	33.4411	0.0000	0.0000	0.0000	0.0000	129.9678	277.1093	409.3740	(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	153.6938	135.1896	141.3269	125.7861	122.6115	108.6170	103.4201	114.7177	114.9017	130.4772	139.1031	149.6910	(64)
Efficiency of water heater (217)m	87.0883	86.7634	86.0077	84.2932	81.7643	79.8000	79.8000	79.8000	79.8000	84.6249	86.4507	79.8000	(216)
Fuel for water heating, kWh/month	176.4805	155.8140	164.3189	149.2245	149.9572	136.1116	129.5991	143.7565	143.9871	154.1831	160.9046	171.6394	(219)
Water heating fuel used												1835.9765	(219)
Annual totals kWh/year													
Space heating fuel - main system												1901.0371	(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)												255.0690	(232)
Total delivered energy for all uses												4067.0827	(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	1901.0371	0.2160	410.6240 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1835.9765	0.2160	396.5709 (264)
Space and water heating			807.1950 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	255.0690	0.5190	132.3808 (268)
Total CO2, kg/m2/year			978.5008 (272)
Emissions per m2 for space and water heating			14.7030 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4113 (272b)
Emissions per m2 for pumps and fans			0.7090 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7030 * 1.55) + 2.4113 + 0.7090, rounded to 2 d.p.			25.9100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT07			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT07		
Property	A207, Tangmere, London, N17				
SAP Rating	87 B	DER	5.91	TER	21.56
Environmental	96 A	% DER<TER	72.59		
CO ₂ Emissions (t/year)	0.37	DFEE	36.08	TFEE	44.67
General Requirements Compliance	Pass	% DFEE<TFEE	19.23		
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 108 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) 21.56 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 5.91 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 44.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 36.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	10.44 m ² , No overhang
Windows facing West:	8.62 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 m ³ /m ² h
Photovoltaic array	1.26 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	108.1000 (1b)	x 2.5000 (2b)	= 270.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.2500 (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					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					2.5000
Infiltration rate					0.1250 (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) =				0.1063 (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	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												74.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2615	0.2588	0.2562	0.2429	0.2402	0.2269	0.2269	0.2243	0.2323	0.2402	0.2455	0.2508 (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			2.2500	1.2000	2.7000		(26)
Windows (Uw = 0.90)			19.0600	0.8687	16.5579		(27)
External Wall 1	76.8700	21.3100	55.5600	0.1400	7.7784		(29a)
sheltered	30.1500		30.1500	0.2700	8.1405		(29a)
Total net area of external elements Aum(A, m ²)			107.0200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.1768		(33)
Party Wall 1			21.7500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							213.1300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4286 (36)
Total fabric heat loss							(33) + (36) = 45.6054 (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	23.3184	23.0815	22.8447	21.6602	21.4233	20.2389	20.2389	20.0020	20.7126	21.4233	21.8971	22.3709 (38)
Heat transfer coeff	68.9239	68.6870	68.4501	67.2656	67.0287	65.8443	65.8443	65.6074	66.3181	67.0287	67.5025	67.9763 (39)
Average = Sum(39)m / 12 =												67.2064 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6376	0.6354	0.6332	0.6223	0.6201	0.6091	0.6091	0.6069	0.6135	0.6201	0.6244	0.6288 (40)
HLP (average)												0.6217 (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	2.8029 (42)
Average daily hot water use (litres/day)	100.7695 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	110.8465	106.8157	102.7849	98.7541	94.7234	90.6926	90.6926	94.7234	98.7541	102.7849	106.8157	110.8465 (44)
Energy conte	164.3821	143.7697	148.3574	129.3416	124.1063	107.0943	99.2386	113.8778	115.2378	134.2986	146.5974	159.1953 (45)
Energy content (annual)	Total = Sum(45)m =											1585.4970 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6573	21.5654	22.2536	19.4012	18.6159	16.0641	14.8858	17.0817	17.2857	20.1448	21.9896	23.8793 (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												
191.3090 168.0907 175.2843 155.3998 151.0332 133.1526 126.1655 140.8046 141.2961 161.2254 172.6557 186.1222 (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												
191.3090 168.0907 175.2843 155.3998 151.0332 133.1526 126.1655 140.8046 141.2961 161.2254 172.6557 186.1222 (64)												
Total per year (kWh/year) = Sum(64)m =												1902.5389 (64)
Heat gains from water heating, kWh/month												
76.1985 67.2602 70.8703 63.8527 62.8068 56.4555 54.5383 59.4058 59.1632 66.1958 69.5902 74.4739 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 140.1464 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
25.1845 22.3686 18.1914 13.7721 10.2948 8.6913 9.3912 12.2071 16.3843 20.8037 24.2809 25.8844 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
268.7974 271.5867 264.5578 249.5942 230.7052 212.9523 201.0922 198.3029 205.3318 220.2955 239.1844 256.9374 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 37.0146 (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)												
-112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 -112.1171 (71)												
Water heating gains (Table 5)												
102.4174 100.0896 95.2558 88.6843 84.4178 78.4104 73.3042 79.8466 82.1711 88.9728 96.6531 100.0994 (72)												
Total internal gains												
461.4432 459.0889 443.0489 417.0944 390.4617 365.0978 348.8316 355.4005 368.9311 395.1159 425.1624 447.9651 (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												
West												
10.4400 10.6334 0.4000 0.7000 0.7700 21.5409 (74)												
8.6200 19.6403 0.4000 0.7000 0.7700 32.8508 (80)												
Solar gains	54.3917	105.4289	175.7829	266.7086	340.5191	355.6732	335.6319	278.3771	207.1906	125.2560	67.5345	44.9724 (83)
Total gains	515.8349	564.5177	618.8318	683.8030	730.9808	720.7711	684.4635	633.7776	576.1217	520.3719	492.6969	492.9375 (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	92.8535	93.1737	93.4962	95.1425	95.4788	97.1963	97.1963	97.5473	96.5019	95.4788	94.8086	94.1478
alpha	7.1902	7.2116	7.2331	7.3428	7.3653	7.4798	7.4798	7.5032	7.4335	7.3653	7.3206	7.2765
util living area												
0.9983 0.9961 0.9874 0.9419 0.8000 0.5802 0.4229 0.4752 0.7598 0.9678 0.9957 0.9987 (86)												
MIT	20.3006	20.4020	20.5801	20.8126	20.9574	20.9965	20.9997	20.9993	20.9781	20.7864	20.5062	20.2841 (87)
Th 2	20.3963	20.3982	20.4002	20.4100	20.4120	20.4218	20.4218	20.4238	20.4179	20.4120	20.4080	20.4041 (88)
util rest of house												
0.9978 0.9951 0.9840 0.9273 0.7626 0.5296 0.3675 0.4162 0.7073 0.9567 0.9944 0.9984 (89)												
MIT 2	19.4385	19.5881	19.8479	20.1835	20.3691	20.4192	20.4217	20.4234	20.3993	20.1535	19.7483	19.4208 (90)
Living area fraction												
fLA = Living area / (4) =												
MIT	19.7702	19.9013	20.1297	20.4256	20.5955	20.6414	20.6441	20.6451	20.6220	20.3970	20.0400	19.7530 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7702	19.9013	20.1297	20.4256	20.5955	20.6414	20.6441	20.6451	20.6220	20.3970	20.0400	19.7530 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9972 0.9941 0.9821 0.9277 0.7747 0.5490 0.3888 0.4389 0.7264 0.9564 0.9934 0.9979 (94)												
Useful gains	514.3928	561.1644	607.7581	634.3670	566.2933	395.6850	266.1420	278.1799	418.4756	497.6621	489.4213	491.9151 (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												
1066.2678 1030.3961 932.9527 775.2758 596.2535 397.7887 266.2816 278.5068 432.5265 656.6828 873.4810 1057.2362 (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												
410.5950 315.3237 241.9448 101.4543 22.2904 0.0000 0.0000 0.0000 0.0000 118.3114 276.5229 420.5989 (98)												
Space heating												1907.0415 (98)
Space heating per m2												(98) / (4) = 17.6415 (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	1907.0415	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	2002.3935	(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	1902.5389	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1997.6659	(310a)
Electricity used for heat distribution	40.0006	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	222.5509	(330a)
Total electricity for the above, kWh/year	222.5509	(331)
Electricity for lighting (calculated in Appendix L)	444.7658	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.26 * 951 * 1.00) =	-958.2209	(333)
Total delivered energy for all uses	3709.1551	(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			270.0000 (367a)
Space heating from Heat pump	1481.5035	0.5190	768.9003 (367)
Electrical energy for heat distribution	40.0006	0.5190	20.7603 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			789.6606 (373)
Space and water heating			789.6606 (376)
Pumps and fans	222.5509	0.5190	115.5039 (378)
Energy for lighting	444.7658	0.5190	230.8334 (379)
Energy saving/generation technologies			
PV Unit	-958.2209	0.5190	-497.3167 (380)
Total CO2, kg/year			638.6813 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			5.9100 (384)

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

DER	5.9100	ZC1
Total Floor Area	108.1000	TFA
Assumed number of occupants	2.8029	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	14.7348	ZC2
CO2 emissions from cooking, equation (L16)	1.7231	ZC3
Total CO2 emissions	22.3680	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	22.3680	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	108.1000 (1b)	x 2.5000 (2b)	= 270.2500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	108.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 270.2500 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) = 0.1480 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3980 (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) =				0.3383 (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	0.4313	0.4229	0.4144	0.3721	0.3637	0.3214	0.3214	0.3129	0.3383	0.3637	0.3806	0.3975 (22b)
	0.5930	0.5894	0.5859	0.5692	0.5661	0.5516	0.5516	0.5490	0.5572	0.5661	0.5724	0.5790 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			19.0600	1.3258	25.2689		(27)					
External Wall 1	76.8700	21.3100	55.5600	0.1800	10.0008		(29a)					
sheltered	30.1500		30.1500	0.1800	5.4270		(29a)					
Total net area of external elements Aum(A, m2)			107.0200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.9467		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9000 (36)					
Total fabric heat loss						(33) + (36) =	50.8467 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 52.8878	Feb 52.5656	Mar 52.2499	Apr 50.7666	May 50.4891	Jun 49.1973	Jul 49.1973	Aug 48.9580	Sep 49.6949	Oct 50.4891	Nov 51.0505	Dec 51.6374 (38)
Heat transfer coeff	103.7346	103.4124	103.0966	101.6134	101.3359	100.0440	100.0440	99.8048	100.5416	101.3359	101.8973	102.4842 (39)
Average = Sum(39)m / 12 =												101.6120 (39)
HLP	Jan 0.9596	Feb 0.9566	Mar 0.9537	Apr 0.9400	May 0.9374	Jun 0.9255	Jul 0.9255	Aug 0.9233	Sep 0.9301	Oct 0.9374	Nov 0.9426	Dec 0.9480 (40)
HLP (average)												0.9400 (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												2.8029 (42)
Average daily hot water use (litres/day)												100.7695 (43)
Daily hot water use	110.8465	106.8157	102.7849	98.7541	94.7234	90.6926	90.6926	94.7234	98.7541	102.7849	106.8157	110.8465 (44)
Energy conte	164.3821	143.7697	148.3574	129.3416	124.1063	107.0943	99.2386	113.8778	115.2378	134.2986	146.5974	159.1953 (45)
Energy content (annual)										Total = Sum(45)m =		1585.4970 (45)
Distribution loss (46)m = 0.15 x (45)m	24.6573	21.5654	22.2536	19.4012	18.6159	16.0641	14.8858	17.0817	17.2857	20.1448	21.9896	23.8793 (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	191.2160	168.0067	175.1913	155.3098	150.9402	133.0626	126.0725	140.7117	141.2061	161.1325	172.5657	186.0292 (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	191.2160	168.0067	175.1913	155.3098	150.9402	133.0626	126.0725	140.7117	141.2061	161.1325	172.5657	186.0292 (64)
	76.1242	67.1931	70.7959	63.7807	62.7325	56.3835	54.4639	59.3315	59.0912	66.1214	69.5183	74.3995 (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	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	140.1464	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.5583	21.8124	17.7391	13.4296	10.0388	8.4752	9.1577	11.9036	15.9769	20.2864	23.6772	25.2408	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	268.7974	271.5867	264.5578	249.5942	230.7052	212.9523	201.0922	198.3029	205.3318	220.2955	239.1844	256.9374	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	37.0146	(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)	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	-112.1171	(71)
Water heating gains (Table 5)	102.3174	99.9897	95.1558	88.5843	84.3178	78.3104	73.2042	79.7466	82.0711	88.8728	96.5531	99.9994	(72)
Total internal gains	463.7170	461.4327	445.4966	419.6520	393.1057	367.7817	351.4981	357.9970	371.4238	397.4986	427.4587	450.2215	(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				10.4400	10.6334	0.6300	0.7000	0.7700	33.9269 (74)						
West				8.6200	19.6403	0.6300	0.7000	0.7700	51.7400 (80)						
Solar gains				85.6669	166.0505	276.8580	420.0661	536.3176	560.1854	528.6203	438.4439	326.3252	197.2783	106.3669	70.8316 (83)
Total gains				549.3839	627.4832	722.3546	839.7181	929.4233	927.9671	880.1184	796.4409	697.7489	594.7769	533.8256	521.0531 (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	72.3669	72.5923	72.8147	73.8775	74.0798	75.0364	75.0364	75.2163	74.6651	74.0798	73.6717	73.2498	
alpha	5.8245	5.8395	5.8543	5.9252	5.9387	6.0024	6.0024	6.0144	5.9777	5.9387	5.9114	5.8833	
util living area	0.9991	0.9979	0.9926	0.9644	0.8618	0.6651	0.4962	0.5674	0.8542	0.9851	0.9981	0.9994	(86)
MIT	19.9349	20.0646	20.2991	20.6208	20.8721	20.9791	20.9969	20.9934	20.9116	20.5771	20.2022	19.9167	(87)
Th 2	20.1171	20.1196	20.1221	20.1336	20.1358	20.1459	20.1459	20.1478	20.1420	20.1358	20.1314	20.1269	(88)
util rest of house	0.9989	0.9972	0.9900	0.9513	0.8178	0.5866	0.4020	0.4670	0.7912	0.9777	0.9973	0.9992	(89)
MIT 2	18.6776	18.8691	19.2125	19.6803	20.0103	20.1320	20.1447	20.1450	20.0686	19.6264	19.0794	18.6583	(90)
Living area fraction	19.1615	19.3291	19.6307	20.0422	20.3420	20.4580	20.4726	20.4715	20.3930	19.9923	19.5115	19.1426	(92)
Temperature adjustment	19.1615	19.3291	19.6307	20.0422	20.3420	20.4580	20.4726	20.4715	20.3930	19.9923	19.5115	19.1426	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9984	0.9963	0.9880	0.9497	0.8292	0.6162	0.4384	0.5058	0.8116	0.9761	0.9965	0.9988	(94)
Ext temp.	548.5152	625.1662	713.7156	797.4620	770.6988	571.7993	385.8536	402.8453	566.2943	580.5570	531.9375	520.4478	(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	1541.6480	1492.1512	1353.7271	1132.2006	875.7409	586.0559	387.4337	406.3536	632.7059	951.7727	1264.6991	1531.3798	(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	738.8909	582.6139	476.1685	241.0117	78.1514	0.0000	0.0000	0.0000	0.0000	276.1845	527.5884	752.1334	(98)
												3672.7427	(98)
												33.9754	(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													3928.0671 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	738.8909	582.6139	476.1685	241.0117	78.1514	0.0000	0.0000	0.0000	0.0000	276.1845	527.5884	752.1334	(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)	790.2576	623.1165	509.2712	257.7666	83.5844	0.0000	0.0000	0.0000	0.0000	295.3845	564.2656	804.4207	(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	191.2160	168.0067	175.1913	155.3098	150.9402	133.0626	126.0725	140.7117	141.2061	161.1325	172.5657	186.0292	(64)
Efficiency of water heater (217)m	88.0722	87.8631	87.3498	85.9821	83.1539	79.8000	79.8000	79.8000	79.8000	86.2394	87.6049	88.1561	(217)
Fuel for water heating, kWh/month	217.1128	191.2142	200.5628	180.6305	181.5192	166.7451	157.9856	176.3304	176.9500	186.8433	196.9819	211.0224	(219)
Water heating fuel used												2243.8982	(219)
Annual totals kWh/year													
Space heating fuel - main system												3928.0671	(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)												433.7066	(232)
Total delivered energy for all uses												6680.6719	(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	3928.0671	0.2160	848.4625 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2243.8982	0.2160	484.6820 (264)
Space and water heating			1333.1445 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	433.7066	0.5190	225.0937 (268)
Total CO2, kg/m2/year			1597.1632 (272)
Emissions per m2 for space and water heating			12.3325 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.0823 (272b)
Emissions per m2 for pumps and fans			0.3601 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.3325 * 1.55) + 2.0823 + 0.3601, rounded to 2 d.p.			21.5600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT08			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT08		
Property	A108, Tangmere, London, N17				
SAP Rating	87 B	DER	5.26	TER	21.46
Environmental	96 A	% DER<TER	75.49		
CO ₂ Emissions (t/year)	0.28	DFEE	26.19	TFEE	36.11
General Requirements Compliance	Pass	% DFEE<TFEE	27.47		
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 77 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) 21.46 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 5.26 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 26.2 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.96 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	6.54 m ² , No overhang
Windows facing South:	3.08 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 m ³ /m ² h
Photovoltaic array	0.90 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	77.0000 (1b)	x 2.5000 (2b)	= 192.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 192.5000 (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					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					2.5000
Number of sides sheltered					0.1250 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.0969 (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	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (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) =												74.8000 (23c)
Effective ac	0.2495	0.2471	0.2447	0.2326	0.2301	0.2180	0.2180	0.2156	0.2229	0.2301	0.2350	0.2398 (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			2.2500	1.2000	2.7000		(26)
Windows (Uw = 0.90)			9.6200	0.8687	8.3571		(27)
External Wall 1	51.2900	11.8700	39.4200	0.1400	5.5188		(29a)
Total net area of external elements Aum(A, m ²)			51.2900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	16.5759		(33)
Party Wall 1			53.6500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							220.3900 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.1859 (36)
Total fabric heat loss						(33) + (36) =	22.7618 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	15.8505	15.6966	15.5428	14.7735	14.6197	13.8504	13.8504	13.6966	14.1581	14.6197	14.9274	15.2351 (38)
Heat transfer coeff	38.6123	38.4585	38.3046	37.5354	37.3815	36.6123	36.6123	36.4584	36.9200	37.3815	37.6892	37.9969 (39)
Average = Sum(39)m / 12 =												37.4969 (39)
HLP	0.5015	0.4995	0.4975	0.4875	0.4855	0.4755	0.4755	0.4735	0.4795	0.4855	0.4895	0.4935 (40)
HLP (average)												0.4870 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

											2.4035 (42)	
Average daily hot water use (litres/day)											91.2825 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	100.4108	96.7595	93.1082	89.4569	85.8056	82.1543	82.1543	85.8056	89.4569	93.1082	96.7595	100.4108 (44)
Energy conte	148.9063	130.2344	134.3902	117.1646	112.4223	97.0119	89.8957	103.1567	104.3887	121.6550	132.7959	144.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1436.2293 (45)
Distribution loss (46)m = 0.15 x (45)m												
22.3359	19.5352	20.1585	17.5747	16.8633	14.5518	13.4844	15.4735	15.6583	18.2482	19.9194	21.6312 (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												
	175.8331	154.5554	161.3170	143.2229	139.3491	123.0701	116.8226	130.0835	130.4469	148.5818	158.8542	171.1346 (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	175.8331	154.5554	161.3170	143.2229	139.3491	123.0701	116.8226	130.0835	130.4469	148.5818	158.8542	171.1346 (64)
								Total per year (kWh/year) = Sum(64)m =				1753.2713 (64)
Heat gains from water heating, kWh/month												
	71.0528	62.7597	66.2262	59.8038	58.9219	53.1030	51.4318	55.8411	55.5558	61.9918	65.0012	69.4906 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5189	19.1129	15.5437	11.7675	8.7964	7.4263	8.0244	10.4304	13.9996	17.7757	20.7469	22.1170 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.0566	215.2674	209.6961	197.8355	182.8636	168.7921	159.3915	157.1806	162.7519	174.6125	189.5845	203.6559 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174 (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)	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390 (71)
Water heating gains (Table 5)	95.5011	93.3925	89.0137	83.0609	79.1961	73.7542	69.1288	75.0552	77.1609	83.3223	90.2795	93.4013 (72)
Total internal gains	389.1287	386.8249	373.3056	351.7160	329.9081	309.0247	295.5967	301.7183	312.9645	334.7626	359.6629	378.2263 (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				6.5400	10.6334	0.4000	0.7000	0.7700	13.4940 (74)
South				3.0800	46.7521	0.4000	0.7000	0.7700	27.9411 (78)
Solar gains	41.4351	71.5480	102.1101	136.2665	163.4678	167.5713	159.3188	137.8744	35.3929 (83)
Total gains	430.5637	458.3729	475.4157	487.9825	493.3759	476.5960	454.9155	439.5927	413.6192 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	122.0827	122.5711	123.0634	125.5855	126.1023	128.7518	128.7518	129.2951	127.6788	126.1023	125.0728	124.0600
alpha	9.1388	9.1714	9.2042	9.3724	9.4068	9.5835	9.5835	9.6197	9.5119	9.4068	9.3382	9.2707
util living area	0.9916	0.9827	0.9567	0.8681	0.6967	0.4914	0.3541	0.3815	0.5954	0.8721	0.9763	0.9936 (86)
MIT	20.6628	20.7388	20.8442	20.9525	20.9939	20.9998	21.0000	21.0000	20.9988	20.9580	20.8073	20.6475 (87)
Th 2	20.5195	20.5213	20.5232	20.5323	20.5342	20.5434	20.5434	20.5452	20.5397	20.5342	20.5305	20.5268 (88)
util rest of house	0.9896	0.9788	0.9476	0.8462	0.6642	0.4564	0.3174	0.3438	0.5564	0.8468	0.9703	0.9921 (89)
MIT 2	20.0658	20.1764	20.3266	20.4785	20.5284	20.5432	20.5434	20.5452	20.5388	20.4885	20.2830	20.0500 (90)
Living area fraction									fLA = Living area / (4) =			0.3506 (91)
MIT	20.2752	20.3736	20.5081	20.6447	20.6916	20.7033	20.7035	20.7047	20.7001	20.6531	20.4669	20.2595 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2752	20.3736	20.5081	20.6447	20.6916	20.7033	20.7035	20.7047	20.7001	20.6531	20.4669	20.2595 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9884	0.9774	0.9472	0.8517	0.6753	0.4687	0.3302	0.3570	0.5701	0.8536	0.9694	0.9911 (94)
Useful gains	425.5676	448.0358	450.3294	415.6121	333.1692	223.3725	150.2350	156.9362	243.1647	354.0694	396.9045	409.9283 (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	616.8377	595.0923	536.5742	440.8425	336.1207	223.4561	150.2375	156.9412	243.6745	375.8012	503.7865	610.2121 (97a)
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	142.3050	98.8220	64.1661	18.1659	2.1959	0.0000	0.0000	0.0000	0.0000	16.1685	76.9550	149.0111 (98)
Space heating												567.7895 (98)
Space heating per m2												(98) / (4) = 7.3739 (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	567.7895 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	596.1789 (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	1753.2713 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1840.9349 (310a)
Electricity used for heat distribution	24.3711 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	158.5238 (330a)
Total electricity for the above, kWh/year	158.5238 (331)
Electricity for lighting (calculated in Appendix L)	380.0307 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.90 * 951 * 1.00) =	-684.4435 (333)
Total delivered energy for all uses	2291.2247 (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			270.0000 (367a)
Space heating from Heat pump	902.6347	0.5190	468.4674 (367)
Electrical energy for heat distribution	24.3711	0.5190	12.6486 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			481.1161 (373)
Space and water heating			481.1161 (376)
Pumps and fans	158.5238	0.5190	82.2738 (378)
Energy for lighting	380.0307	0.5190	197.2359 (379)
Energy saving/generation technologies			
PV Unit	-684.4435	0.5190	-355.2262 (380)
Total CO2, kg/year			405.3996 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			5.2600 (384)

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

DER	5.2600 ZC1
Total Floor Area	TFA 77.0000
Assumed number of occupants	N 2.4035
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	16.3965 ZC2
CO2 emissions from cooking, equation (L16)	2.2946 ZC3
Total CO2 emissions	23.9511 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	23.9511 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	77.0000 (1b)	x 2.5000 (2b)	= 192.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	77.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 192.5000 (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) =				30.0000 / (5) = 0.1558 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4058 (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) =				0.3145 (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	0.4010	0.3932	0.3853	0.3460	0.3381	0.2988	0.2988	0.2909	0.3145	0.3381	0.3538	0.3696 (22b)
Effective ac	0.5804	0.5773	0.5742	0.5599	0.5572	0.5446	0.5446	0.5423	0.5495	0.5572	0.5626	0.5683 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			9.6200	1.3258	12.7538		(27)					
External Wall 1	51.2900	11.8700	39.4200	0.1800	7.0956		(29a)					
Total net area of external elements Aum(A, m2)			51.2900				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	22.0994		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5770 (36)					
Total fabric heat loss						(33) + (36) =	29.6764 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.8706	Feb 36.6722	Mar 36.4778	Apr 35.5646	May 35.3937	Jun 34.5984	Jul 34.5984	Aug 34.4511	Sep 34.9047	Oct 35.3937	Nov 35.7394	Dec 36.1007 (38)
Heat transfer coeff	66.5470	66.3486	66.1542	65.2410	65.0701	64.2747	64.2747	64.1275	64.5811	65.0701	65.4158	65.7771 (39)
Average = Sum(39)m / 12 =												65.2402 (39)
HLP	Jan 0.8642	Feb 0.8617	Mar 0.8591	Apr 0.8473	May 0.8451	Jun 0.8347	Jul 0.8347	Aug 0.8328	Sep 0.8387	Oct 0.8451	Nov 0.8496	Dec 0.8542 (40)
HLP (average)												0.8473 (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												2.4035 (42)
Average daily hot water use (litres/day)												91.2825 (43)
Daily hot water use	Jan 100.4108	Feb 96.7595	Mar 93.1082	Apr 89.4569	May 85.8056	Jun 82.1543	Jul 82.1543	Aug 85.8056	Sep 89.4569	Oct 93.1082	Nov 96.7595	Dec 100.4108 (44)
Energy conte	148.9063	130.2344	134.3902	117.1646	112.4223	97.0119	89.8957	103.1567	104.3887	121.6550	132.7959	144.2078 (45)
Energy content (annual)										Total = Sum(45)m =		1436.2293 (45)
Distribution loss (46)m = 0.15 x (45)m	22.3359	19.5352	20.1585	17.5747	16.8633	14.5518	13.4844	15.4735	15.6583	18.2482	19.9194	21.6312 (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	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)

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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	175.7401	154.4714	161.2241	143.1329	139.2561	122.9801	116.7296	129.9906	130.3570	148.4888	158.7642	171.0416 (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	175.7401	154.4714	161.2241	143.1329	139.2561	122.9801	116.7296	129.9906	130.3570	148.4888	158.7642	171.0416 (64)
Heat gains from water heating, kWh/month	70.9784	62.6926	66.1518	59.7319	58.8475	53.0311	51.3574	55.7667	55.4839	61.9174	64.9293	69.4162 (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	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737	120.1737 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.8953	18.5590	15.0932	11.4265	8.5415	7.2111	7.7918	10.1281	13.5939	17.2606	20.1456	21.4760 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	213.0566	215.2674	209.6961	197.8355	182.8636	168.7921	159.3915	157.1806	162.7519	174.6125	189.5845	203.6559 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174	35.0174 (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)	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390	-96.1390 (71)
Water heating gains (Table 5)	95.4011	93.2925	88.9138	82.9609	79.0961	73.6542	69.0288	74.9552	77.0609	83.2223	90.1795	93.3013 (72)
Total internal gains	391.4051	389.1710	375.7552	354.2750	332.5533	311.7095	298.2642	304.3160	315.4588	337.1475	361.9617	380.4854 (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	6.5400				10.6334		0.6300		0.7000		0.7700		21.2531
South	3.0800				46.7521		0.6300		0.7000		0.7700		44.0072 (78)

Solar gains	65.2602	112.6881	160.8234	214.6197	257.4618	263.9248	250.9271	217.1522	178.8833	126.0845	78.3819	55.7438 (83)	
Total gains	456.6653	501.8591	536.5786	568.8947	590.0150	575.6343	549.1913	521.4682	494.3421	463.2320	440.3436	436.2292 (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	80.3526	80.5928	80.8297	81.9611	82.1763	83.1932	83.1932	83.3843	82.7986	82.1763	81.7421	81.2930
alpha	6.3568	6.3729	6.3886	6.4641	6.4784	6.5462	6.5462	6.5590	6.5199	6.4784	6.4495	6.4195
util living area	0.9979	0.9957	0.9891	0.9632	0.8770	0.6901	0.5117	0.5597	0.8181	0.9712	0.9952	0.9984 (86)
MIT	20.1565	20.2681	20.4481	20.6883	20.8867	20.9817	20.9977	20.9960	20.9467	20.7071	20.3922	20.1369 (87)
Th 2	20.1980	20.2002	20.2024	20.2125	20.2144	20.2233	20.2233	20.2250	20.2199	20.2144	20.2106	20.2066 (88)
util rest of house	0.9973	0.9943	0.9854	0.9503	0.8375	0.6164	0.4232	0.4686	0.7537	0.9586	0.9933	0.9979 (89)
MIT 2	19.0625	19.2270	19.4898	19.8393	20.1012	20.2108	20.2224	20.2232	20.1770	19.8710	19.4164	19.0406 (90)
Living area fraction	19.4461	19.5921	19.8258	20.1370	20.3766	20.4811	20.4943	20.4942	20.4469	20.1642	19.7586	0.3506 (91)
MIT	19.4461	19.5921	19.8258	20.1370	20.3766	20.4811	20.4943	20.4942	20.4469	20.1642	19.7586	19.4250 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4461	19.5921	19.8258	20.1370	20.3766	20.4811	20.4943	20.4942	20.4469	20.1642	19.7586	19.4250 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	455.0317	498.2927	527.5443	539.7712	499.4223	369.3767	249.5051	261.0950	382.5686	443.5848	436.8014	435.0399 (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	1007.9267	974.8004	881.5604	733.1113	564.5896	378.0092	250.3021	262.5501	409.8918	622.3422	828.0710	1001.4578 (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	411.3538	320.2131	263.3880	139.2049	48.4844	0.0000	0.0000	0.0000	0.0000	132.9955	281.7140	421.4149 (98)
Space heating												2018.7687 (98)
Space heating per m2												26.2178 (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													2159.1109 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	411.3538	320.2131	263.3880	139.2049	48.4844	0.0000	0.0000	0.0000	0.0000	132.9955	281.7140	421.4149	(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)	439.9506	342.4739	281.6984	148.8822	51.8550	0.0000	0.0000	0.0000	0.0000	142.2412	301.2984	450.7111	(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	175.7401	154.4714	161.2241	143.1329	139.2561	122.9801	116.7296	129.9906	130.3570	148.4888	158.7642	171.0416	(64)
Efficiency of water heater (217)m	87.0078	86.7162	86.1157	84.7398	82.3133	79.8000	79.8000	79.8000	79.8000	84.5216	86.3279	79.8000	(216)
Fuel for water heating, kWh/month	201.9821	178.1344	187.2180	168.9087	169.1781	154.1104	146.2777	162.8954	163.3546	175.6816	183.9084	196.3124	(219)
Water heating fuel used												2087.9619	(219)
Annual totals kWh/year													
Space heating fuel - main system												2159.1109	(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)												369.0171	(232)
Total delivered energy for all uses												4691.0900	(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	2159.1109	0.2160	466.3680 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2087.9619	0.2160	450.9998 (264)
Space and water heating			917.3677 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.0171	0.5190	191.5199 (268)
Total CO2, kg/m2/year			1147.8126 (272)
Emissions per m2 for space and water heating			11.9139 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4873 (272b)
Emissions per m2 for pumps and fans			0.5055 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.9139 * 1.55) + 2.4873 + 0.5055, rounded to 2 d.p.			21.4600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT12			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT12		
Property	B4.04, Tangmere, London, N17				
SAP Rating	85 B	DER	8.65	TER	24.74
Environmental	94 A	% DER<TER	65.04		
CO ₂ Emissions (t/year)	0.43	DFEE	39.12	TFEE	46.85
General Requirements Compliance	Pass	% DFEE<TFEE	16.50		
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 72 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) 24.74 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 8.65 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 46.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 39.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.95 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	2.73 m ² , No overhang
Windows facing East:	7.34 m ² , No overhang
Windows facing West:	2.64 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 m ³ /m ² h
Photovoltaic array	0.69 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	71.6000 (1b)	x 2.5000 (2b)	= 179.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 179.0000 (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					2.5000
Infiltration rate					0.1250 (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) =				0.0969 (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	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												74.8000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2495	0.2471	0.2447	0.2326	0.2301	0.2180	0.2180	0.2156	0.2229	0.2301	0.2350	0.2398 (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			2.2500	1.2000	2.7000		(26)
Windows (Uw = 0.90)			12.7100	0.8687	11.0415		(27)
External Wall 1	51.3000	14.9600	36.3400	0.1400	5.0876		(29a)
Sheltered	29.5000		29.5000	0.2700	7.9650		(29a)
Total net area of external elements Aum(A, m2)			80.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	26.7941	(33)
Party Wall 1			16.4000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							213.2400 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.3897 (36)
Total fabric heat loss							(33) + (36) = 38.1838 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	14.7389	14.5958	14.4528	13.7375	13.5944	12.8791	12.8791	12.7360	13.1652	13.5944	13.8805	14.1666 (38)
Heat transfer coeff	52.9227	52.7796	52.6366	51.9213	51.7782	51.0629	51.0629	50.9199	51.3490	51.7782	52.0643	52.3505 (39)
Average = Sum(39)m / 12 =												51.8855 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7391	0.7371	0.7351	0.7252	0.7232	0.7132	0.7132	0.7112	0.7172	0.7232	0.7272	0.7312 (40)
HLP (average)												0.7247 (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	2.2843 (42)
Average daily hot water use (litres/day)	88.4529 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.2982	93.7601	90.2220	86.6839	83.1458	79.6076	79.6076	83.1458	86.6839	90.2220	93.7601	97.2982 (44)
Energy conte	144.2905	126.1974	130.2244	113.5328	108.9374	94.0047	87.1092	99.9590	101.1529	117.8839	128.6795	139.7376 (45)
Energy content (annual)												Total = Sum(45)m = 1391.7090 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.6436	18.9296	19.5337	17.0299	16.3406	14.1007	13.0664	14.9939	15.1729	17.6826	19.3019	20.9606 (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												
171.2173 150.5184 157.1512 139.5910 135.8642 120.0629 114.0360 126.8859 127.2111 144.8107 154.7377 166.6644 (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												
171.2173 150.5184 157.1512 139.5910 135.8642 120.0629 114.0360 126.8859 127.2111 144.8107 154.7377 166.6644 (64)												
Total per year (kWh/year) = Sum(64)m =												1708.7510 (64)
Heat gains from water heating, kWh/month												
69.5181 61.4174 64.8411 58.5962 57.7632 52.1031 50.5053 54.7779 54.4799 60.7379 63.6325 68.0042 (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 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 114.2167 (66)												
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.8066 16.7038 13.5845 10.2843 7.6876 6.4902 7.0129 9.1157 12.2350 15.5352 18.1318 19.3292 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
201.0022 203.0879 197.8319 186.6423 172.5174 159.2421 150.3734 148.2876 153.5437 164.7332 178.8581 192.1334 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 34.4217 (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)												
-91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 -91.3734 (71)												
Water heating gains (Table 5)												
93.4382 91.3950 87.1520 81.3837 77.6387 72.3655 67.8834 73.6262 75.6666 81.6369 88.3785 91.4035 (72)												
Total internal gains												
370.5120 368.4518 355.8333 335.5753 315.1088 295.3628 282.5347 288.2944 298.7102 319.1703 342.6334 360.1312 (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				2.7300	10.6334	0.4000	0.7000	0.7700	5.6328 (74)			
East				7.3400	19.6403	0.4000	0.7000	0.7700	27.9727 (76)			
West				2.6400	19.6403	0.4000	0.7000	0.7700	10.0610 (80)			
Solar gains	43.6666	85.1667	140.8213	208.0833	258.5853	266.5624	252.9981	214.7261	164.4996	101.0982	54.3724	35.9729 (83)
Total gains	414.1785	453.6184	496.6546	543.6586	573.6941	561.9252	535.5328	503.0205	463.2098	420.2685	397.0058	396.1041 (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 80.1378 80.3550 80.5734 81.6834 81.9091 83.0565 83.0565 83.2898 82.5937 81.9091 81.4590 81.0138												
alpha 6.3425 6.3570 6.3716 6.4456 6.4606 6.5371 6.5371 6.5527 6.5062 6.4606 6.4306 6.4009												
util living area	0.9956	0.9913	0.9764	0.9196	0.7797	0.5744	0.4187	0.4640	0.7286	0.9475	0.9904	0.9967 (86)
MIT 20.2356 20.3510 20.5483 20.7913 20.9443 20.9934 20.9993 20.9986 20.9726 20.7717 20.4626 20.2126 (87)												
Th 2 20.3064 20.3081 20.3099 20.3187 20.3204 20.3292 20.3292 20.3310 20.3257 20.3204 20.3169 20.3134 (88)												
util rest of house	0.9945	0.9890	0.9702	0.9001	0.7377	0.5171	0.3553	0.3974	0.6697	0.9304	0.9875	0.9958 (89)
MIT 2 19.2728 19.4419 19.7274 20.0721 20.2653 20.3245 20.3289 20.3303 20.3031 20.0528 19.6118 19.2449 (90)												
Living area fraction	19.6762	19.8228	20.0714	20.3734	20.5498	20.6048	20.6098	20.6103	20.5836	20.3540	19.9683	19.6504 (92)
MIT	19.6762	19.8228	20.0714	20.3734	20.5498	20.6048	20.6098	20.6103	20.5836	20.3540	19.9683	19.6504 (93)
Temperature adjustment												0.0000
adjusted MIT	19.6762	19.8228	20.0714	20.3734	20.5498	20.6048	20.6098	20.6103	20.5836	20.3540	19.9683	19.6504 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9932 0.9871 0.9677 0.9018 0.7524 0.5409 0.3819 0.4253 0.6930 0.9314 0.9856 0.9947 (94)												
Useful gains	411.3532	447.7519	480.6198	490.2953	431.6673	303.9372	204.5145	213.9279	321.0074	391.4226	391.2990	393.9992 (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	813.7502	787.6188	714.3510	595.7144	458.2264	306.6211	204.7504	214.3889	332.9282	505.0445	669.9792	808.8332 (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	299.3834	228.3906	173.8960	75.9017	19.7600	0.0000	0.0000	0.0000	0.0000	84.5347	200.6498	308.6364 (98)
Space heating												1391.1525 (98)
Space heating per m2												19.4295 (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	1.0500 (306)
Space heating:	
Annual space heating requirement	1391.1525 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1460.7101 (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	1708.7510 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1794.1885 (310a)
Electricity used for heat distribution	32.5490 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)	
mechanical ventilation fans (SFP = 0.6750)	147.4065 (330a)
Total electricity for the above, kWh/year	147.4065 (331)
Electricity for lighting (calculated in Appendix L)	332.1296 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV Unit 0 (0.80 * 0.69 * 951 * 1.00) =	-524.7400 (333)
Total delivered energy for all uses	3209.6947 (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			270.0000 (367a)
Space heating from Heat pump	1205.5180	0.5190	625.6638 (367)
Electrical energy for heat distribution	32.5490	0.5190	16.8929 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			642.5568 (373)
Space and water heating			642.5568 (376)
Pumps and fans	147.4065	0.5190	76.5040 (378)
Energy for lighting	332.1296	0.5190	172.3752 (379)
Energy saving/generation technologies			
PV Unit	-524.7400	0.5190	-272.3401 (380)
Total CO2, kg/year			619.0959 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			8.6500 (384)

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

DER	8.6500 ZC1
Total Floor Area	TFA 71.6000
Assumed number of occupants	N 2.2843
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	16.6354 ZC2
CO2 emissions from cooking, equation (L16)	2.4277 ZC3
Total CO2 emissions	27.7131 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	27.7131 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	71.6000 (1b)	x 2.5000 (2b)	= 179.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 179.0000 (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) =	0.1676 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4176 (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) =		0.3236 (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	0.4126	0.4045	0.3965	0.3560	0.3479	0.3075	0.3075	0.2994	0.3236	0.3479	0.3641	0.3803 (22b)
Effective ac	0.5851	0.5818	0.5786	0.5634	0.5605	0.5473	0.5473	0.5448	0.5524	0.5605	0.5663	0.5723 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			12.7100	1.3258	16.8504		(27)					
External Wall 1	51.3000	14.9600	36.3400	0.1800	6.5412		(29a)					
Sheltered	29.5000		29.5000	0.1800	5.3100		(29a)					
Total net area of external elements Aum(A, m2)			80.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			30.9516	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0840 (36)					
Total fabric heat loss						(33) + (36) =	41.0356 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.5639	Feb 34.3687	Mar 34.1773	Apr 33.2782	May 33.1100	Jun 32.3269	Jul 32.3269	Aug 32.1819	Sep 32.6285	Oct 33.1100	Nov 33.4503	Dec 33.8060 (38)
Heat transfer coeff	75.5995	75.4042	75.2128	74.3138	74.1456	73.3625	73.3625	73.2175	73.6641	74.1456	74.4858	74.8416 (39)
Average = Sum(39)m / 12 =												74.3130 (39)
HLP	Jan 1.0559	Feb 1.0531	Mar 1.0505	Apr 1.0379	May 1.0356	Jun 1.0246	Jul 1.0246	Aug 1.0226	Sep 1.0288	Oct 1.0356	Nov 1.0403	Dec 1.0453 (40)
HLP (average)												1.0379 (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												2.2843 (42)	
Average daily hot water use (litres/day)												88.4529 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.2982	93.7601	90.2220	86.6839	83.1458	79.6076	79.6076	83.1458	86.6839	90.2220	93.7601	97.2982 (44)	
Energy conte	144.2905	126.1974	130.2244	113.5328	108.9374	94.0047	87.1092	99.9590	101.1529	117.8839	128.6795	139.7376 (45)	
Energy content (annual)											Total = Sum(45)m =	1391.7090 (45)	
Distribution loss (46)m = 0.15 x (45)m	21.6436	18.9296	19.5337	17.0299	16.3406	14.1007	13.0664	14.9939	15.1729	17.6826	19.3019	20.9606 (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

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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	171.1243	150.4344	157.0582	139.5010	135.7713	119.9729	113.9430	126.7929	127.1211	144.7178	154.6478	166.5715 (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	171.1243	150.4344	157.0582	139.5010	135.7713	119.9729	113.9430	126.7929	127.1211	144.7178	154.6478	166.5715 (64)
	69.4437	61.3503	64.7667	58.5243	57.6888	52.0312	50.4309	54.7035	54.4079	60.6635	63.5605	67.9299 (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	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	114.2167	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3436	16.2926	13.2500	10.0311	7.4984	6.3305	6.8403	8.8913	11.9338	15.1527	17.6855	18.8534	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.0022	203.0879	197.8319	186.6423	172.5174	159.2421	150.3734	148.2876	153.5437	164.7332	178.8581	192.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	34.4217	(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)	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	-91.3734	(71)
Water heating gains (Table 5)	93.3383	91.2950	87.0520	81.2837	77.5387	72.2655	67.7835	73.5262	75.5666	81.5370	88.2785	91.3036	(72)
Total internal gains	372.9490	370.9406	358.3989	338.2221	317.8195	298.1031	285.2621	290.9700	301.3091	321.6879	345.0871	362.5554	(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				2.7300	10.6334	0.6300	0.7000	0.7700		8.8717 (74)		
East				7.3400	19.6403	0.6300	0.7000	0.7700		44.0570 (76)		
West				2.6400	19.6403	0.6300	0.7000	0.7700		15.8461 (80)		

Solar gains	68.7748	134.1375	221.7936	327.7312	407.2718	419.8358	398.4720	338.1936	259.0868	159.2297	85.6366	56.6573 (83)
Total gains	441.7239	505.0781	580.1925	665.9533	725.0914	717.9389	683.7341	629.1636	560.3959	480.9176	430.7237	419.2127 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	65.7705	65.9409	66.1087	66.9085	67.0603	67.7761	67.7761	67.9103	67.4986	67.0603	66.7539	66.4366	
alpha	5.3847	5.3961	5.4072	5.4606	5.4707	5.5184	5.5184	5.5274	5.4999	5.4707	5.4503	5.4291	
util living area	0.9977	0.9948	0.9843	0.9412	0.8234	0.6308	0.4681	0.5273	0.8020	0.9702	0.9951	0.9983	(86)
MIT	19.9033	20.0499	20.3060	20.6353	20.8761	20.9777	20.9963	20.9932	20.9211	20.5920	20.1879	19.8783	(87)
Th 2	20.0370	20.0393	20.0415	20.0519	20.0538	20.0629	20.0629	20.0646	20.0594	20.0538	20.0499	20.0458	(88)
util rest of house	0.9970	0.9931	0.9789	0.9213	0.7720	0.5481	0.3706	0.4242	0.7277	0.9562	0.9931	0.9977	(89)
MIT 2	18.5724	18.7877	19.1600	19.6299	19.9368	20.0486	20.0615	20.0618	19.9981	19.5808	18.9975	18.5423	(90)
Living area fraction	19.1300	19.3166	19.6401	20.0511	20.3303	20.4379	20.4532	20.4521	20.3848	20.0045	19.4963	19.1021	(91)
MIT	19.1300	19.3166	19.6401	20.0511	20.3303	20.4379	20.4532	20.4521	20.3848	20.0045	19.4963	19.1021	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1300	19.3166	19.6401	20.0511	20.3303	20.4379	20.4532	20.4521	20.3848	20.0045	19.4963	19.1021	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.9431	500.7239	566.2862	613.5576	571.4788	417.9378	281.4103	294.2056	423.3678	459.4239	427.0963	417.9204	(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	1121.1411	1087.0725	988.3071	828.6829	639.9017	428.2812	282.6814	296.6830	462.9648	697.3003	923.3494	1115.2955	(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	506.8113	394.0263	313.9836	154.8902	50.9066	0.0000	0.0000	0.0000	0.0000	176.9800	357.3022	518.8471	(98)
Space heating												2473.7473	(98)
Space heating per m2												34.5495	(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													2645.7191 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	506.8113	394.0263	313.9836	154.8902	50.9066	0.0000	0.0000	0.0000	0.0000	176.9800	357.3022	518.8471	(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)	542.0442	421.4185	335.8113	165.6580	54.4456	0.0000	0.0000	0.0000	0.0000	189.2835	382.1414	554.9167	(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	171.1243	150.4344	157.0582	139.5010	135.7713	119.9729	113.9430	126.7929	127.1211	144.7178	154.6478	166.5715	(64)
Efficiency of water heater (217)m	87.5372	87.2670	86.6271	85.0933	82.4586	79.8000	79.8000	79.8000	79.8000	85.3517	86.9771	79.8000	(216)
Fuel for water heating, kWh/month	195.4875	172.3841	181.3038	163.9388	164.6539	150.3420	142.7858	158.8884	159.2997	169.5547	177.8029	190.0545	(219)
Water heating fuel used												2026.4960	(219)
Annual totals kWh/year													
Space heating fuel - main system												2645.7191	(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)												323.9535	(232)
Total delivered energy for all uses												5071.1685	(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	2645.7191	0.2160	571.4753 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2026.4960	0.2160	437.7231 (264)
Space and water heating			1009.1985 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.9535	0.5190	168.1319 (268)
Total CO2, kg/m2/year			1216.2553 (272)
Emissions per m2 for space and water heating			14.0950 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3482 (272b)
Emissions per m2 for pumps and fans			0.5436 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0950 * 1.55) + 2.3482 + 0.5436, rounded to 2 d.p.			24.7400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT14			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT14		
Property	A506, Tangmere, London, N17				
SAP Rating	87 B	DER	5.89	TER	21.69
Environmental	96 A	% DER<TER	72.85		
CO ₂ Emissions (t/year)	0.33	DFEE	33.70	TFEE	41.42
General Requirements Compliance	Pass	% DFEE<TFEE	18.63		
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 94 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) 21.69 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 5.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)33.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.94 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.47	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	10.02 m ² , No overhang
Windows facing West:	3.24 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 m ³ /m ² h
Photovoltaic array	1.10 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	94.0000 (1b)	x 2.5000 (2b)	= 235.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0000 (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											2.5000	
Infiltration rate											0.1250	(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) =										0.1063	(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)
	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (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	0.2572	0.2546	0.2519	0.2386	0.2360	0.2227	0.2227	0.2200	0.2280	0.2360	0.2413	0.2466 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			13.2600	0.8687	11.5193		(27)					
External Wall 1	57.1300	15.5100	41.6200	0.1400	5.8268		(29a)					
sheltered	29.0000		29.0000	0.2700	7.8300		(29a)					
Total net area of external elements Aum(A, m2)			86.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	27.8761		(33)					
Party Wall 1			22.3300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							211.6800 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2700 (36)					
Total fabric heat loss							(33) + (36) = 36.1461 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 19.9473	Feb 19.7413	Mar 19.5353	Apr 18.5054	May 18.2994	Jun 17.2694	Jul 17.2694	Aug 17.0634	Sep 17.6814	Oct 18.2994	Nov 18.7114	Dec 19.1233 (38)
Heat transfer coeff	56.0935	55.8875	55.6815	54.6515	54.4455	53.4156	53.4156	53.2096	53.8275	54.4455	54.8575	55.2695 (39)
Average = Sum(39)m / 12 =												54.6000 (39)
HLP	Jan 0.5967	Feb 0.5945	Mar 0.5924	Apr 0.5814	May 0.5792	Jun 0.5683	Jul 0.5683	Aug 0.5661	Sep 0.5726	Oct 0.5792	Nov 0.5836	Dec 0.5880 (40)
HLP (average)												0.5809 (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												2.6766 (42)
Average daily hot water use (litres/day)												97.7695 (43)
Daily hot water use	Jan 107.5465	Feb 103.6357	Mar 99.7249	Apr 95.8141	May 91.9033	Jun 87.9926	Jul 87.9926	Aug 91.9033	Sep 95.8141	Oct 99.7249	Nov 103.6357	Dec 107.5465 (44)
Energy conte	159.4883	139.4895	143.9406	125.4909	120.4115	103.9060	96.2842	110.4875	111.8071	130.3004	142.2331	154.4559 (45)
Energy content (annual)												Total = Sum(45)m = 1538.2950 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.9232	20.9234	21.5911	18.8236	18.0617	15.5859	14.4426	16.5731	16.7711	19.5451	21.3350	23.1684 (46)
Water storage loss:												

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Store volume												1.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0240 (51)
Volume factor from Table 2a												4.9324 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.1182 (55)
Total storage loss												
3.6645 3.3098 3.6645 3.5462 3.6645 3.5462 3.6645 3.6645 3.5462 3.6645 3.5462 3.6645 (56)												
If cylinder contains dedicated solar storage												
3.6645 3.3098 3.6645 3.5462 3.6645 3.5462 3.6645 3.6645 3.5462 3.6645 3.5462 3.6645 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
186.4151 163.8105 170.8675 151.5492 147.3384 129.9643 123.2110 137.4144 137.8653 157.2272 168.2913 181.3827 (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												
186.4151 163.8105 170.8675 151.5492 147.3384 129.9643 123.2110 137.4144 137.8653 157.2272 168.2913 181.3827 (64)												
Heat gains from water heating, kWh/month												
74.5713 65.8371 69.4017 62.5723 61.5783 55.3953 53.5560 58.2786 58.0225 64.8664 68.1391 72.8981 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
24.2154 21.5079 17.4914 13.2421 9.8986 8.3569 9.0299 11.7374 15.7539 20.0032 23.3467 24.8884 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
246.2474 248.8027 242.3634 228.6551 211.3508 195.0872 184.2221 181.6668 188.1061 201.8144 219.1187 235.3823 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 36.3831 (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)												
-107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 -107.0644 (71)												
Water heating gains (Table 5)												
100.2303 97.9718 93.2819 86.9060 82.7666 76.9380 71.9838 78.3314 80.5867 87.1860 94.6376 97.9813 (72)												
Total internal gains												
433.8422 431.4316 416.2859 391.9524 367.1652 343.5312 328.3850 334.8848 347.5958 372.1527 400.2521 421.4012 (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					10.0200	10.6334	0.4000	0.7000	0.7700		20.6743 (74)	
West					3.2400	19.6403	0.4000	0.7000	0.7700		12.3476 (80)	

Solar gains	33.0219	63.6642	106.9157	165.8540	216.3685	228.2978	214.4853	174.7132	126.9847	75.6925	40.9005	27.3892 (83)
Total gains	466.8642	495.0958	523.2016	557.8065	583.5337	571.8290	542.8703	509.5980	474.5805	447.8452	441.1526	448.7904 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	98.5356	98.8987	99.2646	101.1354	101.5180	103.4755	103.4755	103.8761	102.6835	101.5180	100.7556	100.0045
alpha	7.5690	7.5932	7.6176	7.7424	7.7679	7.8984	7.8984	7.9251	7.8456	7.7679	7.7170	7.6670
util living area												
0.9974 0.9952 0.9868 0.9459 0.8142 0.5937 0.4326 0.4796 0.7545 0.9612 0.9938 0.9980 (86)												
MIT	20.3951	20.4770	20.6258	20.8277	20.9597	20.9969	20.9998	20.9995	20.9828	20.8250	20.5825	20.3816 (87)
Th 2	20.4329	20.4349	20.4369	20.4468	20.4487	20.4587	20.4587	20.4606	20.4547	20.4487	20.4448	20.4408 (88)
util rest of house												
0.9968 0.9939 0.9833 0.9323 0.7790 0.5451 0.3796 0.4237 0.7044 0.9488 0.9919 0.9975 (89)												
MIT 2	19.6061	19.7271	19.9444	20.2373	20.4077	20.4564	20.4585	20.4604	20.4400	20.2385	19.8893	19.5929 (90)
Living area fraction												
fLA = Living area / (4) =												0.3485 (91)
MIT	19.8811	19.9885	20.1819	20.4431	20.6001	20.6447	20.6472	20.6483	20.6292	20.4429	20.1309	19.8677 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8811	19.9885	20.1819	20.4431	20.6001	20.6447	20.6472	20.6483	20.6292	20.4429	20.1309	19.8677 (93)

8. Space heating requirement

Utilisation	0.9959	0.9927	0.9814	0.9322	0.7890	0.5619	0.3981	0.4432	0.7210	0.9486	0.9906	0.9969 (94)
Useful gains	464.9664	491.4741	513.4560	520.0046	460.4368	321.3344	216.0913	225.8482	342.1590	424.8252	437.0173	447.3850 (95)
Ext temp.	4.3000	4.9000	6.5000	8.0000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
873.9973 843.2564 761.8275 630.8455 484.5684 322.8834 216.1816 226.0487 351.4507 535.9015 714.8406 865.9478 (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												
304.3189 236.3977 184.7884 79.8054 17.9539 0.0000 0.0000 0.0000 0.0000 82.6407 200.0327 311.4107 (98)												
Space heating												1417.3485 (98)
Space heating per m2												(98) / (4) = 15.0782 (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	1417.3485	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1488.2160	(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	1855.3370	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1948.1038	(310a)
Electricity used for heat distribution	34.3632	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.5875)		
mechanical ventilation fans (SFP = 0.5875)	168.4363	(330a)
Total electricity for the above, kWh/year	168.4363	(331)
Electricity for lighting (calculated in Appendix L)	427.6519	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.10 * 951 * 1.00) =	-836.5421	(333)
Total delivered energy for all uses	3195.8658	(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			270.0000 (367a)
Space heating from Heat pump	1272.7110	0.5190	660.5370 (367)
Electrical energy for heat distribution	34.3632	0.5190	17.8345 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			678.3715 (373)
Space and water heating			678.3715 (376)
Pumps and fans	168.4363	0.5190	87.4184 (378)
Energy for lighting	427.6519	0.5190	221.9513 (379)
Energy saving/generation technologies			
PV Unit	-836.5421	0.5190	-434.1653 (380)
Total CO2, kg/year			553.5759 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			5.8900 (384)

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

DER	5.8900	ZC1
Total Floor Area	94.0000	TFA
Assumed number of occupants	2.6766	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	15.5235	ZC2
CO2 emissions from cooking, equation (L16)	1.9493	ZC3
Total CO2 emissions	23.3629	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	23.3629	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	94.0000 (1b)	x 2.5000 (2b)	= 235.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	94.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 235.0000 (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) = 0.1277 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3777 (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) =				0.3210 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4093	0.4013	0.3932	0.3531	0.3451	0.3050	0.3050	0.2969	0.3210	0.3451	0.3611	0.3772 (22b)
Effective ac	0.5838	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.2500	1.0000	2.2500			(26)					
TER Opening Type (Uw = 1.40)			13.2600	1.3258	17.5795			(27)					
External Wall 1	57.1300	15.5100	41.6200	0.1800	7.4916			(29a)					
sheltered	29.0000		29.0000	0.1800	5.2200			(29a)					
Total net area of external elements Aum(A, m2)			86.1300					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.5411		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.6020 (36)					
Total fabric heat loss						(33) + (36) =		39.1431 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 45.2705	Feb 45.0182	Mar 44.7710	Apr 43.6098	May 43.3925	Jun 42.3811	Jul 42.3811	Aug 42.1938	Sep 42.7707	Oct 43.3925	Nov 43.8320	Dec 44.2915	(38)
Heat transfer coeff	84.4136	84.1614	83.9142	82.7529	82.5357	81.5242	81.5242	81.3369	81.9138	82.5357	82.9752	83.4347	(39)
Average = Sum(39)m / 12 =												82.7519	(39)
HLP	Jan 0.8980	Feb 0.8953	Mar 0.8927	Apr 0.8804	May 0.8780	Jun 0.8673	Jul 0.8673	Aug 0.8653	Sep 0.8714	Oct 0.8780	Nov 0.8827	Dec 0.8876	(40)
HLP (average)												0.8803	(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												2.6766 (42)
Average daily hot water use (litres/day)												97.7695 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	107.5465	103.6357	99.7249	95.8141	91.9033	87.9926	87.9926	91.9033	95.8141	99.7249	103.6357	107.5465 (44)
Energy conte	159.4883	139.4895	143.9406	125.4909	120.4115	103.9060	96.2842	110.4875	111.8071	130.3004	142.2331	154.4559 (45)
Energy content (annual)											Total = Sum(45)m =	1538.2950 (45)
Distribution loss (46)m = 0.15 x (45)m	23.9232	20.9234	21.5911	18.8236	18.0617	15.5859	14.4426	16.5731	16.7711	19.5451	21.3350	23.1684 (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	186.3222	163.7265	170.7745	151.4592	147.2454	129.8743	123.1181	137.3214	137.7754	157.1343	168.2013	181.2898 (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	186.3222	163.7265	170.7745	151.4592	147.2454	129.8743	123.1181	137.3214	137.7754	157.1343	168.2013	181.2898 (64)
	74.4970	65.7699	69.3274	62.5004	61.5039	55.3234	53.4816	58.2042	57.9505	64.7920	68.0671	72.8237 (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	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	133.8305	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.5130	20.8840	16.9840	12.8580	9.6115	8.1144	8.7679	11.3969	15.2969	19.4229	22.6694	24.1665	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	246.2474	248.8027	242.3634	228.6551	211.3508	195.0872	184.2221	181.6668	188.1061	201.8144	219.1187	235.3823	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	36.3831	(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)	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	-107.0644	(71)
Water heating gains (Table 5)	100.1303	97.8719	93.1819	86.8060	82.6666	76.8380	71.8839	78.2315	80.4868	87.0860	94.5376	97.8813	(72)
Total internal gains	436.0398	433.7077	418.6786	394.4683	369.7781	346.1888	331.0231	337.4443	350.0389	374.4724	402.4749	423.5792	(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						10.0200	10.6334	0.6300	0.7000	0.7700	32.5620	
West						3.2400	19.6403	0.6300	0.7000	0.7700	19.4475 (84)	

Solar gains	52.0095	100.2712	168.3922	261.2201	340.7805	359.5690	337.8144	275.1734	200.0009	119.2157	64.4182	43.1380 (83)
Total gains	488.0494	533.9789	587.0708	655.6884	710.5585	705.7578	668.8375	612.6177	550.0398	493.6882	466.8931	466.7172 (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	77.3309	77.5626	77.7911	78.8828	79.0904	80.0716	80.0716	80.2560	79.6908	79.0904	78.6715	78.2382	
alpha	6.1554	6.1708	6.1861	6.2589	6.2727	6.3381	6.3381	6.3504	6.3127	6.2727	6.2448	6.2159	
util living area	0.9990	0.9981	0.9943	0.9744	0.8934	0.7074	0.5315	0.6001	0.8747	0.9865	0.9979	0.9993	(86)
MIT	20.0344	20.1387	20.3364	20.6192	20.8605	20.9763	20.9966	20.9931	20.9115	20.6097	20.2780	20.0186	(87)
Th 2	20.1692	20.1715	20.1737	20.1842	20.1862	20.1954	20.1954	20.1971	20.1919	20.1862	20.1822	20.1781	(88)
util rest of house	0.9987	0.9974	0.9922	0.9647	0.8562	0.6314	0.4369	0.5009	0.8178	0.9798	0.9971	0.9990	(89)
MIT 2	18.8622	19.0165	19.3064	19.7206	20.0445	20.1791	20.1940	20.1940	20.1161	19.7128	19.2286	18.8459	(90)
Living area fraction	19.2707	19.4076	19.6654	20.0338	20.3289	20.4569	20.4737	20.4725	20.3933	20.0254	19.5943	19.2546	(92)
Temperature adjustment	19.2707	19.4076	19.6654	20.0338	20.3289	20.4569	20.4737	20.4725	20.3933	20.0254	19.5943	19.2546	(93)
adjusted MIT	19.2707	19.4076	19.6654	20.0338	20.3289	20.4569	20.4737	20.4725	20.3933	20.0254	19.5943	19.2546	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9982	0.9966	0.9905	0.9625	0.8635	0.6571	0.4700	0.5356	0.8337	0.9781	0.9962	0.9987	(94)
Ext temp.	487.1911	532.1488	581.5043	631.1184	613.5583	463.7213	314.3643	328.1477	458.5841	482.8832	465.1263	466.0934	(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	1263.7337	1220.9794	1104.7604	921.3549	712.1916	477.4809	315.8033	331.2466	515.5076	777.9301	1036.7170	1256.0751	(97)
Space heating kWh	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	577.7477	462.8942	389.3025	208.9703	73.3832	0.0000	0.0000	0.0000	0.0000	219.5148	411.5453	587.7464	(98)
Space heating per m2												2931.1044	(98)
												31.1820	(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													3134.8710 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	577.7477	462.8942	389.3025	208.9703	73.3832	0.0000	0.0000	0.0000	0.0000	219.5148	411.5453	587.7464	(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)	617.9120	495.0740	416.3663	223.4977	78.4847	0.0000	0.0000	0.0000	0.0000	234.7752	440.1554	628.6058	(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	186.3222	163.7265	170.7745	151.4592	147.2454	129.8743	123.1181	137.3214	137.7754	157.1343	168.2013	181.2898	(64)
Efficiency of water heater (217)m	87.6346	87.4367	86.9453	85.6728	83.0666	79.8000	79.8000	79.8000	79.8000	85.7057	87.1112	87.7271	(216)
Fuel for water heating, kWh/month	212.6126	187.2515	196.4160	176.7881	177.2619	162.7497	154.2833	172.0819	172.6508	183.3417	193.0881	206.6521	(219)
Water heating fuel used												2195.1776	(219)
Annual totals kWh/year													
Space heating fuel - main system												3134.8710	(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)												415.2465	(232)
Total delivered energy for all uses												5820.2951	(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	3134.8710	0.2160	677.1321 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2195.1776	0.2160	474.1584 (264)
Space and water heating			1151.2905 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	415.2465	0.5190	215.5129 (268)
Total CO2, kg/m2/year			1405.7284 (272)
Emissions per m2 for space and water heating			12.2478 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2927 (272b)
Emissions per m2 for pumps and fans			0.4141 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2478 * 1.55) + 2.2927 + 0.4141, rounded to 2 d.p.			21.6900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type FT16			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type FT16		
Property	A2.11, Tangmere, London, N17				
SAP Rating	88 B	DER	4.90	TER	20.36
Environmental	96 A	% DER<TER	75.93		
CO ₂ Emissions (t/year)	0.33	DFEE	33.40	TFEE	43.78
General Requirements Compliance	Pass	% DFEE<TFEE	23.71		
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 123 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) 20.36 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 4.90 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 43.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 33.4 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54	
Maximum	1.5	OK
MVHR efficiency:	88%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	5.28 m ² , No overhang
Windows facing East:	14.42 m ² , No overhang
Windows facing South:	4.14 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 m ³ /m ² h
Photovoltaic array	1.44 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	122.8000 (1b)	x 2.5000 (2b)	= 307.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 307.0000 (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							2.5000					
Infiltration rate							0.1250	(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) =	0.1063 (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	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (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) =												74.8000 (23c)
Effective ac	0.2615	0.2588	0.2562	0.2429	0.2402	0.2269	0.2269	0.2243	0.2323	0.2402	0.2455	0.2508 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			23.8400	0.8687	20.7104		(27)					
External Wall 1	122.6600	26.0900	96.5700	0.1400	13.5198		(29a)					
Total net area of external elements Aum(A, m2)			122.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.9302		(33)					
Party Wall 1			31.9000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							208.7000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0750 (36)					
Total fabric heat loss							(33) + (36) = 49.0052 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 26.4894	Feb 26.2203	Mar 25.9512	Apr 24.6057	May 24.3366	Jun 22.9910	Jul 22.9910	Aug 22.7219	Sep 23.5292	Oct 24.3366	Nov 24.8748	Dec 25.4130 (38)
Heat transfer coeff	75.4946	75.2255	74.9564	73.6109	73.3418	71.9963	71.9963	71.7272	72.5345	73.3418	73.8800	74.4182 (39)
Average = Sum(39)m / 12 =												73.5436 (39)
HLP	Jan 0.6148	Feb 0.6126	Mar 0.6104	Apr 0.5994	May 0.5972	Jun 0.5863	Jul 0.5863	Aug 0.5841	Sep 0.5907	Oct 0.5972	Nov 0.6016	Dec 0.6060 (40)
HLP (average)												0.5989 (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												2.8735 (42)
Average daily hot water use (litres/day)												102.4460 (43)
Daily hot water use	Jan 112.6906	Feb 108.5927	Mar 104.4949	Apr 100.3970	May 96.2992	Jun 92.2014	Jul 92.2014	Aug 96.2992	Oct 100.3970	Nov 104.4949	Dec 108.5927	112.6906 (44)
Energy conte	167.1168	146.1614	150.8255	131.4933	126.1710	108.8760	100.8896	115.7723	117.1550	136.5328	149.0363	161.8437 (45)
Energy content (annual)												Total = Sum(45)m = 1611.8738 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.0675	21.9242	22.6238	19.7240	18.9256	16.3314	15.1334	17.3658	17.5732	20.4799	22.3554	24.2766 (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												
	194.0437	170.4825	177.7524	157.5516	153.0978	134.9342	127.8164	142.6991	143.2132	163.4597	175.0945	188.7706 (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	194.0437	170.4825	177.7524	157.5516	153.0978	134.9342	127.8164	142.6991	143.2132	163.4597	175.0945	188.7706 (64)
								Total per year (kWh/year) = Sum(64)m =			1928.9158 (64)	
Heat gains from water heating, kWh/month												
	77.1078	68.0555	71.6910	64.5681	63.4933	57.0479	55.0873	60.0358	59.8006	66.9386	70.4012	75.3545 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.5594	23.5898	19.1845	14.5239	10.8568	9.1658	9.9039	12.8735	17.2788	21.9394	25.6065	27.2975 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8149	291.8119	284.2596	268.1816	247.8859	228.8109	216.0677	213.0707	220.6230	236.7010	256.9966	276.0716 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676 (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)	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406 (71)
Water heating gains (Table 5)	103.6396	101.2731	96.3588	89.6780	85.3405	79.2331	74.0420	80.6932	83.0564	89.9713	97.7794	101.2830 (72)
Total internal gains	485.1165	482.7775	465.9056	438.4861	410.1860	383.3125	366.1163	372.7401	387.0609	414.7144	446.4852	470.7548 (73)

[Jan]				Area	Solar flux	g	FF	Access		Gains		
				m2	Table 6a	Specific data	Specific data	factor		W		
					W/m2	or Table 6b	or Table 6c	Table 6d				
North				5.2800	10.6334	0.4000	0.7000	0.7700		10.8942 (74)		
East				14.4200	19.6403	0.4000	0.7000	0.7700		54.9546 (76)		
South				4.1400	46.7521	0.4000	0.7000	0.7700		37.5571 (78)		
Solar gains	103.4059	189.8312	290.7706	403.5841	485.2673	494.6859	471.6741	409.8726	330.2893	218.6871	126.4794	86.7268 (83)
Total gains	588.5225	672.6086	756.6762	842.0703	895.4532	877.9984	837.7905	782.6127	717.3502	633.4015	572.9646	557.4816 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	94.2980	94.6353	94.9750	96.7111	97.0659	98.8800	98.8800	99.2510	98.1463	97.0659	96.3588	95.6619
alpha	7.2865	7.3090	7.3317	7.4474	7.4711	7.5920	7.5920	7.6167	7.5431	7.4711	7.4239	7.3775
util living area												
	0.9979	0.9939	0.9775	0.9048	0.7353	0.5229	0.3780	0.4213	0.6831	0.9466	0.9941	0.9986 (86)
MIT	20.3328	20.4621	20.6557	20.8720	20.9765	20.9984	20.9999	20.9997	20.9895	20.8377	20.5455	20.3114 (87)
Th 2	20.4167	20.4187	20.4207	20.4305	20.4325	20.4424	20.4424	20.4443	20.4384	20.4325	20.4285	20.4246 (88)
util rest of house												
	0.9974	0.9924	0.9720	0.8851	0.6975	0.4781	0.3301	0.3705	0.6327	0.9308	0.9924	0.9982 (89)
MIT 2	19.5029	19.6929	19.9733	20.2798	20.4094	20.4412	20.4423	20.4442	20.4298	20.2407	19.8229	19.4781 (90)
Living area fraction												
MIT	19.8692	20.0324	20.2745	20.5412	20.6597	20.6871	20.6884	20.6894	20.6769	20.5042	20.1418	19.8459 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8692	20.0324	20.2745	20.5412	20.6597	20.6871	20.6884	20.6894	20.6769	20.5042	20.1418	19.8459 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9968	0.9911	0.9704	0.8892	0.7130	0.4979	0.3513	0.3929	0.6544	0.9330	0.9913	0.9977 (94)
Useful gains	586.6147	666.6526	734.2922	748.7510	638.4363	437.1217	294.2812	307.5135	469.4505	590.9644	568.0034	556.2096 (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	1175.3888	1138.3423	1032.4869	856.9171	657.1202	438.2475	294.3491	307.6659	477.0486	726.3928	963.5284	1164.3388 (97)
Month fracti	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	438.0479	316.9755	221.8568	77.8796	13.9008	0.0000	0.0000	0.0000	0.0000	100.7587	284.7780	452.4481 (98)
Space heating												1906.6456 (98)
Space heating per m2												15.5264 (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	1906.6456	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	2001.9779	(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	1928.9158	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2025.3615	(310a)
Electricity used for heat distribution	40.2734	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	252.8145	(330a)
Total electricity for the above, kWh/year	252.8145	(331)
Electricity for lighting (calculated in Appendix L)	469.0467	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.44 * 951 * 1.00) =	-1095.1096	(333)
Total delivered energy for all uses	3654.0910	(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			270.0000 (367a)
Space heating from Heat pump	1491.6072	0.5190	774.1441 (367)
Electrical energy for heat distribution	40.2734	0.5190	20.9019 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			795.0460 (373)
Space and water heating			795.0460 (376)
Pumps and fans	252.8145	0.5190	131.2107 (378)
Energy for lighting	469.0467	0.5190	243.4352 (379)
Energy saving/generation technologies			
PV Unit	-1095.1096	0.5190	-568.3619 (380)
Total CO2, kg/year			601.3301 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			4.9000 (384)

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

DER		4.9000	ZC1
Total Floor Area	TFA	122.8000	
Assumed number of occupants	N	2.8735	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		13.9369	ZC2
CO2 emissions from cooking, equation (L16)		1.5307	ZC3
Total CO2 emissions		20.3676	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		20.3676	ZC8

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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	122.8000 (1b)	x 2.5000 (2b)	= 307.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	122.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 307.0000 (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				4 * 10 =	40.0000 (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) =					40.0000 / (5) = 0.1303 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3803 (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) = 0.3232 (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	0.4121	0.4041	0.3960	0.3556	0.3475	0.3071	0.3071	0.2990	0.3232	0.3475	0.3637	0.3798 (22b)
Effective ac	0.5849	0.5816	0.5784	0.5632	0.5604	0.5472	0.5472	0.5447	0.5522	0.5604	0.5661	0.5721 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			23.8400	1.3258	31.6061		(27)					
External Wall 1	122.6600	26.0900	96.5700	0.1800	17.3826		(29a)					
Total net area of external elements Aum(A, m2)			122.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	51.2387		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9720 (36)					
Total fabric heat loss							(33) + (36) = 61.2107 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 59.2593	Feb 58.9252	Mar 58.5977	Apr 57.0595	May 56.7717	Jun 55.4319	Jul 55.4319	Aug 55.1838	Sep 55.9479	Oct 56.7717	Nov 57.3539	Dec 57.9626 (38)
Heat transfer coeff	120.4700	120.1359	119.8084	118.2701	117.9823	116.6425	116.6425	116.3944	117.1586	117.9823	118.5645	119.1732 (39)
Average = Sum(39)m / 12 =												118.2687 (39)
HLP	Jan 0.9810	Feb 0.9783	Mar 0.9756	Apr 0.9631	May 0.9608	Jun 0.9499	Jul 0.9499	Aug 0.9478	Sep 0.9541	Oct 0.9608	Nov 0.9655	Dec 0.9705 (40)
HLP (average)												0.9631 (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												2.8735 (42)
Average daily hot water use (litres/day)												102.4460 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.6906	108.5927	104.4949	100.3970	96.2992	92.2014	92.2014	96.2992	100.3970	104.4949	108.5927	112.6906 (44)
Energy conte	167.1168	146.1614	150.8255	131.4933	126.1710	108.8760	100.8896	115.7723	117.1550	136.5328	149.0363	161.8437 (45)
Energy content (annual)												Total = Sum(45)m = 1611.8738 (45)
Distribution loss (46)m = 0.15 x (45)m	25.0675	21.9242	22.6238	19.7240	18.9256	16.3314	15.1334	17.3658	17.5732	20.4799	22.3554	24.2766 (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	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)

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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	193.9507	170.3985	177.6594	157.4616	153.0049	134.8442	127.7235	142.6062	143.1232	163.3667	175.0045	188.6776 (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	193.9507	170.3985	177.6594	157.4616	153.0049	134.8442	127.7235	142.6062	143.1232	163.3667	175.0045	188.6776 (64)
Heat gains from water heating, kWh/month	77.0334	67.9883	71.6166	64.4962	63.4190	56.9759	55.0129	59.9614	59.7286	66.8643	70.3292	75.2801 (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	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757	143.6757 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.0172	23.1082	18.7929	14.2274	10.6351	8.9786	9.7017	12.6107	16.9260	21.4915	25.0837	26.7403 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	288.8149	291.8119	284.2596	268.1816	247.8859	228.8109	216.0677	213.0707	220.6230	236.7010	256.9966	276.0716 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676	37.3676 (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)	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406	-114.9406 (71)
Water heating gains (Table 5)	103.5396	101.1731	96.2589	89.5780	85.2405	79.1332	73.9421	80.5933	82.9565	89.8713	97.6794	101.1830 (72)
Total internal gains	487.4744	485.1959	468.4140	441.0897	412.8643	386.0255	368.8142	375.3773	389.6082	417.1665	448.8625	473.0976 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	5.2800	10.6334	0.6300	0.7000	0.7700	17.1584 (74)
East	14.4200	19.6403	0.6300	0.7000	0.7700	86.5535 (76)
South	4.1400	46.7521	0.6300	0.7000	0.7700	59.1525 (78)

Solar gains	162.8644	298.9841	457.9637	635.6450	764.2960	779.1302	742.8868	645.5493	520.2056	344.4322	199.2050	136.5947 (83)
Total gains	650.3387	784.1800	926.3777	1076.7347	1177.1603	1165.1557	1111.7009	1020.9266	909.8138	761.5987	648.0675	609.6922 (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	70.7876	70.9844	71.1785	72.1042	72.2801	73.1104	73.1104	73.2662	72.7883	72.2801	71.9252	71.5578
alpha	5.7192	5.7323	5.7452	5.8069	5.8187	5.8740	5.8740	5.8844	5.8526	5.8187	5.7950	5.7705
util living area	0.9989	0.9966	0.9872	0.9445	0.8217	0.6230	0.4590	0.5188	0.7992	0.9754	0.9973	0.9993 (86)
MIT	19.9251	20.0900	20.3502	20.6722	20.8971	20.9837	20.9976	20.9954	20.9355	20.6165	20.2072	19.8987 (87)
Th 2	20.0992	20.1015	20.1037	20.1142	20.1162	20.1253	20.1253	20.1270	20.1218	20.1162	20.1122	20.1080 (88)
util rest of house	0.9986	0.9955	0.9828	0.9260	0.7721	0.5454	0.3692	0.4233	0.7278	0.9638	0.9962	0.9990 (89)
MIT 2	18.6500	18.8924	19.2714	19.7324	20.0186	20.1148	20.1245	20.1251	20.0714	19.6652	19.0722	18.6180 (90)
Living area fraction									fLA = Living area / (4) =			0.4414 (91)
MIT	19.2128	19.4210	19.7476	20.1472	20.4063	20.4983	20.5099	20.5093	20.4528	20.0851	19.5732	19.1833 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2128	19.4210	19.7476	20.1472	20.4063	20.4983	20.5099	20.5093	20.4528	20.0851	19.5732	19.1833 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	649.0954	779.7480	908.4121	997.9304	929.3378	674.8805	454.6178	475.3438	688.3543	733.6530	645.0029	608.8774 (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	1796.5458	1744.4936	1587.1695	1330.2073	1027.1951	687.9922	456.0552	478.2939	744.2878	1119.0720	1478.8789	1785.6051 (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	853.7031	648.3091	504.9955	239.2394	72.8059	0.0000	0.0000	0.0000	0.0000	286.7518	600.3907	875.4854 (98)
Space heating												4081.6808 (98)
Space heating per m2												33.2384 (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													4365.4341 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	853.7031	648.3091	504.9955	239.2394	72.8059	0.0000	0.0000	0.0000	0.0000	286.7518	600.3907	875.4854	(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)	913.0514	693.3787	540.1022	255.8710	77.8672	0.0000	0.0000	0.0000	0.0000	306.6864	642.1291	936.3480	(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	193.9507	170.3985	177.6594	157.4616	153.0049	134.8442	127.7235	142.6062	143.1232	163.3667	175.0045	188.6776	(64)
Efficiency of water heater (217)m	88.3079	88.0430	87.4485	85.9268	82.9626	79.8000	79.8000	79.8000	79.8000	86.3002	87.8417	88.3985	(216)
Fuel for water heating, kWh/month	219.6300	193.5402	203.1590	183.2509	184.4264	168.9778	160.0545	178.7045	179.3524	189.3005	199.2272	213.4399	(219)
Water heating fuel used												2273.0633	(219)
Annual totals kWh/year													
Space heating fuel - main system												4365.4341	(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)												459.4711	(232)
Total delivered energy for all uses												7172.9684	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4365.4341	0.2160	942.9338 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2273.0633	0.2160	490.9817 (264)
Space and water heating			1433.9154 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	459.4711	0.5190	238.4655 (268)
Total CO2, kg/m2/year			1711.3059 (272)
Emissions per m2 for space and water heating			11.6768 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.9419 (272b)
Emissions per m2 for pumps and fans			0.3170 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.6768 * 1.55) + 1.9419 + 0.3170, rounded to 2 d.p.			20.3600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Flat Type MA01			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Flat Type MA01		
Property	B0.01, Tangmere, London, N17				
SAP Rating	86 B	DER	7.73	TER	21.97
Environmental	94 A	% DER<TER	64.81		
CO ₂ Emissions (t/year)	0.69	DFEE	46.13	TFEE	51.77
General Requirements Compliance	Pass	% DFEE<TFEE	10.89		
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

Ground-floor flat, total floor area 143 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) 21.97 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 7.73 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)46.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.93 (max. 2.00)	1.20 (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:	2.50 (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, 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:	0.54
Maximum	1.5 OK
MVHR efficiency:	88%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing East:	11.81 m ² , No overhang
Windows facing South:	2.52 m ² , No overhang
Windows facing West:	8.89 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Floor U-value	0.09 W/m ² K
Window U-value	0.90 W/m ² K
Air permeability	2.5 m ³ /m ² h
Photovoltaic array	1.38 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	71.3000 (1b)	x 2.5000 (2b)	= 178.2500 (1b) - (3b)
First floor	71.3000 (1c)	x 2.9000 (2c)	= 206.7700 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	385.0200 (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								2.5000				
Infiltration rate								0.1250 (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) =	0.0969 (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)
	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (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) =												74.8000 (23c)
Effective ac	0.2495	0.2471	0.2447	0.2326	0.2301	0.2180	0.2180	0.2156	0.2229	0.2301	0.2350	0.2398 (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			2.2500	1.2000	2.7000		(26)					
Windows (Uw = 0.90)			23.2200	0.8687	20.1718		(27)					
Heat Loss Floor 1			71.3000	0.0900	6.4170		(28a)					
External Wall 1	96.1200	25.4700	70.6500	0.1400	9.8910		(29a)					
Sheltered	52.7800		52.7800	0.2700	14.2506		(29a)					
Total net area of external elements Aum(A, m2)			220.2000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		53.4304		(33)					
Party Wall 1			43.7400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							265.5200 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							25.4088 (36)					
Total fabric heat loss							(33) + (36) = 78.8392 (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	31.7026	31.3949	31.0872	29.5486	29.2409	27.7023	27.7023	27.3946	28.3177	29.2409	29.8563	30.4717 (38)
Heat transfer coeff	110.5418	110.2341	109.9264	108.3878	108.0801	106.5415	106.5415	106.2338	107.1570	108.0801	108.6955	109.3110 (39)
Average = Sum(39)m / 12 =												108.3109 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7752	0.7730	0.7709	0.7601	0.7579	0.7471	0.7471	0.7450	0.7515	0.7579	0.7622	0.7666 (40)
HLP (average)												0.7595 (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												2.9219 (42)
Average daily hot water use (litres/day)												103.5946 (43)
Daily hot water use	Jan 113.9541	Feb 109.8103	Mar 105.6665	Apr 101.5227	May 97.3789	Jun 93.2351	Jul 93.2351	Aug 97.3789	Sep 101.5227	Oct 105.6665	Nov 109.8103	Dec 113.9541 (44)
Energy conte	168.9906	147.8002	152.5166	132.9677	127.5856	110.0967	102.0208	117.0703	118.4685	138.0637	150.7073	163.6583 (45)
Energy content (annual)										Total = Sum(45)m =		1629.9464 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	25.3486	22.1700	22.8775	19.9452	19.1378	16.5145	15.3031	17.5606	17.7703	20.7095	22.6061	24.5488 (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												
195.9174 172.1213 179.4435 159.0259 154.5125 136.1550 128.9476 143.9972 144.5268 164.9905 176.7655 190.5852 (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												
195.9174 172.1213 179.4435 159.0259 154.5125 136.1550 128.9476 143.9972 144.5268 164.9905 176.7655 190.5852 (64)												
Total per year (kWh/year) = Sum(64)m =												1946.9884 (64)
Heat gains from water heating, kWh/month												
77.7308 68.6004 72.2533 65.0583 63.9637 57.4538 55.4634 60.4674 60.2374 67.4476 70.9568 75.9579 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
29.7604 26.4329 21.4967 16.2744 12.1653 10.2704 11.0976 14.4250 19.3613 24.5836 28.6927 30.5875 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
312.3493 315.5905 307.4227 290.0346 268.0852 247.4558 233.6741 230.4329 238.6007 255.9888 277.9382 298.5676 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 37.6094 (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)												
-116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 -116.8751 (71)												
Water heating gains (Table 5)												
104.4769 102.0839 97.1146 90.3588 85.9727 79.7969 74.5476 81.2733 83.6630 90.6554 98.5511 102.0939 (72)												
Total internal gains												
513.4147 510.9355 492.8622 463.4959 433.0513 404.3513 386.1475 392.9595 408.4531 438.0560 472.0101 498.0772 (73)												

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
East		11.8100	19.6403	0.4000	0.7000	0.7700	45.0079 (76)
South		2.5200	46.7521	0.4000	0.7000	0.7700	22.8609 (78)
West		8.8900	19.6403	0.4000	0.7000	0.7700	33.8798 (80)

Solar gains	101.7485	191.7611	301.8368	424.5573	510.4211	519.0628	495.5214	431.5691	345.4008	223.4976	125.4615	84.6272 (83)
Total gains	615.1632	702.6966	794.6990	888.0532	943.4724	923.4141	881.6689	824.5286	753.8539	661.5536	597.4716	582.7044 (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	95.1454	95.4110	95.6780	97.0362	97.3125	98.7178	98.7178	99.0037	98.1508	97.3125	96.7615	96.2167
alpha	7.3430	7.3607	7.3785	7.4691	7.4875	7.5812	7.5812	7.6002	7.5434	7.4875	7.4508	7.4144
util living area	0.9998	0.9993	0.9970	0.9818	0.9081	0.7175	0.5296	0.5881	0.8742	0.9921	0.9994	0.9999 (86)
MIT	20.1734	20.2795	20.4613	20.7040	20.9001	20.9869	20.9988	20.9974	20.9458	20.6850	20.3849	20.1567 (87)
Th 2	20.2749	20.2768	20.2786	20.2881	20.2899	20.2994	20.2994	20.3013	20.2956	20.2899	20.2862	20.2824 (88)
util rest of house												
0.9997 0.9991 0.9959 0.9744 0.8750 0.6479 0.4465 0.5013 0.8198 0.9879 0.9991 0.9998 (89)												
MIT 2	19.1430	19.2998	19.5668	19.9242	20.1884	20.2906	20.2989	20.3002	20.2503	19.9015	19.4617	19.1246 (90)
Living area fraction									fLA = Living area / (4) =			0.2875 (91)
MIT	19.4392	19.5815	19.8240	20.1484	20.3930	20.4908	20.5001	20.5007	20.4503	20.1267	19.7271	19.4213 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4392	19.5815	19.8240	20.1484	20.3930	20.4908	20.5001	20.5007	20.4503	20.1267	19.7271	19.4213 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9996 0.9988 0.9949 0.9727 0.8803 0.6676 0.4705 0.5264 0.8331 0.9867 0.9988 0.9997 (94)												
Useful gains	614.9129	701.8397	790.6824	863.7806	830.5676	616.4457	414.7911	434.0115	628.0111	652.7312	596.7841	582.5460 (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												
1673.5201 1618.4002 1464.6602 1219.1862 939.5433 627.6142 415.5250 435.6281 680.4752 1029.6517 1372.5135 1663.8595 (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												
787.6037 615.9286 501.4395 255.8920 81.0779 0.0000 0.0000 0.0000 0.0000 280.4289 558.5252 804.4972 (98)												
Space heating												3885.3930 (98)
Space heating per m2												27.2468 (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	1.0500	(306)
Space heating:		
Annual space heating requirement	3885.3930	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	4079.6626	(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	1946.9884	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2044.3378	(310a)
Electricity used for heat distribution	61.2400	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6750)		
mechanical ventilation fans (SFP = 0.6750)	317.0640	(330a)
Total electricity for the above, kWh/year	317.0640	(331)
Electricity for lighting (calculated in Appendix L)	525.5772	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.38 * 951 * 1.00) =	-1049.4801	(333)
Total delivered energy for all uses	5917.1616	(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			270.0000 (367a)
Space heating from Heat pump	2268.1483	0.5190	1177.1690 (367)
Electrical energy for heat distribution	61.2400	0.5190	31.7836 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1208.9525 (373)
Space and water heating			1208.9525 (376)
Pumps and fans	317.0640	0.5190	164.5562 (378)
Energy for lighting	525.5772	0.5190	272.7746 (379)
Energy saving/generation technologies			
PV Unit	-1049.4801	0.5190	-544.6802 (380)
Total CO2, kg/year			1101.6032 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			7.7300 (384)

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

DER	7.7300	ZC1
Total Floor Area	142.6000	
Assumed number of occupants	2.9219	
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	
CO2 emissions from appliances, equation (L14)	12.9798	ZC2
CO2 emissions from cooking, equation (L16)	1.3263	ZC3
Total CO2 emissions	22.0360	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	22.0360	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	71.3000 (1b)	x 2.5000 (2b)	= 178.2500 (1b) - (3b)
First floor	71.3000 (1c)	x 2.9000 (2c)	= 206.7700 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 385.0200 (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) =	0.1039 (8)		
Pressure test											Yes			
Measured/design AP50											5.0000			
Infiltration rate											0.3539 (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) =	0.2743 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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	0.3497	0.3428	0.3360	0.3017	0.2948	0.2606	0.2606	0.2537	0.2743	0.2948	0.3085	0.3223 (22b)		
Effective ac	0.5611	0.5588	0.5564	0.5455	0.5435	0.5339	0.5339	0.5322	0.5376	0.5435	0.5476	0.5519 (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			2.2500	1.0000	2.2500		(26)					
TER Opening Type (Uw = 1.40)			23.2200	1.3258	30.7841		(27)					
Heat Loss Floor 1			71.3000	0.1300	9.2690		(28a)					
External Wall 1	96.1200	25.4700	70.6500	0.1800	12.7170		(29a)					
Sheltered	52.7800		52.7800	0.1800	9.5004		(29a)					
Total net area of external elements Aum(A, m2)			220.2000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.5205		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.0250 (36)					
Total fabric heat loss						(33) + (36) =	81.5455 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 71.2967	Feb 70.9950	Mar 70.6993	Apr 69.3105	May 69.0507	Jun 67.8411	Jul 67.8411	Aug 67.6171	Sep 68.3070	Oct 69.0507	Nov 69.5763	Dec 70.1259 (38)
Heat transfer coeff	152.8422	152.5405	152.2448	150.8560	150.5962	149.3866	149.3866	149.1626	149.8525	150.5962	151.1218	151.6714 (39)
Average = Sum(39)m / 12 =												150.8548 (39)
HLP	Jan 1.0718	Feb 1.0697	Mar 1.0676	Apr 1.0579	May 1.0561	Jun 1.0476	Jul 1.0476	Aug 1.0460	Sep 1.0509	Oct 1.0561	Nov 1.0598	Dec 1.0636 (40)
HLP (average)												1.0579 (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													2.9219 (42)
Average daily hot water use (litres/day)													103.5946 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
Energy conte	113.9541	109.8103	105.6665	101.5227	97.3789	93.2351	93.2351	97.3789	101.5227	105.6665	109.8103	113.9541 (44)	
Energy content (annual)	168.9906	147.8002	152.5166	132.9677	127.5856	110.0967	102.0208	117.0703	118.4685	138.0637	150.7073	163.6583 (45)	
Distribution loss	Total = Sum(45)m = 1629.9464 (45)												
	(46)m = 0.15 x (45)m												
Water storage loss:	25.3486	22.1700	22.8775	19.9452	19.1378	16.5145	15.3031	17.5606	17.7703	20.7095	22.6061	24.5488 (46)	
Store volume													
a) If manufacturer declared loss factor is known (kWh/day):													
Temperature factor from Table 2b													
	1.0000 (47)												
	0.2134 (48)												
	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	195.8245	172.0373	179.3505	158.9359	154.4195	136.0650	128.8547	143.9042	144.4368	164.8975	176.6756	190.4922 (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	195.8245	172.0373	179.3505	158.9359	154.4195	136.0650	128.8547	143.9042	144.4368	164.8975	176.6756	190.4922 (64)
								Total per year (kWh/year) =	Sum(64)m =			1945.8937 (64)
Heat gains from water heating, kWh/month	77.6565	68.5332	72.1789	64.9864	63.8893	57.3818	55.3890	60.3930	60.1654	67.3733	70.8848	75.8835 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939	146.0939 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.9520	25.7149	20.9128	15.8323	11.8348	9.9915	10.7961	14.0332	18.8354	23.9158	27.9133	29.7566 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.3493	315.5905	307.4227	290.0346	268.0852	247.4558	233.6741	230.4329	238.6007	255.9888	277.9382	298.5676 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094	37.6094 (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)	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751	-116.8751 (71)
Water heating gains (Table 5)	104.3770	101.9840	97.0146	90.2588	85.8728	79.6969	74.4476	81.1734	83.5631	90.5555	98.4511	101.9940 (72)
Total internal gains	515.5064	513.1175	495.1783	465.9539	435.6209	406.9724	388.7460	395.4677	410.8273	440.2883	474.1308	500.1464 (73)

[Jan	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	

East	11.8100	19.6403	0.6300	0.7000	0.7700	70.8874 (76)
South	2.5200	46.7521	0.6300	0.7000	0.7700	36.0059 (78)
West	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (80)

MIT	19.7459	19.9023	20.1684	20.5139	20.8007	20.9538	20.9913	20.9846	20.8671	20.4747	20.0426	19.7187 (87)
Th 2	20.0239	20.0256	20.0274	20.0354	20.0369	20.0439	20.0439	20.0452	20.0412	20.0369	20.0338	20.0307 (88)
util rest of house												
	0.9992	0.9975	0.9904	0.9571	0.8487	0.6380	0.4371	0.4994	0.8129	0.9805	0.9979	0.9994 (89)
MIT 2	18.3329	18.6629	18.9518	19.4528	19.8371	20.0124	20.0405	20.0385	19.9291	19.4045	18.7743	18.2980 (90)
Living area fraction									fLA = Living area / (4) =			0.2875 (91)
MIT	18.7392	18.9480	19.3016	19.7578	20.1142	20.2830	20.3139	20.3105	20.1988	19.7122	19.1389	18.7064 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7392	18.9480	19.3016	19.7578	20.1142	20.2830	20.3139	20.3105	20.1988	19.7122	19.1389	18.7064 (93)

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

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												6168.0449 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1139.8200	894.2234	736.8244	400.9905	156.5763	0.0000	0.0000	0.0000	0.0000	444.8416	827.7349	1166.1108 (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)	1219.0589	956.3886	788.0475	428.8668	167.4613	0.0000	0.0000	0.0000	0.0000	475.7664	885.2779	1247.1774 (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	195.8245	172.0373	179.3505	158.9359	154.4195	136.0650	128.8547	143.9042	144.4368	164.8975	176.6756	190.4922 (64)
Efficiency of water heater (217)m	88.7552	88.5836	88.1853	87.1818	84.8508	79.8000	79.8000	79.8000	79.8000	87.3331	88.4147	79.8000 (216)
Fuel for water heating, kWh/month	220.6344	194.2090	203.3792	182.3040	181.9894	170.5075	161.4720	180.3311	180.9985	188.8144	199.8260	214.4517 (219)
Water heating fuel used												2278.9173 (219)
Annual totals kWh/year												
Space heating fuel - main system												6168.0449 (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)												511.3010 (232)
Total delivered energy for all uses												9033.2631 (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	6168.0449	0.2160	1332.2977 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2278.9173	0.2160	492.2461 (264)
Space and water heating			1824.5438 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	511.3010	0.5190	265.3652 (268)
Total CO2, kg/m2/year			2128.8340 (272)
Emissions per m2 for space and water heating			12.7948 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.8609 (272b)
Emissions per m2 for pumps and fans			0.2730 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7948 * 1.55) + 1.8609 + 0.2730, rounded to 2 d.p.			21.9700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Townhouse Type TH01			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Townhouse Type TH01		
Property	TH0.10, Tangmere, London, N17				
SAP Rating	85 B	DER	12.52	TER	22.98
Environmental	89 B	% DER<TER	45.51		
CO ₂ Emissions (t/year)	1.30	DFEE	47.12	TFEE	53.22
General Requirements Compliance	Pass	% DFEE<TFEE	11.46		
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 House, total floor area 129 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) 22.98 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.52 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 47.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	0.91 (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: 1.80 (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, 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: 0.85
Maximum 1.5 OK
MVHR efficiency: 87%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North: 8.96 m², No overhang
Windows facing South: 12.76 m², No overhang
Air change rate: 6.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Floor U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.90 W/m²K
Air permeability 1.8 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	52.7000 (1b)	x 2.5000 (2b)	= 131.7500 (1b) - (3b)
First floor	38.2500 (1c)	x 3.1000 (2c)	= 118.5750 (1c) - (3c)
Second floor	38.2500 (1d)	x 3.1000 (2d)	= 118.5750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 368.9000 (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							1.8000					
Infiltration rate							0.0900		(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) =	0.0698	(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
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
Adj infilt rate	0.0889	0.0872	0.0854	0.0767	0.0750	0.0663	0.0663	0.0645	0.0698	0.0750	0.0785	0.0820
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) =												73.9500
Effective ac	0.2192	0.2174	0.2157	0.2070	0.2052	0.1965	0.1965	0.1948	0.2000	0.2052	0.2087	0.2122
												(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			2.2500	1.0000	2.2500		(26)
Windows (Uw = 0.90)			21.7200	0.8687	18.8687		(27)
Heat Loss Floor 1			52.7000	0.1100	5.7970		(28a)
External Wall 1	93.9800	23.9700	70.0100	0.1400	9.8014		(29a)
Main Roof	38.2500		38.2500	0.1100	4.2075		(30)
Terrace	14.4600		14.4600	0.1800	2.6028		(30)
Total net area of external elements Aum(A, m ²)				199.3900			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.5274		(32)
Party Wall 1			147.2800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							208.2300 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							33.8926 (36)
Total fabric heat loss							(33) + (36) = 77.4200 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.6825	26.4702	26.2579	25.1965	24.9842	23.9228	23.9228	23.7106	24.3474	24.9842	25.4088	25.8334 (38)
Heat transfer coeff	104.1025	103.8902	103.6779	102.6165	102.4043	101.3429	101.3429	101.1306	101.7674	102.4043	102.8288	103.2534 (39)
Average = Sum(39)m / 12 =												102.5635 (39)
HLP	0.8057	0.8041	0.8025	0.7942	0.7926	0.7844	0.7844	0.7827	0.7877	0.7926	0.7959	0.7992 (40)
HLP (average)												0.7938 (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												2.8929 (42)
Average daily hot water use (litres/day)												102.9060 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	113.1967	109.0804	104.9642	100.8479	96.7317	92.6154	92.6154	96.7317	100.8479	104.9642	109.0804	113.1967 (44)
	167.8674	146.8179	151.5029	132.0839	126.7376	109.3649	101.3427	116.2922	117.6811	137.1460	149.7056	162.5706 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	Total = Sum (45)m = 1619.1129 (45)										
Distribution loss (46)m = 0.15 x (45)m											
25.1801 22.0227 22.7254 19.8126 19.0106 16.4047 15.2014 17.4438 17.6522 20.5719 22.4558 24.3856	(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	194.7942 171.1389 178.4297 158.1421 153.6645 135.4232 128.2696 143.2191 143.7394 164.0729 175.7638 189.4974	(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	194.7942 171.1389 178.4297 158.1421 153.6645 135.4232 128.2696 143.2191 143.7394 164.0729 175.7638 189.4974	(64)									
Heat gains from water heating, kWh/month	77.3574 68.2738 71.9162 64.7645 63.6817 57.2104 55.2379 60.2086 59.9756 67.1425 70.6237 75.5962	(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	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.0819	24.9421	20.2843	15.3565	11.4791	9.6912	10.4717	13.6115	18.2693	23.1970	27.0744	28.8623	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	296.7538	299.8331	292.0732	275.5532	254.6998	235.1004	222.0068	218.9275	226.6874	243.2074	264.0609	283.6602	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	(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)	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	(71)
Water heating gains (Table 5)	103.9750	101.5979	96.6615	89.9507	85.5937	79.4589	74.2445	80.9256	83.2994	90.2453	98.0885	101.6078	(72)
Total internal gains	495.2039	492.7664	475.4123	447.2537	418.1659	390.6438	373.1163	379.8578	394.6494	423.0430	455.6170	480.5236	(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					8.9600	10.6334	0.4000	0.7000			0.7700			18.4872
South					12.7600	46.7521	0.4000	0.7000			0.7700			115.7558 (74)

Solar gains	134.2430	224.9081	301.5232	369.3654	414.3157	412.7733	397.2647	362.7192	324.4444	246.5336	160.0164	115.4355 (83)		
Total gains	629.4469	717.6745	776.9355	816.6191	832.4817	803.4171	770.3811	742.5771	719.0938	669.5766	615.6334	595.9591 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	71.7864	71.9331	72.0804	72.8259	72.9769	73.7412	73.7412	73.8960	73.4335	72.9769	72.6756	72.3767
alpha	5.7858	5.7955	5.8054	5.8551	5.8651	5.9161	5.9161	5.9264	5.8956	5.8651	5.8450	5.8251
util living area	0.9982	0.9958	0.9894	0.9688	0.9052	0.7505	0.5690	0.6112	0.8446	0.9745	0.9958	0.9987 (86)
MIT	19.9978	20.1348	20.3363	20.5922	20.8200	20.9586	20.9931	20.9897	20.9140	20.6265	20.2615	19.9698 (87)
Th 2	20.2484	20.2498	20.2512	20.2583	20.2597	20.2669	20.2669	20.2683	20.2640	20.2597	20.2569	20.2540 (88)
util rest of house	0.9977	0.9946	0.9864	0.9592	0.8754	0.6838	0.4790	0.5212	0.7907	0.9648	0.9945	0.9983 (89)
MIT 2	18.8835	19.0846	19.3788	19.7515	20.0638	20.2338	20.2634	20.2627	20.1861	19.8047	19.2754	18.8469 (90)
Living area fraction	19.1202	19.3077	19.5821	19.9301	20.2244	20.3877	20.4184	20.4171	20.3407	19.9792	19.4848	19.0854 (91)
MIT	19.1202	19.3077	19.5821	19.9301	20.2244	20.3877	20.4184	20.4171	20.3407	19.9792	19.4848	19.0854 (92)
Temperature adjustment	19.1202	19.3077	19.5821	19.9301	20.2244	20.3877	20.4184	20.4171	20.3407	19.9792	19.4848	19.0854 (93)
adjusted MIT	19.1202	19.3077	19.5821	19.9301	20.2244	20.3877	20.4184	20.4171	20.3407	19.9792	19.4848	19.0854 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9967	0.9926	0.9828	0.9539	0.8738	0.6955	0.4980	0.5400	0.7970	0.9602	0.9926	0.9975	(94)
Useful gains	627.3597	712.3638	763.5658	778.9692	727.4257	558.7788	383.6633	401.0175	573.1083	642.8963	611.0594	594.4933	(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	1542.8163	1496.8161	1356.3281	1131.8695	872.9324	586.5447	386.9691	406.2553	635.1024	960.4705	1273.5184	1536.9667	(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	681.0997	527.1520	441.0152	254.0882	108.2570	0.0000	0.0000	0.0000	0.0000	236.2753	476.9705	701.2002	(98)
Space heating	681.0997	527.1520	441.0152	254.0882	108.2570	0.0000	0.0000	0.0000	0.0000	236.2753	476.9705	701.2002	(98)

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Space heating per m2 (98) / (4) = 26.5175 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	1.0000 (303a)
Fraction of total space heat from community Heat pump	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	3426.0580 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	3597.3609 (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	1936.1548 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2032.9626 (310a)
Electricity used for heat distribution	56.3032 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0625)	
mechanical ventilation fans (SFP = 1.0625)	478.1866 (330a)
Total electricity for the above, kWh/year	478.1866 (331)
Electricity for lighting (calculated in Appendix L)	495.9345 (332)
Total delivered energy for all uses	6604.4446 (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			270.0000 (367a)
Space heating from Heat pump	2085.3050	0.5190	1082.2733 (367)
Electrical energy for heat distribution	56.3032	0.5190	29.2214 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1111.4947 (373)
Space and water heating			1111.4947 (376)
Pumps and fans	478.1866	0.5190	248.1789 (378)
Energy for lighting	495.9345	0.5190	257.3900 (379)
Total CO2, kg/year			1617.0635 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5200 (384)

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

DER	12.5200	ZC1
Total Floor Area	129.2000	TFA
Assumed number of occupants	2.8929	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	13.6107	ZC2
CO2 emissions from cooking, equation (L16)	1.4584	ZC3
Total CO2 emissions	27.5891	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	27.5891	ZC8

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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)
First floor	38.2500 (1c)	x 3.1000 (2c)	= 118.5750 (1c) - (3c)
Second floor	38.2500 (1d)	x 3.1000 (2d)	= 118.5750 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	129.2000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 368.9000 (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					4 * 10 = 40.0000 (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) =				40.0000 / (5) = 0.1084 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3584 (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) =				0.2778 (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	0.3542	0.3472	0.3403	0.3056	0.2986	0.2639	0.2639	0.2569	0.2778	0.2986	0.3125	0.3264 (22b)
Effective ac	0.5627	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5488	0.5533 (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			2.2500	1.0000	2.2500		(26)
TER Opening Type (Uw = 1.40)			21.7200	1.3258	28.7955		(27)
Heat Loss Floor 1			52.7000	0.1300	6.8510		(28a)
External Wall 1	93.9800	23.9700	70.0100	0.1800	12.6018		(29a)
Main Roof	38.2500		38.2500	0.1300	4.9725		(30)
Terrace	14.4600		14.4600	0.1300	1.8798		(30)
Total net area of external elements Aum(A, m ²)			199.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.3506		(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)							22.3210 (36)
Total fabric heat loss						(33) + (36) =	79.6716 (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	68.5038	68.2073	67.9167	66.5517	66.2963	65.1074	65.1074	64.8872	65.5653	66.2963	66.8129	67.3531 (38)
Heat transfer coeff	148.1754	147.8789	147.5883	146.2232	145.9678	144.7790	144.7790	144.5588	145.2369	145.9678	146.4845	147.0246 (39)
Average = Sum(39)m / 12 =												146.2220 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1469	1.1446	1.1423	1.1318	1.1298	1.1206	1.1206	1.1189	1.1241	1.1298	1.1338	1.1380 (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												2.8929 (42)
Average daily hot water use (litres/day)												102.9060 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.1967	109.0804	104.9642	100.8479	96.7317	92.6154	92.6154	96.7317	100.8479	104.9642	109.0804	113.1967 (44)
Energy conte	167.8674	146.8179	151.5029	132.0839	126.7376	109.3649	101.3427	116.2922	117.6811	137.1460	149.7056	162.5706 (45)
Energy content (annual)												Total = Sum(45)m = 1619.1129 (45)
Distribution loss (46)m = 0.15 x (45)m	25.1801	22.0227	22.7254	19.8126	19.0106	16.4047	15.2014	17.4438	17.6522	20.5719	22.4558	24.3856 (46)
Water storage loss:												1.0000 (47)
Store volume												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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												
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	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
194.7012	171.0549	178.3368	158.0522	153.5715	135.3332	128.1766	143.1261	143.6494	163.9799	175.6739	189.4045	(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	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
194.7012	171.0549	178.3368	158.0522	153.5715	135.3332	128.1766	143.1261	143.6494	163.9799	175.6739	189.4045	(64)
Heat gains from water heating, kWh/month												
77.2830	68.2066	71.8418	64.6925	63.6074	57.1385	55.1636	60.1343	59.9036	67.0682	70.5517	75.5218	(65)
Total per year (kWh/year) = Sum(64)m =												1935.0601 (64)

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	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	144.6443	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
27.3413	24.2843	19.7493	14.9515	11.1764	9.4356	10.1955	13.2525	17.7875	22.5853	26.3604	28.1012	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
296.7538	299.8331	292.0732	275.5532	254.6998	235.1004	222.0068	218.9275	226.6874	243.2074	264.0609	283.6602	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	37.4644	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	-115.7155	(71)
Water heating gains (Table 5)												
103.8750	101.4979	96.5616	89.8507	85.4938	79.3590	74.1446	80.8256	83.1994	90.1454	97.9885	101.5078	(72)
Total internal gains												
497.3634	495.0086	477.7774	449.7488	420.7632	393.2883	375.7402	382.3989	397.0676	425.3313	457.8030	482.6625	(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					8.9600	10.6334	0.6300	0.7000			0.7700			29.1173
South					12.7600	46.7521	0.6300	0.7000			0.7700			182.3154 (78)
Solar gains	211.4327	354.2303	474.8991	581.7505	652.5473	650.1180	625.6919	571.2828	510.9999	388.2904	252.0259	181.8109 (83)		
Total gains	708.7961	849.2390	952.6765	1031.4992	1073.3105	1043.4062	1001.4322	953.6817	908.0675	813.6217	709.8289	664.4734 (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	60.5514	60.6728	60.7923	61.3598	61.4671	61.9719	61.9719	62.0663	61.7765	61.4671	61.2503	61.0253
alpha	5.0368	5.0449	5.0528	5.0907	5.0978	5.1315	5.1315	5.1378	5.1184	5.0978	5.0834	5.0684
util living area												
	0.9987	0.9964	0.9906	0.9722	0.9170	0.7835	0.6119	0.6601	0.8749	0.9803	0.9969	0.9991 (86)
MIT	19.7151	19.8834	20.1292	20.4410	20.7276	20.9203	20.9823	20.9741	20.8483	20.4743	20.0315	19.6842 (87)
Th 2	19.9627	19.9646	19.9664	19.9750	19.9766	19.9841	19.9841	19.9854	19.9812	19.9766	19.9733	19.9700 (88)
util rest of house												
	0.9982	0.9952	0.9872	0.9610	0.8812	0.6963	0.4828	0.5324	0.8099	0.9701	0.9956	0.9987 (89)
MIT 2	18.2442	18.4912	18.8501	19.3039	19.6963	19.9273	19.9771	19.9741	19.8542	19.3575	18.7144	18.2041 (90)
Living area fraction									fLA = Living area / (4) =			0.2124 (91)
MIT	18.5566	18.7869	19.1218	19.5454	19.9153	20.1382	20.1906	20.1865	20.0653	19.5947	18.9941	18.5185 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5566	18.7869	19.1218	19.5454	19.9153	20.1382	20.1906	20.1865	20.0653	19.5947	18.9941	18.5185 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9973	0.9931	0.9832	0.9548	0.8786	0.7110	0.5103	0.5594	0.8163	0.9649	0.9938	0.9980 (94)
Useful gains	706.8694	843.4212	936.6833	984.8613	943.0588	741.8221	511.0424	533.4560	741.2483	785.0950	705.4294	663.1555 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	2112.4705	2053.5738	1862.8277	1556.6100	1199.1757	801.8143	519.8452	547.3730	866.3880	1312.9349	1742.3023	2105.1690 (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												
	1045.7672	813.2226	689.0514	411.6591	190.5510	0.0000	0.0000	0.0000	0.0000	392.7129	746.5484	1072.8580 (98)
Space heating												5362.3707 (98)
Space heating per m2												(98) / (4) = 41.5044 (99)

8c. Space cooling requirement

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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													5735.1558 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1045.7672	813.2226	689.0514	411.6591	190.5510	0.0000	0.0000	0.0000	0.0000	392.7129	746.5484	1072.8580	(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)	1118.4676	869.7568	736.9534	440.2771	203.7979	0.0000	0.0000	0.0000	0.0000	420.0138	798.4475	1147.4417	(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	194.7012	171.0549	178.3368	158.0522	153.5715	135.3332	128.1766	143.1261	143.6494	163.9799	175.6739	189.4045	(64)
Efficiency of water heater (217)m	88.6346	88.4392	88.0720	87.2543	85.3904	79.8000	79.8000	79.8000	79.8000	87.0614	88.2460	88.7151	(216)
Fuel for water heating, kWh/month	219.6673	193.4154	202.4897	181.1398	179.8464	169.5905	160.6223	179.3560	180.0118	188.3497	199.0728	213.4975	(219)
Water heating fuel used												2267.0590	(219)
Annual totals kWh/year													
Space heating fuel - main system												5735.1558	(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)												482.8560	(232)
Total delivered energy for all uses												8560.0709	(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	5735.1558	0.2160	1238.7937 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2267.0590	0.2160	489.6848 (264)
Space and water heating			1728.4784 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	482.8560	0.5190	250.6022 (268)
Total CO2, kg/m2/year			2018.0057 (272)
Emissions per m2 for space and water heating			13.3783 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.9396 (272b)
Emissions per m2 for pumps and fans			0.3013 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3783 * 1.55) + 1.9396 + 0.3013, rounded to 2 d.p.			22.9800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Townhouse Type TH04			Issued on Date	20/03/2026
Assessment Reference	Be Green	Prop Type Ref	Townhouse Type TH04		
Property	TH0.15, Tangmere, London, N17				
SAP Rating	84 B	DER	13.43	TER	25.77
Environmental	88 B	% DER<TER	47.89		
CO ₂ Emissions (t/year)	1.45	DFEE	52.55	TFEE	64.79
General Requirements Compliance	Pass	% DFEE<TFEE	18.90		
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 House, total floor area 134 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) 25.77 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.43 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)64.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)52.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	0.91 (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: 1.80 (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, 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: 0.85

Maximum 1.5 OK

MVHR efficiency: 87% OK

Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading: Average

Windows facing North: 12.86 m², No overhang

Windows facing East: 3.78 m², No overhang

Windows facing South: 14.73 m², No overhang

Air change rate: 6.00 ach

Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.11 W/m²K

Floor U-value 0.11 W/m²K

Door U-value 1.00 W/m²K

Window U-value 0.90 W/m²K

Air permeability 1.8 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	49.0000 (1b)	x 2.5000 (2b)	= 122.5000 (1b) - (3b)
First floor	49.9000 (1c)	x 3.1000 (2c)	= 154.6900 (1c) - (3c)
Second floor	35.2900 (1d)	x 3.1000 (2d)	= 109.3990 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.5890 (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												1.8000
Infiltration rate												0.0900 (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) =	0.0698 (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	0.0889	0.0872	0.0854	0.0767	0.0750	0.0663	0.0663	0.0645	0.0698	0.0750	0.0785	0.0820 (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) =												73.9500 (23c)
Effective ac	0.2192	0.2174	0.2157	0.2070	0.2052	0.1965	0.1965	0.1948	0.2000	0.2052	0.2087	0.2122 (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			2.2500	1.0000	2.2500		(26)
Windows (Uw = 0.90)			31.3700	0.8687	27.2519		(27)
Heat Loss Floor 1			49.0000	0.1100	5.3900		(28a)
External Wall 1	190.4400	33.6200	156.8200	0.1400	21.9548		(29a)
Main Roof	35.2900		35.2900	0.1100	3.8819		(30)
Terrace	14.0000		14.0000	0.1800	2.5200		(30)
Total net area of external elements Aum(A, m ²)			288.7300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	63.2486		(32)
Party Wall 1			58.3600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							212.5200 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							35.7650 (36)
Total fabric heat loss							(33) + (36) = 99.0136 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.9619	27.7395	27.5170	26.4047	26.1822	25.0700	25.0700	24.8475	25.5149	26.1822	26.6272	27.0721 (38)
Heat transfer coeff	126.9755	126.7530	126.5306	125.4183	125.1958	124.0835	124.0835	123.8611	124.5285	125.1958	125.6408	126.0857 (39)
Average = Sum(39)m / 12 =												125.3627 (39)
HLP	0.9462	0.9446	0.9429	0.9346	0.9330	0.9247	0.9247	0.9230	0.9280	0.9330	0.9363	0.9396 (40)
HLP (average)												0.9342 (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												2.9051 (42)
Average daily hot water use (litres/day)												103.1960 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	113.5156	109.3878	105.2599	101.1321	97.0043	92.8764	92.8764	97.0043	101.1321	105.2599	109.3878	113.5156 (44)
	168.3404	147.2316	151.9298	132.4561	127.0948	109.6731	101.6283	116.6199	118.0127	137.5325	150.1274	163.0287 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum (45)m =	1623.6753 (45)
Distribution loss (46)m = 0.15 x (45)m													
25.2511	22.0847	22.7895	19.8684	19.0642	16.4510	15.2442	17.4930	17.7019	20.6299	22.5191	24.4543		(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	22.5120	23.2624	22.5120	23.2624		(59)
Total heat required for water heating calculated for each month													
195.2672	171.5526	178.8567	158.5143	154.0216	135.7314	128.5551	143.5468	144.0710	164.4593	176.1857	189.9555		(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		(63)
Output from w/h	195.2672	171.5526	178.8567	158.5143	154.0216	135.7314	128.5551	143.5468	144.0710	164.4593	176.1857	189.9555	(64)
Heat gains from water heating, kWh/month	77.5147	68.4113	72.0581	64.8882	63.8005	57.3129	55.3329	60.3176	60.0858	67.2710	70.7640	75.7485	(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	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
27.1171	24.0851	19.5874	14.8289	11.0848	9.3582	10.1119	13.1438	17.6416	22.4001	26.1442	27.8707		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
302.7029	305.8440	297.9285	281.0774	259.8058	239.8136	226.4575	223.3164	231.2319	248.0830	269.3546	289.3468		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255		(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		(70)
Losses e.g. evaporation (negative values) (Table 5)													
-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038		(71)
Water heating gains (Table 5)													
104.1864	101.8026	96.8523	90.1226	85.7533	79.6013	74.3722	81.0721	83.4525	90.4180	98.2833	101.8125		(72)
Total internal gains	500.5828	498.3082	480.9446	452.6053	423.2204	395.3495	377.5180	384.1087	398.9025	427.4776	460.3585	485.6066	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	g	Specific data	Specific data	Access	Gains						
	m2	Table 6a	W/m2	or Table 6b	or Table 6c	factor	W						
						Table 6d							
North	12.8600	10.6334	0.4000	0.7000	0.7700	26.5341	(74)						
East	3.7800	19.6403	0.4000	0.7000	0.7700	14.4056	(76)						
South	14.7300	46.7521	0.4000	0.7000	0.7700	133.6272	(78)						
Solar gains	174.5668	297.7352	411.3464	521.1613	597.7180	600.4749	575.9071	517.0931	448.7846	329.8465	209.0890	149.4327	(83)
Total gains	675.1496	796.0434	892.2911	973.7666	1020.9384	995.8244	953.4251	901.2019	847.6871	757.3241	669.4476	635.0393	(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	62.3875	62.4970	62.6069	63.1621	63.2743	63.8415	63.8415	63.9562	63.6134	63.2743	63.0503	62.8278	
alpha	5.1592	5.1665	5.1738	5.2108	5.2183	5.2561	5.2561	5.2637	5.2409	5.2183	5.2034	5.1885	
util living area	0.9981	0.9953	0.9875	0.9621	0.8889	0.7326	0.5592	0.6102	0.8454	0.9744	0.9958	0.9986	(86)
MIT	19.8010	19.9648	20.2091	20.5175	20.7865	20.9462	20.9893	20.9834	20.8813	20.5311	20.1031	19.7681	(87)
Th 2	20.1284	20.1298	20.1312	20.1382	20.1396	20.1466	20.1466	20.1480	20.1438	20.1396	20.1368	20.1340	(88)
util rest of house	0.9976	0.9939	0.9838	0.9500	0.8532	0.6571	0.4573	0.5074	0.7860	0.9639	0.9944	0.9983	(89)
MIT 2	18.5061	18.7463	19.1022	19.5486	19.9137	20.1053	20.1416	20.1395	20.0385	19.5743	18.9534	18.4622	(90)
Living area fraction	18.6536	18.8850	19.2283	19.6589	20.0131	20.2010	20.2381	20.2356	20.1345	19.6832	19.0847	18.6109	(91)
MIT	18.6536	18.8850	19.2283	19.6589	20.0131	20.2010	20.2381	20.2356	20.1345	19.6832	19.0847	18.6109	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6536	18.8850	19.2283	19.6589	20.0131	20.2010	20.2381	20.2356	20.1345	19.6832	19.0847	18.6109	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9962	0.9911	0.9784	0.9414	0.8471	0.6623	0.4685	0.5184	0.7852	0.9565	0.9918	0.9972	0.9972	(94)
Useful gains	672.6124	788.9825	873.0412	916.7216	864.8824	659.5573	446.7131	467.2117	665.6386	724.3686	663.9346	633.2698	(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	1822.5514	1772.6449	1610.5153	1349.3641	1040.7663	694.9960	451.4274	475.0786	751.4651	1137.1804	1505.7708	1817.0072	(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	855.5546	661.0211	548.6807	311.5026	130.8576	0.0000	0.0000	0.0000	0.0000	307.1320	606.1221	880.7006	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating				4301.5714 (98)
Space heating per m2			(98) / (4) =	32.0558 (99)

8c. Space cooling requirement				

Not applicable				

9b. Energy requirements				

Fraction of space heat from secondary/supplementary system (Table 11)				0.0000 (301)
Fraction of space heat from community system				1.0000 (302)
Fraction of heat from community Heat pump				1.0000 (303a)
Fraction of total space heat from community Heat pump				1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating				1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating				1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system				1.0500 (306)
Space heating:				
Annual space heating requirement				4301.5714 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05				4516.6500 (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				1940.7172 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05				2037.7531 (310a)
Electricity used for heat distribution				65.5440 (313)
Annual totals kWh/year				
Electricity for pumps and fans:				
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0625)				
mechanical ventilation fans (SFP = 1.0625)				501.1160 (330a)
Total electricity for the above, kWh/year				501.1160 (331)
Electricity for lighting (calculated in Appendix L)				478.8961 (332)
Total delivered energy for all uses				7534.4151 (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			270.0000 (367a)	
Space heating from Heat pump	2427.5567	0.5190	1259.9019 (367)	
Electrical energy for heat distribution	65.5440	0.5190	34.0174 (372)	
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1293.9193 (373)	
Space and water heating			1293.9193 (376)	
Pumps and fans	501.1160	0.5190	260.0792 (378)	
Energy for lighting	478.8961	0.5190	248.5471 (379)	
Total CO2, kg/year			1802.5455 (383)	
Dwelling Carbon Dioxide Emission Rate (DER)			13.4300 (384)	

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES				
DER			13.4300 ZC1	
Total Floor Area		TFA	134.1900	
Assumed number of occupants		N	2.9051	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			13.3673 ZC2	
CO2 emissions from cooking, equation (L16)			1.4064 ZC3	
Total CO2 emissions			28.2036 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			28.2036 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	49.0000 (1b)	x 2.5000 (2b)	= 122.5000 (1b) - (3b)
First floor	49.9000 (1c)	x 3.1000 (2c)	= 154.6900 (1c) - (3c)
Second floor	35.2900 (1d)	x 3.1000 (2d)	= 109.3990 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 386.5890 (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					4 * 10 = 40.0000 (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 40.0000 / (5) = 0.1035 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3535 (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) =		0.2739 (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	0.3493	0.3424	0.3356	0.3013	0.2945	0.2602	0.2602	0.2534	0.2739	0.2945	0.3082	0.3219 (22b)
Effective ac	0.5610	0.5586	0.5563	0.5454	0.5434	0.5339	0.5339	0.5321	0.5375	0.5434	0.5475	0.5518 (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			2.2500	1.0000	2.2500		(26)
TER Opening Type (Uw = 1.40)			31.3000	1.3258	41.4962		(27)
Heat Loss Floor 1			49.0000	0.1300	6.3700		(28a)
External Wall 1	190.4400	33.5500	156.8900	0.1800	28.2402		(29a)
Main Roof	35.2900		35.2900	0.1300	4.5877		(30)
Terrace	14.0000		14.0000	0.1300	1.8200		(30)
Total net area of external elements Aum(A, m ²)			288.7300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		84.7641		(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)							30.8680 (36)
Total fabric heat loss						(33) + (36) =	115.6321 (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	71.5686	71.2665	70.9703	69.5791	69.3189	68.1072	68.1072	67.8828	68.5739	69.3189	69.8454	70.3959 (38)
Heat transfer coeff	187.2007	186.8986	186.6024	185.2112	184.9510	183.7393	183.7393	183.5149	184.2060	184.9510	185.4775	186.0280 (39)
Average = Sum(39)m / 12 =												185.2100 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3950	1.3928	1.3906	1.3802	1.3783	1.3692	1.3692	1.3676	1.3727	1.3783	1.3822	1.3863 (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												2.9051 (42)
Average daily hot water use (litres/day)												103.1960 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	113.5156	109.3878	105.2599	101.1321	97.0043	92.8764	92.8764	97.0043	101.1321	105.2599	109.3878	113.5156 (44)
Energy conte	168.3404	147.2316	151.9298	132.4561	127.0948	109.6731	101.6283	116.6199	118.0127	137.5325	150.1274	163.0287 (45)
Energy content (annual)										Total = Sum(45)m =		1623.6753 (45)
Distribution loss (46)m = 0.15 x (45)m	25.2511	22.0847	22.7895	19.8684	19.0642	16.4510	15.2442	17.4930	17.7019	20.6299	22.5191	24.4543 (46)
Water storage loss:												
Store volume												1.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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												
	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	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
	195.1743	171.4686	178.7637	158.4244	153.9286	135.6414	128.4621	143.4538	143.9810	164.3663	176.0957	189.8626 (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												
	195.1743	171.4686	178.7637	158.4244	153.9286	135.6414	128.4621	143.4538	143.9810	164.3663	176.0957	189.8626 (64)
								Total per year (kWh/year) = Sum(64)m =				1939.6225 (64)
Heat gains from water heating, kWh/month												
	77.4403	68.3441	71.9838	64.8163	63.7261	57.2409	55.2585	60.2432	60.0139	67.1966	70.6920	75.6741 (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	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548	145.2548 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	26.9862	23.9689	19.4928	14.7573	11.0313	9.3131	10.0631	13.0804	17.5565	22.2920	26.0180	27.7362 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	302.7029	305.8440	297.9285	281.0774	259.8058	239.8136	226.4575	223.3164	231.2319	248.0830	269.3546	289.3468 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255	37.5255 (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)												
	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038	-116.2038 (71)
Water heating gains (Table 5)												
	104.0864	101.7026	96.7524	90.0226	85.6534	79.5013	74.2722	80.9721	83.3526	90.3181	98.1833	101.7126 (72)
Total internal gains												
	503.3519	501.0919	483.7501	455.4337	426.0669	398.2043	380.3692	386.9453	401.7174	430.2695	463.1324	488.3720 (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					12.8300	10.6334	0.6300	0.7000	0.7700			41.6937 (74)
East					3.7700	19.6403	0.6300	0.7000	0.7700			22.6287 (76)
South					14.7000	46.7521	0.6300	0.7000	0.7700			210.0342 (78)

Solar gains	274.3566	467.9273	646.4664	819.0278	939.3220	943.6473	905.0419	812.6274	705.2960	518.3900	328.6120	234.8556 (83)
Total gains	777.7085	969.0192	1130.2165	1274.4616	1365.3889	1341.8517	1285.4111	1199.5727	1107.0134	948.6595	791.7444	723.2276 (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	49.7795	49.8599	49.9391	50.3142	50.3850	50.7172	50.7172	50.7792	50.5887	50.3850	50.2419	50.0933	50.0933
alpha	4.3186	4.3240	4.3293	4.3543	4.3590	4.3811	4.3811	4.3853	4.3726	4.3590	4.3495	4.3396	4.3396
util living area													
	0.9982	0.9949	0.9866	0.9612	0.8938	0.7568	0.5956	0.6511	0.8654	0.9762	0.9959	0.9987	0.9987 (86)
MIT	19.4256	19.6294	19.9335	20.3175	20.6643	20.8921	20.9711	20.9575	20.7895	20.3298	19.7983	19.3876	19.3876 (87)
Th 2	19.7671	19.7689	19.7706	19.7785	19.7800	19.7870	19.7870	19.7883	19.7843	19.7800	19.7770	19.7739	19.7739 (88)
util rest of house													
	0.9975	0.9931	0.9815	0.9453	0.8482	0.6556	0.4475	0.5039	0.7905	0.9635	0.9942	0.9982	0.9982 (89)
MIT 2	17.6871	17.9856	18.4281	18.9815	19.4490	19.7147	19.7768	19.7712	19.6149	19.0086	18.2387	17.6361	17.6361 (90)
Living area fraction													
									fLA = Living area / (4) =				0.1139 (91)
MIT	17.8851	18.1728	18.5995	19.1337	19.5874	19.8488	19.9128	19.9063	19.7487	19.1591	18.4163	17.8355	17.8355 (92)
Temperature adjustment													0.0000
adjusted MIT	17.8851	18.1728	18.5995	19.1337	19.5874	19.8488	19.9128	19.9063	19.7487	19.1591	18.4163	17.8355	17.8355 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9958	0.9895	0.9744	0.9339	0.8393	0.6615	0.4639	0.5196	0.7878	0.9540	0.9910	0.9969	0.9969 (94)
Useful gains	774.4657	958.8114	1101.2708	1190.2549	1145.9303	887.6007	596.3536	623.3305	872.1286	905.0578	784.6046	720.9935	720.9935 (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	4.2000 (96)
Heat loss rate W													
	2543.1389	2480.6599	2257.7989	1895.3886	1458.7836	964.4085	608.6932	643.4615	1040.5182	1583.0069	2098.9129	2536.5875	2536.5875 (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	1.0000 (97a)
Space heating kWh													
	1315.8929	1022.6822	860.4569	507.6962	232.7628	0.0000	0.0000	0.0000	0.0000	504.3942	946.3020	1350.8019	1350.8019 (98)
Space heating													6740.9891 (98)
Space heating per m2													(98) / (4) = 50.2347 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

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													7209.6140 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1315.8929	1022.6822	860.4569	507.6962	232.7628	0.0000	0.0000	0.0000	0.0000	504.3942	946.3020	1350.8019	(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)	1407.3721	1093.7778	920.2748	542.9906	248.9442	0.0000	0.0000	0.0000	0.0000	539.4590	1012.0877	1444.7079	(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	195.1743	171.4686	178.7637	158.4244	153.9286	135.6414	128.4621	143.4538	143.9810	164.3663	176.0957	189.8626	(64)
Efficiency of water heater (217)m	88.9593	88.7905	88.4597	87.7032	85.9143	79.8000	79.8000	79.8000	79.8000	87.6127	88.6354	79.8000	(216)
Fuel for water heating, kWh/month	219.3972	193.1160	202.0849	180.6370	179.1652	169.9767	160.9801	179.7667	180.4273	187.6056	198.6743	213.2595	(219)
Water heating fuel used												2265.0905	(219)
Annual totals kWh/year													
Space heating fuel - main system												7209.6140	(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)												476.5844	(232)
Total delivered energy for all uses												10026.2889	(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	7209.6140	0.2160	1557.2766	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2265.0905	0.2160	489.2595	(264)
Space and water heating			2046.5362	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	476.5844	0.5190	247.3473	(268)
Total CO2, kg/m2/year			2332.8085	(272)
Emissions per m2 for space and water heating			15.2510	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			1.8433	(272b)
Emissions per m2 for pumps and fans			0.2901	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2510 * 1.55) + 1.8433 + 0.2901, rounded to 2 d.p.			25.7700	(273)

Appendix 4



BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

BE LEAN

As designed

Date: Fri Mar 20 10:27:48 2026

Administrative information

Building Details

Address: Enterprise Units, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.30

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.30

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Neil Rothon NRG Consulting Ltd

Telephone number:

Address: Coppergate House, 10 Whites Row, London, E1

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	21.7
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	21.7
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	13.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	FL000000:Surf[4]
Floor	0.25	0.11	0.11	FL000000:Surf[0]
Roof	0.25	0.12	0.12	FL000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.23	1.23	FL000000:Surf[3]
Personnel doors	2.2	1.4	1.4	FL000000:Surf[2]
Vehicle access & similar large doors	1.5	-	-	No vehicle access doors in building
High usage entrance doors	3.5	-	-	No high usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	4

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Gas for Be Lean

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	2.5	0	-	0.85
Standard value	0.91*	2.6	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
Enterprise Centre 1		-	-	-	0.8	-	-	-	-	-	-	N/A
Enterprise Centre 2		-	-	-	0.8	-	-	-	-	-	-	N/A
Enterprise Centre 3		-	-	-	0.8	-	-	-	-	-	-	N/A
Enterprise Centre 4		-	-	-	0.8	-	-	-	-	-	-	N/A
Enterprise Centre 5		-	-	-	0.8	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
	Standard value	60	60	22
Enterprise Centre 1	-	105	-	222
Enterprise Centre 2	-	105	-	337
Enterprise Centre 3	-	105	-	281
Enterprise Centre 4	-	105	-	169
Enterprise Centre 5	-	105	-	209

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Enterprise Centre 1	NO (-85.2%)	YES
Enterprise Centre 2	NO (-66.7%)	YES
Enterprise Centre 3	NO (-75.3%)	YES
Enterprise Centre 4	NO (-95.6%)	YES
Enterprise Centre 5	NO (-80.8%)	YES

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	236.6	236.6
External area [m ²]	660.3	660.3
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	4	5
Average conductance [W/K]	198.27	365.71
Average U-value [W/m ² K]	0.3	0.55
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

A1/A2 Retail/Financial and Professional services
A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
B1 Offices and Workshop businesses
B2 to B7 General Industrial and Special Industrial Groups
B8 Storage or Distribution
C1 Hotels
C2 Residential Institutions: Hospitals and Care Homes
C2 Residential Institutions: Residential schools
C2 Residential Institutions: Universities and colleges
C2A Secure Residential Institutions
Residential spaces

100 D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries
D1 Non-residential Institutions: Education
D1 Non-residential Institutions: Primary Health Care Building
D1 Non-residential Institutions: Crown and County Courts
D2 General Assembly and Leisure, Night Clubs, and Theatres
Others: Passenger terminals
Others: Emergency services
Others: Miscellaneous 24hr activities
Others: Car Parks 24 hrs
Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	22.05	48.28
Cooling	4.04	5.99
Auxiliary	5.22	3.95
Lighting	5.9	10.27
Hot water	5.1	4.84
Equipment*	4.72	4.72
TOTAL **	42.31	73.33

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	98.01	231.58
Primary energy* [kWh/m ²]	79.67	125.31
Total emissions [kg/m ²]	13.7	21.7

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	70.8	27.2	22	4	5.2	0.89	1.87	0.91	2.5
	Notional	149.8	81.7	48.3	6	3.9	0.86	3.79	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	FL000000:Surf[4]
Floor	0.2	0.11	FL000000:Surf[0]
Roof	0.15	0.12	FL000000:Surf[1]
Windows, roof windows, and rooflights	1.5	1.23	FL000000:Surf[3]
Personnel doors	1.5	1.4	FL000000:Surf[2]
Vehicle access & similar large doors	1.5	-	No vehicle access doors in building
High usage entrance doors	1.5	-	No high usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	4

Appendix 5



Project name

BE GREEN

As designed

Date: Fri Jan 30 12:17:44 2026

Administrative information

Building Details

Address: Enterprise Units, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.30

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.30

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Neil Rothon NRG Consulting Ltd

Telephone number:

Address: Coppergate House, 10 Whites Row, London, E1

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	19.3
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	19.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	12.6
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	FL000000:Surf[4]
Floor	0.25	0.11	0.11	FL000000:Surf[0]
Roof	0.25	0.12	0.12	FL000000:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.23	1.23	FL000000:Surf[3]
Personnel doors	2.2	1.4	1.4	FL000000:Surf[2]
Vehicle access & similar large doors	1.5	-	-	No vehicle access doors in building
High usage entrance doors	3.5	-	-	No high usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	4

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Air to Air Heat Pump

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	3	0	-	0.85
Standard value	2.5*	2.6	N/A	N/A	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types ≤12 kW output, refer to EN 14825 for limiting standards.					

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I		
	Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Enterprise Centre 1		-	-	-	0.8	-	-	-	-	-	-	N/A
Enterprise Centre 2		-	-	-	0.8	-	-	-	-	-	-	N/A
Enterprise Centre 3		-	-	-	0.8	-	-	-	-	-	-	N/A
Enterprise Centre 4		-	-	-	0.8	-	-	-	-	-	-	N/A
Enterprise Centre 5		-	-	-	0.8	-	-	-	-	-	-	N/A

General lighting and display lighting

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
Enterprise Centre 1		-	105	-	222
Enterprise Centre 2		-	105	-	337
Enterprise Centre 3		-	105	-	281
Enterprise Centre 4		-	105	-	169
Enterprise Centre 5		-	105	-	209

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Enterprise Centre 1	NO (-85.2%)	YES
Enterprise Centre 2	NO (-66.7%)	YES
Enterprise Centre 3	NO (-75.3%)	YES
Enterprise Centre 4	NO (-95.6%)	YES
Enterprise Centre 5	NO (-80.8%)	YES

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	236.6	236.6
External area [m ²]	660.3	660.3
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	4	5
Average conductance [W/K]	198.27	365.71
Average U-value [W/m ² K]	0.3	0.55
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

A1/A2 Retail/Financial and Professional services
A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
B1 Offices and Workshop businesses
B2 to B7 General Industrial and Special Industrial Groups
B8 Storage or Distribution
C1 Hotels
C2 Residential Institutions: Hospitals and Care Homes
C2 Residential Institutions: Residential schools
C2 Residential Institutions: Universities and colleges
C2A Secure Residential Institutions
Residential spaces

100

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries
D1 Non-residential Institutions: Education
D1 Non-residential Institutions: Primary Health Care Building
D1 Non-residential Institutions: Crown and County Courts
D2 General Assembly and Leisure, Night Clubs, and Theatres
Others: Passenger terminals
Others: Emergency services
Others: Miscellaneous 24hr activities
Others: Car Parks 24 hrs
Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	8.03	16.27
Cooling	3.37	5.99
Auxiliary	5.22	3.95
Lighting	5.9	10.27
Hot water	1.86	1.63
Equipment*	4.72	4.72
TOTAL **	24.37	38.12

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	98.01	231.58
Primary energy* [kWh/m ²]	74.82	114.09
Total emissions [kg/m ²]	12.6	19.3

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	70.8	27.2	8	3.4	5.2	2.45	2.24	2.5	3
	Notional	149.8	81.7	16.3	6	3.9	2.56	3.79	----	----

Key to terms	
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
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Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
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HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	FL000000:Surf[4]
Floor	0.2	0.11	FL000000:Surf[0]
Roof	0.15	0.12	FL000000:Surf[1]
Windows, roof windows, and rooflights	1.5	1.23	FL000000:Surf[3]
Personnel doors	1.5	1.4	FL000000:Surf[2]
Vehicle access & similar large doors	1.5	-	No vehicle access doors in building
High usage entrance doors	1.5	-	No high usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	4

Appendix 6



MRXBOXAB-ECO2 MRXBOX-ECO2 and Opposite Handed versions

ACHIEVES
100%
DUTY IN BYPASS
MODE

The MRXBOXAB-ECO2 has been designed with automatic 100% bypass as listed on the SAP Product Characteristics Database (PCDB).

Due to its intelligent and smart design, there will be no reduction in airflow when operating in bypass mode resulting in enhanced performance.

Both the MRXBOXAB-ECO2 and the MRXBOX-ECO2 are designed to provide optimised balanced (supply and extract) mechanical ventilation with heat recovery and both are listed on the PCDB.

The units operate by continuously extracting moisture-laden air from 'wet' rooms within the property and at the same time drawing in fresh supply air from outside. The heat from the extracted stale air is recovered via a heat exchanger inside the heat recovery unit which becomes tempered then filtered before supplying into the habitable rooms, creating comfortable and well ventilated homes.

The heat exchanger block within these units can recover up to 95% of the normally wasted heat. The two independent fans have full-speed control for background and boost ventilation rates.

The MRXBOXAB-ECO2 has a Summer bypass function. In warmer months this function automatically activates to ensure the property is being well-ventilated and comfort levels are maintained in the home by continuously drawing in fresh filtered air into the habitable rooms.

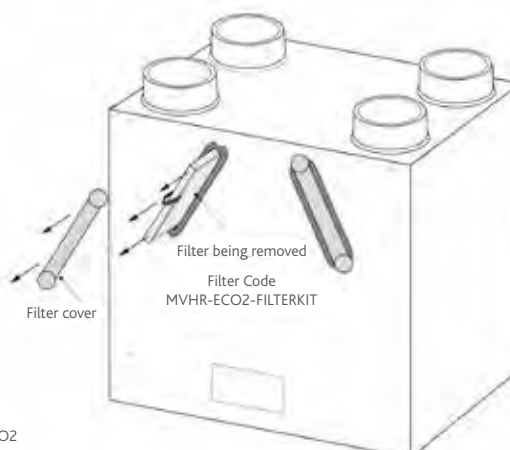


Typical Installation ▼

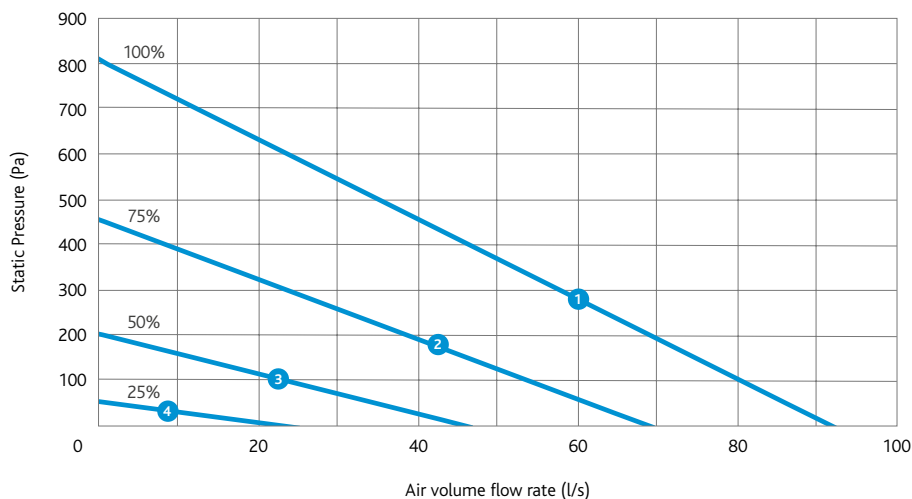
INSTALLATION FEATURES



Typical cupboard installation of MRXBOX(AB)-ECO2



Performance - MRXBOX(AB)-ECO2 ▼



CODE DESCRIPTION

MRXBOXAB-ECO2

Wall mounted unit with 100% bypass and integral humidistat.

MRXBOX-ECO2

Wall mounted unit.

MRXBOXAB-ECO2-OH

Opposite handed configuration wall mounted unit with 100% bypass and integral humidistat.

MRXBOX-ECO2-OH

Opposite handed configuration wall mounted unit.

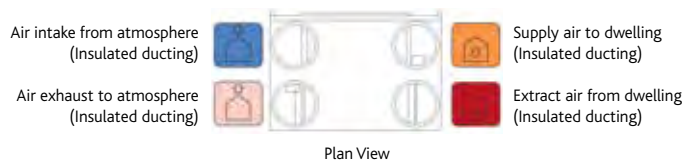
Electrical & Sound ▼

	Maximum power consumption		Sound Power Levels dB re 1pW (Frequency Hz)								dBA @3m
Curve	(Watts)		63	125	250	500	1k	2k	4k	8k	
1	155	Open inlet	48	52	59	55	50	46	35	27	
		Open outlet	60	67	69	69	64	64	54	46	
		Breakout	59	60	58	59	49	46	35	27	40
2	69	Open inlet	44	47	57	50	45	41	30	21	
		Open outlet	55	63	63	65	60	59	49	40	
		Breakout	56	57	53	52	44	40	28	18	34
3	19	Open inlet	39	38	48	40	35	29	16	<16	
		Open outlet	48	54	53	55	49	47	35	24	
		Breakout	43	48	44	42	34	29	<16	<16	24
4	7	Open inlet	38	31	27	23	<16	<16	<16	<16	
		Open outlet	38	34	31	31	22	<16	<16	<16	
		Breakout	37	31	24	20	<16	<16	<16	<16	<16

The maximum power consumption shown above (Watts) is consumed on units running continuously, not taking into account any heat recovery saving and based on SAP Product Characteristic Database (PCDB) testing. The breakout case-radiated dBA values are given for Hemispherical free field radiation at 3m - to obtain the Spherical radiated data, subtract 3 dBA.

Please note: Sound data is provided at a particular duty point for 25%, 50%, 75% and 100%. For accurate sound data at a specific speed duty, please use Nuaire's fan selector or call the office on 029 2085 8500.

Standard Handing



Opposite Handing



MRXBOXAB-ECO2 & MRXBOX-ECO2

SAP 2009 Test Results ▼

Product Code	MRXBOXAB-ECO2			MRXBOX-ECO2		
Application	Specific Fan Power (W/l/s)	Heat Exchange Efficiency	Energy Saving Trust Best Practice Compliant	Specific Fan Power (W/l/s)	Heat Exchange Efficiency	Energy Saving Trust Best Practice Compliant
Kitchen + 1 Wet Room	0.49	90%	Yes	0.46	90%	Yes
Kitchen + 2 Wet Room	0.50	90%	Yes	0.45	89%	Yes
Kitchen + 3 Wet Room	0.58	89%	Yes	0.50	89%	Yes
Kitchen + 4 Wet Room	0.69	88%	Yes	0.60	88%	Yes
Kitchen + 5 Wet Room	0.81	87%	Yes	0.70	87%	Yes

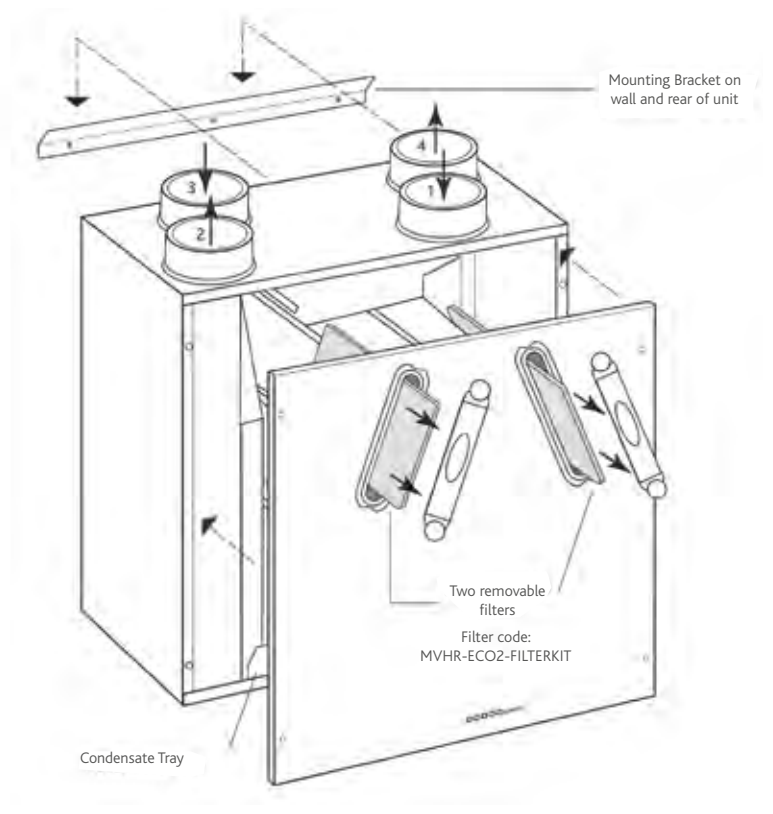
SAP 2012 Test Results ▼

Product Code	MRXBOXAB-ECO2			MRXBOX-ECO2		
Application	Specific Fan Power (W/l/s)	Heat Exchange Efficiency	Energy Saving Trust Best Practice Compliant	Specific Fan Power (W/l/s)	Heat Exchange Efficiency	Energy Saving Trust Best Practice Compliant
Kitchen + 1 Wet Room	0.52	90%	Yes	0.47	89%	Yes
Kitchen + 2 Wet Room	0.59	89%	Yes	0.54	88%	Yes
Kitchen + 3 Wet Room	0.77	87%	Yes	0.66	87%	Yes
Kitchen + 4 Wet Room	1.00	86%	Yes	0.85	87%	Yes
Kitchen + 5 Wet Room	1.23	86%	Yes	1.05	86%	Yes

General Arrangement ▼

SPIGOT LOCATION & DUCTING REFERENCES

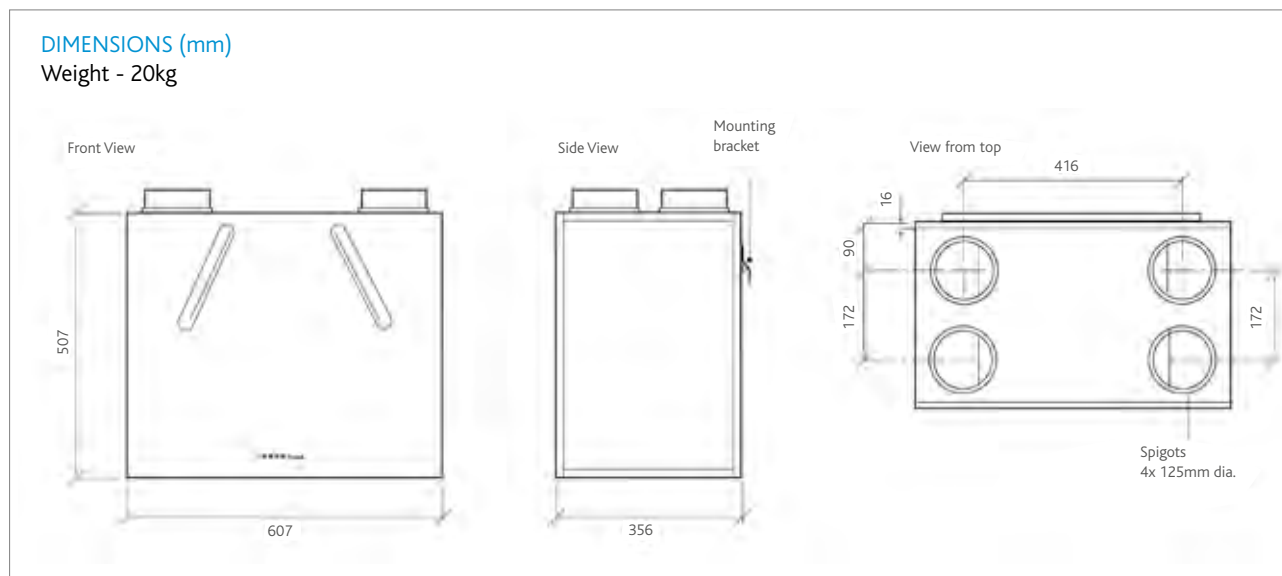
Spigot 1. 125mm dia. = Extract air from dwelling.
 Spigot 2. 125mm dia. = Extract air to outside.
 Spigot 3. 125mm dia. = Intake air from outside.
 Spigot 4. 125mm dia. = Supply air to property



Technical - MRXBOX(AB)-ECO2 ▼

DIMENSIONS (mm)

Weight - 20kg



Electrical Details ▼

Please note: The electrical connection of the unit must be carried out by a qualified electrician.

The unit is supplied with a flexible cord for connection to the mains supply.

NOTE: This unit must be earthed.

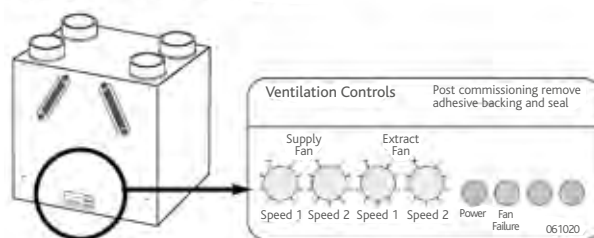
The mains power supply cable should be connected to a fixed wiring installation in accordance with current IEE wiring regulations.

Electrical Details: MRXBOX(AB)-ECO2

Voltage: 230V 1ph 50Hz

Consumption: 1.2 Amp

Detail of unit control on front panel.

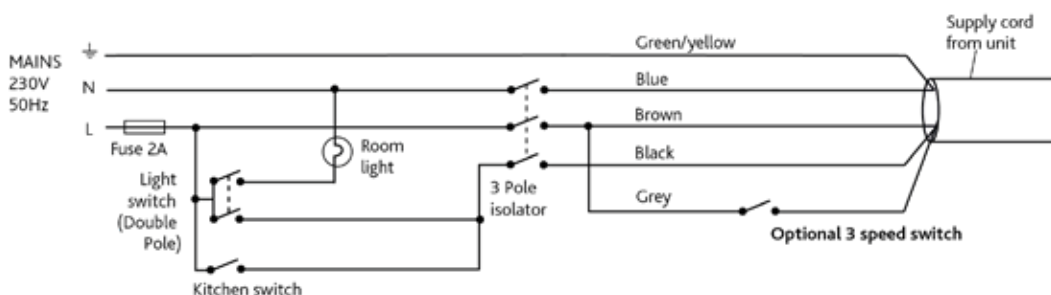


Tamper proof label following commissioning, includes system status indication.

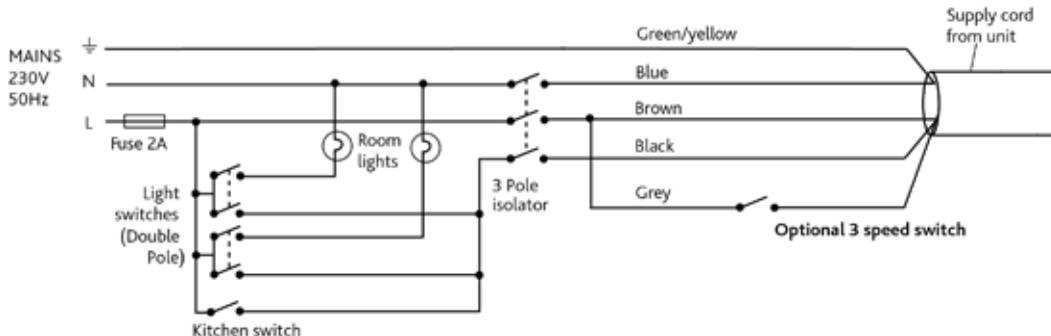
MRXBOXAB-ECO2
& MRXBOX-ECO2

Wiring - MRXBOX(AB)-ECO2 ▼

UNIT SERVING KITCHEN & BATHROOM



UNIT SERVING KITCHEN & TWO BATHROOMS

Optional Sensors
and Detectors ▼

Customise MRXBOX(AB)-ECO2 for enhanced performance. All supplied with pre-plugged 10m data cable and incorporates status LED.

MRXBOX95-PIR (Passive Infrared)

A low voltage sensor, detects movement and activates system. Incorporates overrun timer and timer adjustments.

MRXBOX95-HUM (Relative Humidity)

A low voltage sensor, activates the system when the RH level is above set point. Incorporates overrun timer and RH setpoint level adjustment.

MRXBOX95-RFI (Remote Fail Indicator)

If fan failure occurs, the audio visual indicator will flash a warning.



MRXBOX-VSC
CONTROL SCREEN
COMPATIBLE WITH
THIS UNIT

Consultants Specification

SPECIFICATION

The unit shall be fully insulated providing excellent thermal and acoustic characteristics and shall be complete with a multi-plate, counter-flow, high-efficiency heat exchanger block, with a thermal efficiency of up to 95%. The heat exchanger shall be protected by G3 grade filters on fresh air inlet and system extract. The heat exchanger and filters shall be accessible via the front access panel, enabling quick and easy maintenance.

The unit shall have low energy, high-efficiency EC fan/motor assemblies with sealed for life bearings, the impellers shall be backward-curved centrifugal type. The motors shall be suitable for an ambient temperature of 40°C.

The unit shall be supplied complete with an insulated condensate drip tray and 21.5mm drain connection.

The unit shall be suitable for 125mm circular ducting.

Note: The unit is also available in opposite handed format, refer to spigot configuration for set up.

The breakout noise level and power requirements shall be as detailed by the unit manufacturer and in accordance with the ventilation equipment schedule.

Units shall be MRXBOX-ECO2 or MRXBOXAB-ECO2 as manufactured by Nuaire and shall be listed on the SAP PCDB.

MRXBOX-ECO2-OH and MRXBOXAB-ECO2-OH are opposite handed assemblies compliant as per standard handed versions listed in SAP PCDB.

OPERATION

The supply and extract system shall be positioned as indicated on the drawings and shall be in accordance with the particular fan schedule in the specification.

The combined supply and extract with heat recovery unit shall supply filtered fresh air to each of the habitable rooms and moisture-laden air shall be extracted from all wet areas, e.g. bathroom, en suite, w.c, kitchen, utility rooms etc. The supply air shall be pre-heated by the warm extract air via the integrated counter-flow heat exchanger element. The extracted air shall also be filtered before it reaches the heat exchanger block.

The ventilation unit shall vary its speed and therefore the ventilation rate, as it receives signals from one of the following:

- Switched live signal from light/remote switches.

When signals are received, the fan shall alter its speed to adjustable, normal and boost rates.

The unit shall have the facility to commission the supply and extract fans independently on minimum speed (continuous background ventilation) and boost speed via inbuilt minimum and maximum speed adjustment. The fans shall have infinitely variable speed control.

INTEGRAL AUTOMATIC HX BYPASS WITH NO REDUCTION IN AIRFLOW (MRXBOXAB-ECO2 & MRXBOXAB-ECO2-OH)

The bypass damper shall open automatically via a wax actuator, allowing the air to bypass the heat exchanger to deliver fresh filtered air during the warmer months.

The automatic bypass diverts 100% airflow around the heat exchanger with no reduction in airflow as independently tested by the BRE.

INTEGRAL HUMIDITY SENSOR (MRXBOXAB-ECO2 & MRXBOXAB-ECO2-OH)

The integral humidity sensor incorporated within the extract fan chamber will automatically boost both the extract and supply fan, to the commissioned boost speed, when the humidity level exceeds that set by the front panel mounted adjustment potentiometer.

CONTROL OPTIONS

All versions shall have the following functions integrally mounted within the fan unit on a purpose made PCB, all such components are pre-wired and factory fitted by the manufacturer:

- Independent control of background supply and extract flow rates.
- Independent control of boost speed supply and extract flow rates.
- Integral heat exchanger frost protection.
- Fan failure indication.
- Integral S/L terminal for boost from remote switch, e.g. light switch.
- Additional S/L terminal for 100% boost speed from remote switch, e.g. plate switch.
- Discreet daily run monitor.
- Remote fail indicator (part number MRXBOX95-RFI).
- Indication and controls – The unit shall have clear LED visual indication for maintenance, servicing and operation mode, i.e. HX bypass, frost protection.

MRXBOX-VSC (VISUAL SYSTEM CONTROLLER)

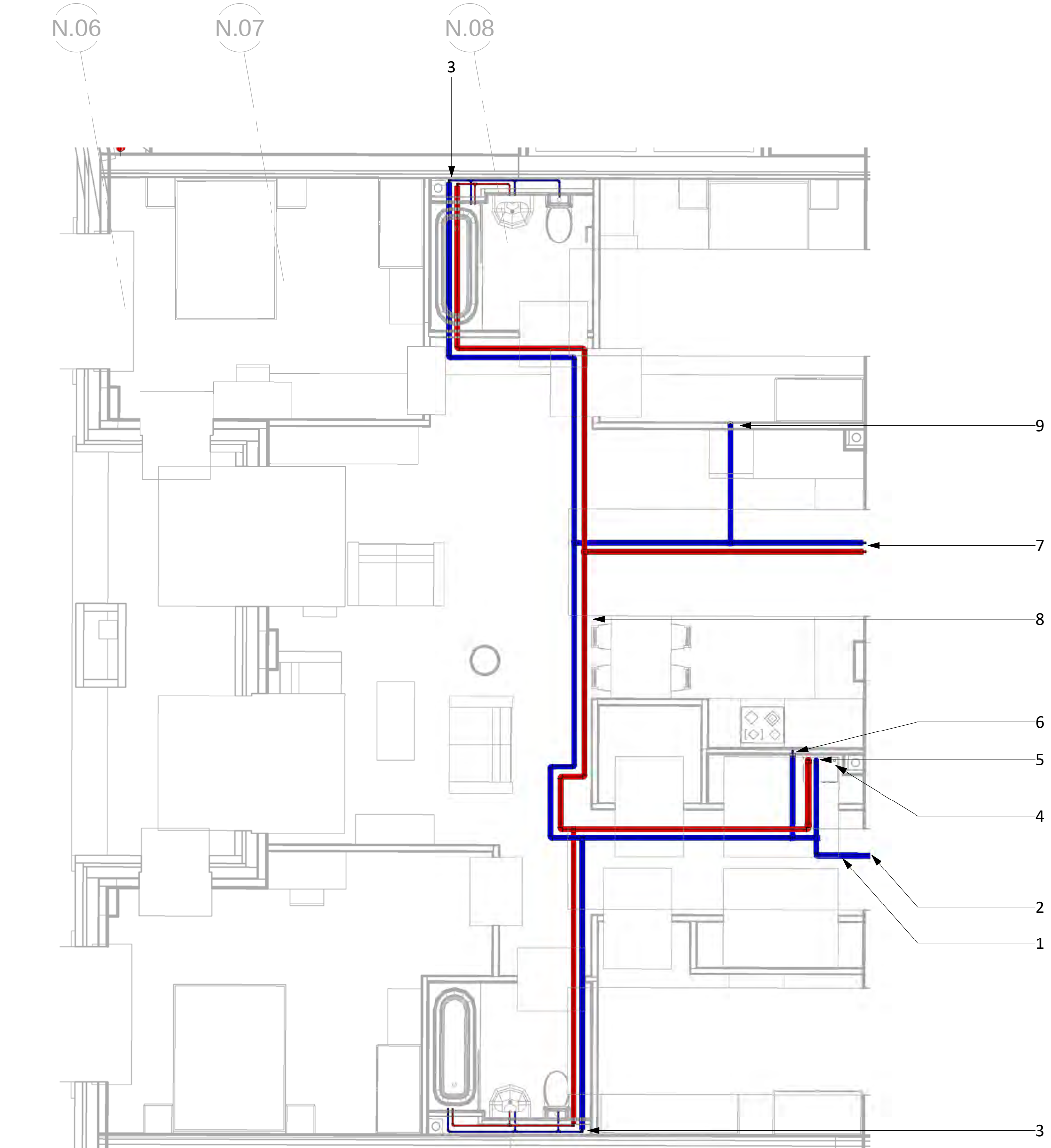
The MRXBOX-VSC is compatible with the Nuaire MRXBOXAB-ECO2 heat recovery units and can be purchased separately. The controller comes complete with commissioning and end user functions.

The display will be a 3.5" LCD display and will remain on standby until such time the screen is touched.

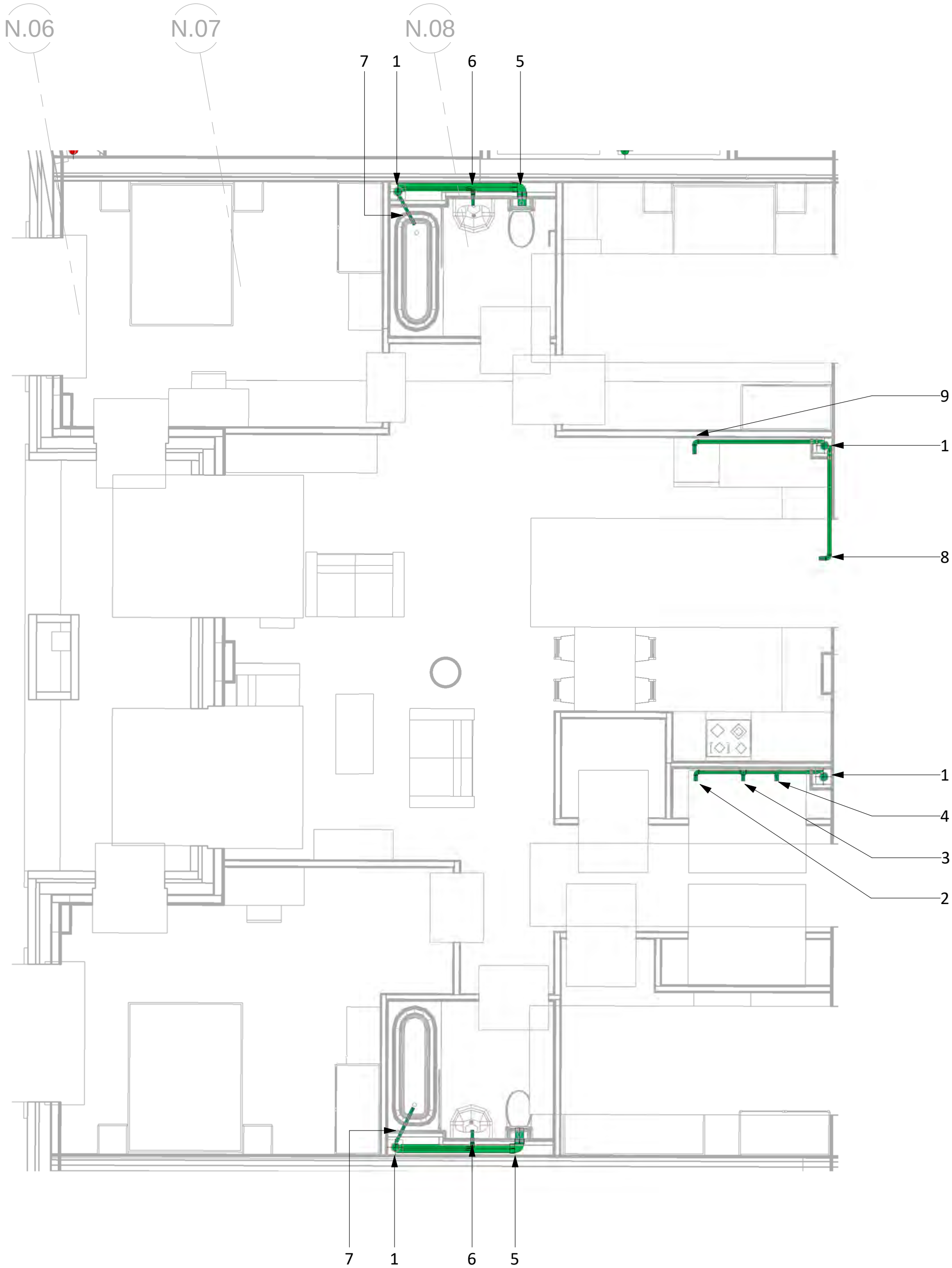
The initial display will show the MVHR system status as listed below:

- Current fan speed.
- Current indoor/outside temperature.
- Indicate when the Summer bypass is activated.
- Indicate when frost protection is activated.
- Indicate when the filters require cleaning/changing.

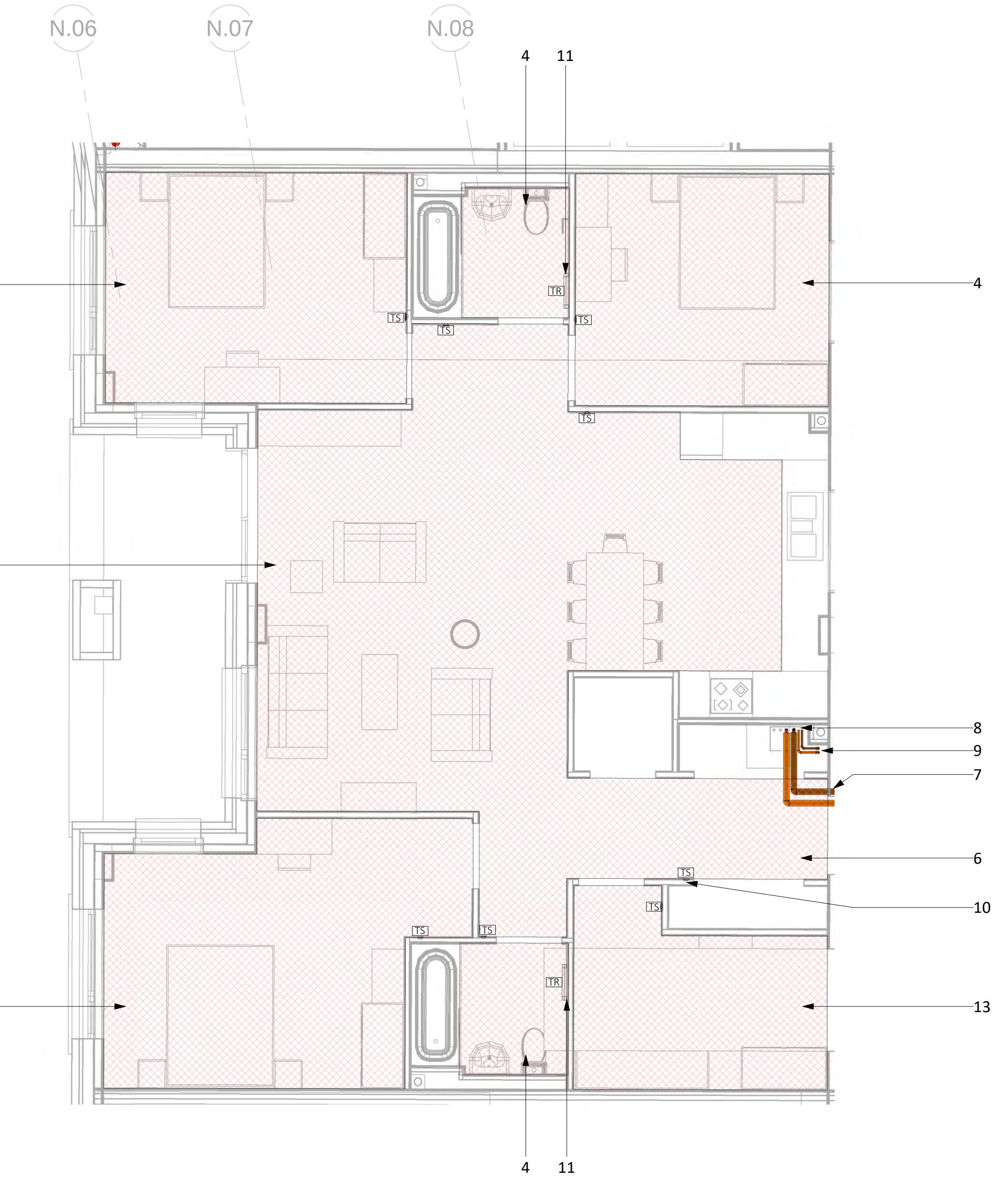
The unit shall come with a 5 year warranty which starts from the day of delivery, and includes parts and labour for the first year and parts only for the remaining 4 years.



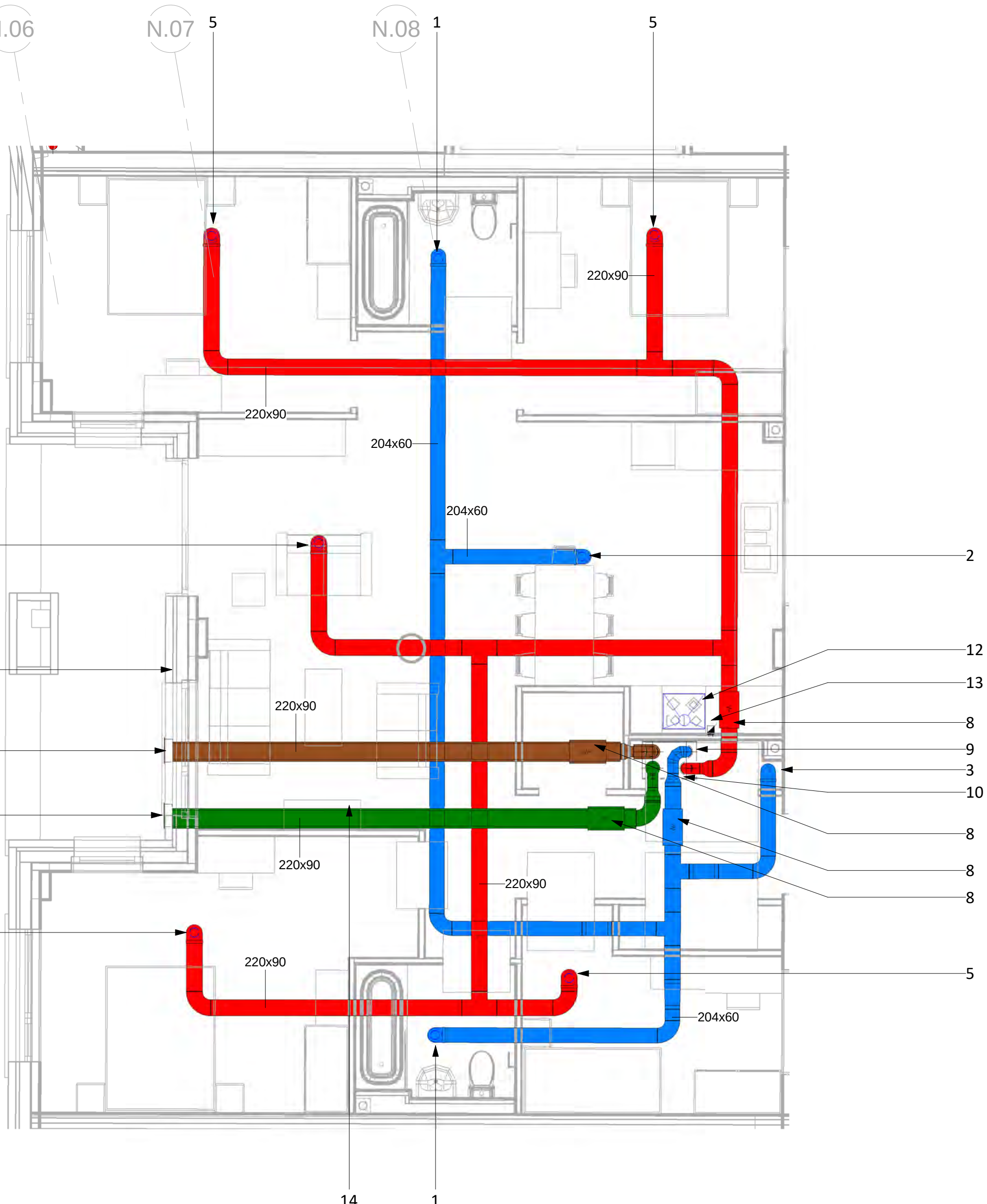
1 Flat Type 4B7P-FLT-01 - Domestics
1 : 50



2 Flat Type 4B7P-FLT-01 - Drainage
1 : 50



3 Flat Type 4B7P-FLT-01 - Heating
1 : 50



4 Flat Type 4B7P-FLT-01 - Ventilation
1 : 50

Drainage Tag Notes:

1. 110mm SVP DROP
2. 110mm SVP DROPS F.A. AND DROPS T.B. WITH CONNECTIONS FOR 32mm MVHR
3. 110mm SVP DROPS F.A. AND DROPS T.B. WITH CONNECTIONS FOR 32mm HIU
4. 110mm SVP DROPS F.A. AND DROPS T.B. WITH CONNECTIONS FOR 40mm VM
5. 110mm SVP DROPS F.A. AND DROPS T.B. WITH CONNECTIONS FOR 110mm WC
6. 110mm SVP DROPS F.A. AND DROPS T.B. WITH CONNECTIONS FOR 40mm WHB
7. 110mm SVP DROPS F.A. AND DROPS T.B. WITH CONNECTIONS FOR 40mm BATH
8. 110mm SVP DROPS F.A. AND DROPS T.B. WITH CONNECTIONS FOR 40mm SINK
9. 110mm SVP DROPS F.A. AND DROPS T.B. WITH CONNECTIONS FOR 40mm DW

Drainage General Notes:

STACK LOCATIONS MAY DIFFER DEPENDING ON LOCATION WITHIN DEVELOPMENT. STUDY STACK REQUIREMENTS SUBJECT TO LOCATION WITHIN DEVELOPMENT TO BE COMPLETED WITH ANY SUBJECT TO BUILDING CONTROL.

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND INTERIOR DESIGN DRAWINGS.

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT MEP SCHEMATICS AND SPECIFICATIONS.

DO NOT SCALE, VERIFY ALL DIMENSIONS BY SITE MEASUREMENT.

WHERE APPLIANCE TRAPS CONNECT TO A LARGER BRANCH PIPE SIZE, THE TAIL OF THE TRAP IS TO BE LENGTHENED BY 50MM BEFORE INITIAL CONNECTION.

BRANCH VENTILATING PIPEWORK IS TO BE CONNECTED TO THE REQUIRED BRANCH PIPE WITHIN 300MM OF THE TRAP AND SHOULD BE NOT LESS THAN 25MM DIAMETER OR, WHERE THE LENGTH OF THE VENTILATING PIPE EXCEEDS 15M OR HAS MORE THAN 5 BENDS, NOT LESS THAN 32MM DIAMETER.

A BRANCH LINE OF DN50 TO DN150 JOINING DISCHARGE STACK OF EQUAL DIAMETER SHALL BE SWEEP IN THE DIRECTION OF FLOW WITH RADIUS OF NOT LESS THAN 50MM FOR ANGLES OF 90° TO 87.5° IN ACCORDANCE WITH BS EN 12056-2:2000, FIGURE ND.2.

FIRE COLLARS TO BE INSTALLED ON ALL WASTE PIPES PASSING THROUGH FLOOR SLABS AND FIRE COMPARTMENTS. FIRE COLLARS TO BE INSTALLED ON ALL WASTE PIPES OVER 110MM. FIRE SLEEVES TO BE INSTALLED ON ALL WASTE PIPES UNDER 110MM.

ALL VERTICAL AND HORIZONTAL DRAINAGE PIPEWORK WITHIN APARTMENT CEILING VOIDS/RISERS/POH CEILING VOIDS/BOTH CEILING VOID/PUBLIC SPACES (INCLUDING BOXES IN PIPE WORK) TO BE INSTALLED IN HOPE PIPEWORK TO BE INSULATED WITH MULTI-LAG INSULATION INCORPORATING VAPOUR SEAL BARRIER TO ALL PIPE WORK AND ANGULARY FITTINGS FOR ACOUSTIC PURPOSES.

ALL DRAINAGE PIPEWORK FROM LEVEL 1 AND ABOVE TO BE HDPE PIPEWORK, ALL LOW LEVEL PIPEWORK WITHIN APARTMENTS TO BE UPVC PIPE WORK, UNLESS OTHERWISE NOTED.

ALL OFFSETTING AND CHANGES IN DIRECTION SOILS & WASTE PIPEWORK TO BE COMPLETE WITH KODDING ACCESS POINTS AT ANY BENDS.

ACCESS DOOR / KODDING EYE ON MAIN SOIL RISER AT EACH LEVEL ABOVE FINAL CONNECTION AT EACH LEVEL REFER TO SOILS & WASTE SCHEMATICS FOR FURTHER DETAILS.

ANTI-SYPHON TRAPS & VENTILATION PIPES SHALL BE PROVIDED THROUGHOUT TO PREVENT THE LOSS OF WATER WITHIN TRAPS THROUGHOUT THE SYSTEM.

THE SYSTEM SHALL BE DESIGNED AND INSTALLED IN ACCORDANCE WITH BS 12056 PARTS 1, 2 & 3 AND BUILDING REGULATIONS.

ALL SERVICES TO BE INSTALLED AS TIGHT AS POSSIBLE TO SOFFIT / UNDER SIDE OF SLAB.

AAV (AIR ADMITTANCE VALVE) SHALL BE LOCATED A MINIMUM OF 100MM ABOVE THE PIPE.

AAV SHALL BE LOCATED IN A SPACE THAT PERMITS AIR TO ENTER THE VALVE.

AAV SHALL BE USED IN AREAS WHERE THE AMBIENT TEMPERATURE -20° C TO +60°C.

AAV SHALL BE INSTALLED IN THE VERTICAL UPRIGHT POSITION.

THE VENT SHALL CONNECT TO THE DRAIN WITH A VERTICAL CONNECTION TO MAINTAIN AN UNBLOCKED OPENING IN THE PIPING TO THE AAV.

Domestics Tag Notes:

1. 28mm BCWS TO ENTER THE FLAT WITHIN THE CEILING VOID.
2. EXACT LOCATION OF SERVICES ENTERING THE FLAT MAY BE DIFFERENT DEPENDING ON LOCATION WITHIN DEVELOPMENT. REQUIREMENTS FOR EXTERNAL METER BOX SUBJECT TO LOCATION WITHIN DEVELOPMENT.
3. 15mm BCWS & HWS-F DROP TO U/L TO SERVE BATHROOM.
4. 22mm BCWS & HWS-F EXIT UTILITY CUPBOARD TO SERVE APARTMENT.
5. 280A BCWS DROPS WITHIN UTILITY CUPBOARD TO SERVE HIU, C/W DCV, ISOLATION VALVE AND MAIN WATER STOP COCK. 150A BCWS CONNECTION C/W ISOLATION VALVE AND NRV PROVIDED AT HIU TO BE USED AS FILL LOOP FOR LTHW SECONDARY CIRCUIT.
6. 15mm BCWS DROPS TO U/L TO SERVE WASHING MACHINE C/W ISOLATION VALVE AND DCV.
7. 15mm BCWS & HWS-F DROP TO U/L TO SERVE SINK C/W ISOLATION VALVES, DCV AND DRAIN COCK.
8. 15mm BCWS & HWS-F SERVICES RUN WITHIN CEILING VOID.
9. 15mm BCWS DROP TO U/L TO SERVE DISHWASHER, C/W ISOLATION VALVE AND DCV.
10. 15mm CWS & HWS-F SERVICES RISE T.A TO SERVE BATHROOM.

Domestics General Notes:

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND INTERIOR DESIGN DRAWINGS.

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT MEP SCHEMATICS AND SPECIFICATIONS.

DO NOT SCALE, VERIFY ALL DIMENSION ON SITE MEASUREMENTS.

ISOLATION VALVES ON RISERS SHOWN ON THIS DRAWING FOR CLARITY ONLY. VALVES TO BE LOCATED AT ALL TAPS, SHOWERS AND WASHING MACHINES.

DOUBLE CHECK VALVES WILL BE REQUIRED AT ALL TAPS, SHOWERS AND WASHING MACHINES.

SURGE ARRESTORS TO BE INSTALLED AT THE TOP OF ALL VERTICAL RISERS.

ALL DOMESTIC HOT AND COLD WATER PIPE WORK EXCEEDING 50MM TO BE STAINLESS STEEL. ALL PIPEWORK UNDER 50MM SHALL BE COPPER SERVING ALL WATER OUTLETS THROUGHOUT THE BUILDING.

ALL PIPEWORK TO BE IDENTIFIED IN ACCORDANCE WITH BS1710.

ALL PIPEWORK TO BE INSULATED IN ACCORDANCE WITH BS5442:2001 AND MECHANICAL SPECIFICATION. ALL INSULATION TO BE CLASS 0 MECHANICAL, WHERE PIPE WORK PASSES THROUGH A FIRE COMPARTMENT IT SHALL BE LINED WITH THE FIRE INSULATION SCHEMATIC.

VALVE ACCESS TO BE INSTALLED THROUGHOUT PLANT AREAS (RISER), COMMENCING AT 800MM ABOVE FINISHED FLOOR LEVEL.

ALL PIPEWORK DROPS TO BE CONCEALED WITHIN WALL CHASES, STUD PARTITIONS OR P.B.

ALL PIPEWORK ABOVE 40MM THAT PASSES THROUGH WALL / FLOOR SHALL HAVE A FIRE COLLAR INSTALLED. REFER TO DETAIL.

ALL PIPEWORK 42MM AND BELOW THAT PASSES THROUGH WALL / FLOOR SHALL BE SLEEVED & SEALED.

ALL CHASES PROVIDED TO BE BRACKETED IN LINE WITH BS 5970:2012 TO ENSURE THERMAL TRANSFER IS AVOIDED.

EXPANSION BELLOWS TO BE INSTALLED ON ANCHOR AND GUIDE POINTS IN LINE WITH MANUFACTURERS GUIDELINES.

ALL STANDARD WHS AND SHOWERS TO BE TMV2 RATED.

ALL DDA WHS AND SHOWERS TO BE TMV3 RATED.

HEATING TAG NOTES:

1. UNDERFLOOR HEATING ZONE 1 - LIVING ROOM
2. UNDERFLOOR HEATING ZONE 2 - KITCHEN
3. UNDERFLOOR HEATING ZONE 3 - BEDROOM
4. UNDERFLOOR HEATING ZONE 4 - BEDROOM 2
5. UNDERFLOOR HEATING ZONE 5 - BATHROOM
6. UNDERFLOOR HEATING ZONE 6 - CIRCULATING
7. CONSTANT TEMPERATURE 22° LTHW F&R PIPEWORK ENTRES THE APARTMENT AT HIGH LEVEL, OFFSETTING WITHIN CEILING VOID TO UTILITY CUPBOARD.
8. HEAT INTERFACE UNIT, REFER TO MECHANICAL SPECIFICATION FOR DETAILS.
9. LTHW F&R PIPEWORK DROP TO U/L TO SERVE LO1 UNDERFLOOR HEATING MANIFOLD. SIZE TO BE CONFIRMED BY UNDERFLOOR HEATING SPECIALIST.
10. PROGRAMMABLE ROOM THERMOSTAT. EXACT LOCATION TO BE AGREED WITH ARCHITECT/INTERIOR DESIGNER.
11. ELECTRIC TOWEL RAIL TO BE PROVIDED WITHIN BATHROOMS.
12. UNDERFLOOR HEATING ZONE 7 - BEDROOM 3
13. UNDERFLOOR HEATING ZONE 8 - BEDROOM 4
14. LTHW F&R PIPEWORK TO RISE F.A. TO SERVE LO1 UNDERFLOOR HEATING MANIFOLD. SIZE TO BE CONFIRMED BY UNDERFLOOR HEATING SPECIALIST.

Heating General Notes:

LTHW FINAL CONNECTIONS WITHIN APARTMENTS TO BE COPPER TO BS EN 1057 R250.

ALL HIGH POINTS TO HAVE MANUAL AND AUTOMATIC AIR VENT FITTED.

ALL LOW POINTS TO HAVE DRAIN COCK FITTED.

ALL PIPEWORK IN PLANT AREAS, CAR PARKS, EXPOSED AND SEMI-EXPOSED AREAS TO BE CLADDED IN ALUMINIUM AND INSULATED WITH CLASS '0' INSULATION, THICKNESS TO CONFORM TO BS 5422.

ALL PIPEWORK IN CAR PARK, EXPOSED OR SEMI-EXPOSED AREAS TO BE ELECTRICALLY HEAT TRACED FOR ITS ENTIRE LENGTH.

ALL PIPEWORK LESS THAN 800 PENETRATING FIRE COMPARTMENTS/WALLS SHALL BE SLEEVED AND SEALED WITH INTUMESCENT MASTIC.

ALL PIPEWORK 800 AND GREATER PENETRATING FIRE COMPARTMENTS/WALLS SHALL BE SLEEVED WITH AN INTUMESCENT COLLAR.

ALL PIPEWORK BRANCHES SHALL HAVE ISOLATING VALVES FITTED.

VALVE JACKETS TO BE PROVIDED WITHIN PLANTROOMS/RISERS AND PRIMARY SIDE OF APARTMENT HIU.

ENSURE ALL PIPEWORK IS PRESSURE TESTED AND WITNESSED BEFORE IT IS CONCEALED.

ADEQUATE ACCESS SHALL BE PROVIDED THROUGHOUT FOR CLEANING AND TESTING THE LTHW SERVICES AND PIPEWORK.

MECHANICAL CONTRACTOR SHALL INCLUDE FOR EXTENSION PIECES TO ALL TEST POINTS TO CLEAR INSULATION AND CLADDING.

ALL PUMPS SHALL BE MOUNTED WITH FLEXIBLE CONNECTIONS TO PIPEWORK AND ON VIBRATION ISOLATORS TO SUPPORTS.

ALL PIPEWORK, FITTINGS AND EQUIPMENT SHALL BE CLEARLY LABELLED.

LOCATION OF EXPANSION BELLOWS AND ASSOCIATED ANCHOR POINTS TO BE AGREED WITH SUPPLIERS AND MECHANICAL CONTRACTORS.

EXPANSION BELLOWS TO BE INSTALLED ON ALL PIPEWORK CROSSING BUILDING EXPANSION JOINTS AND ON RUNS GREATER THAN 25 METERS IN LENGTH. ANY PROVISIONS SHOWN FOR EXPANSION, ANCHORS AND GUIDES ON THESE DRAWINGS ARE FOR GUIDANCE ONLY. THE MECHANICAL CONTRACTOR IS TO CONFIRM REQUIREMENTS AND ADVISE ON ANY STRUCTURAL IMPLICATIONS.

THIS CONTRACT SHALL INCLUDE FOR THE SUPPLY AND INSTALLATION OF ALL NECESSARY STEELWORK, BRACKETING ETC. TO SUPPORT ALL CONDUNIT, TRUNNING, TRAY AND SWITCHGEAR LOCATED WITHIN BEDROOM RISER SHAFTS AND ALL MAIN SERVICE SHAFTS. ALL SERVICES SHALL BE FULLY AND INDEPENDENTLY SUPPORTED BY MEANS OF A SELF-SUPPORTING UNISTRUT FRAMING. UNISTRUT FRAMING SHALL BE SECURED AT THE TOP AND BOTTOM OF THE ONE OFF FLOOR AND SHALL NOT BE FIRED TO THE RISER WALLS. 3D COORDINATED SETTING OUT DRAWINGS SHOWING ALL RELEVANT EQUIPMENT SHALL BE PROVIDED UNDER THIS CONTRACT.

General Notes:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND INTERIOR DESIGN DRAWINGS.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT MEP SCHEMATICS AND SPECIFICATIONS.
3. DO NOT SCALE. VERIFY ALL DIMENSIONS BY SITE MEASUREMENT.
4. THE MECHANICAL CONTRACTOR MUST ENSURE THE CONTRACTOR AND INSTALLATION TEAM MAKE THE NECESSARY ALLOWANCES FOR DIVERGENCES, OFFSETS AND VERTICAL ALIGNMENT NOT DEPICTED IN THE 2D DRAWING FORMAT WHICH ARE PARTICULAR TO THE BUILDING LAYOUT AND LIMITATIONS. THE CONTRACTOR SHALL USE THE INFORMATION CONTAINED WITHIN THE DETAILED DESIGN PACKAGE AND TENDER REVIT MODEL TO PRODUCE 3D COORDINATED INSTALLATION DRAWINGS. FOR COMMENT, PRIOR TO INSTALLATIONS COMMENCING ON SITE.

Ventilation Tag Notes:

1. 204X60 EXTRACT DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE BATHROOM.
2. 204X60 EXTRACT DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE KITCHEN/LIVING AREA.
3. 204X60 EXTRACT DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE UTILITY ROOM.
4. 220X90 SUPPLY DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE KITCHEN/LIVING AREA.
5. 220X90 SUPPLY DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE BEDROOM.
6. 220X90 EXHAUST ATMOSPHERE DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO AN EXTERNAL AIR BRICK/COLVRE.
7. 220X90 FRESH AIR ATMOSPHERE DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO AN EXTERNAL AIR BRICK/COLVRE. FINAL AIR BRICK LOCATIONS TO BE COORDINATED WITH ARCHITECT ELEVATIONS.
8. IN-LINE SOUND ABSORPTION ATTENUATION.
9. MVHR UNIT LOCATION C/W ACOUSTIC ENCLOSURE AND TOP BOX ATTENUATION AND COOLING MODULE. HANDING TO BE CHECKED WITH CONSULTANT PRIOR TO ORDER.
10. NUAIRE MVHR MRXBOX ECOS ANTI VIBRATION MOUNT TO BE INSTALLED.
11. SUPPLY & EXTRACT DUCTWORK RISE T.A.
12. KITCHEN RE-CIRCULATING EXTRACTOR FAN
13. FAN BOOST SWITCH ADJACENT TO HOB
14. FRESH AIR AND EXHAUST DUCTWORK TO BE FULLY INSULATED.
15. PURGE VENTILATION TO BE ACHIEVED VIA OPENABLE WINDOWS.
16. SUPPLY & EXTRACT DUCTWORK DROPS T.B.

Ventilation General Notes:

READ IN CONJUNCTION WITH ALL RELEVANT SCHEMATICS, SCHEDULES, DETAILS & SPECIFICATIONS.

REFER TO PLANT SCHEDULE FOR FURTHER DETAILS.

REFER TO ATTENUATOR SCHEDULE FOR FURTHER DETAILS.

REFER TO LOUVRE SCHEDULE FOR FURTHER DETAILS.

DUCTWORK ROUTES TO BE FULLY CO-ORDINATED WITH OTHER SERVICES.

ACCESS TO BE PROVIDED TO ALL FIRE DAMPERS (BOTH STANDARD AND MOTORIZED) AND VOLUME CONTROL DAMPERS. CONTRACTOR TO PROVIDE ACCESS POINTS IN DUCTWORK TO ACCESS DAMPERS.

GRILLE LOCATIONS TO BE CO-ORDINATED WITH INTERIOR DESIGNERS COORDINATED REFLECTED CEILING PLAN.

ALL GRILLES TO BE COMPLETE WITH PLENUM BOX AND SPIGOT CONNECTION, OPPOSED BLADE DAMPER AND CONCEALED FININGS. MECHANICAL CONTRACTOR TO CONFIRM SIZE OF PLENUMS.

GRILLES TO BE FINISHED IN A RAL COLOUR TO BE SPECIFIED BY ARCHITECT/INTERIOR DESIGNER PRIOR TO ORDERING.

ALL GRILLES SHALL BE SIZED TO PROVIDE MAXIMUM NOISE LEVEL OF NR25 OR AS DETAILED IN THE ACOUSTIC REPORT.

ALL GRILLES AS MANUFACTURED BY TROX, GILBERT OR OTHER EQUAL AND APPROVED.

ALL LOUVRES ARE TO BE ACOUSTIC LOUVRES AND CLASS A RATED.

ALL FIRE RATED DUCTWORK SHALL BE AS THOR DUCT 2 HOUR FIRE RATED DUCTWORK. TESTED TO BS EN 1366-1, BS EN 13501-3 CLASSIFICATION. FIRE RESISTANT DUCT SYSTEMS MUST BE APPROVED TO BS EN 12201-7 SMOKE CONTROL DUCTING BS EN 15871. FIRE RESISTANT DUCTING MUST HAVE A CE MARKING LABEL ATTACHED TO EACH DUCT SECTION.

ALL FIRE RATED DUCTWORK TO BE THERMALLY INSULATED TO MINIMIZE HEAT RADIATION AND TRANSFER.

ALL DUCTWORK TERMINATING WITH A BELL MOUTH TO BE FITTED WITH A MESH GRILLE.

LEGEND:

SUPPLY DUCTWORK

EXTRACT DUCTWORK

EXHAUST DUCTWORK

INTAKE AIR DUCTWORK

ATTENUATOR

GRILL

BCWS- BOOSTED COLD WATER SUPPLY PIPE

HWS- DOMESTIC HOT WATER FLOW PIPE

SVP- SOIL AND WASTE WATER PIPE

LTHW FLOW

LTHW RETURN

UNDERFLOOR HEATING

THERMOSTAT

TOWEL RAIL

PO1 30/01/26 PRELIMINARY ISSUE KD | AS

REV DATE DESCRIPTION DR | CK

ARCHITECT A&S ARCHITECTS

PROJECT- 426 BROADWATER FARM ESTATE TANGMERE

PROJECT STATUS S3 - SUITABLE FOR REVIEW & COMMENT

DRAWING MECHANICAL SERVICES INSTALLATION

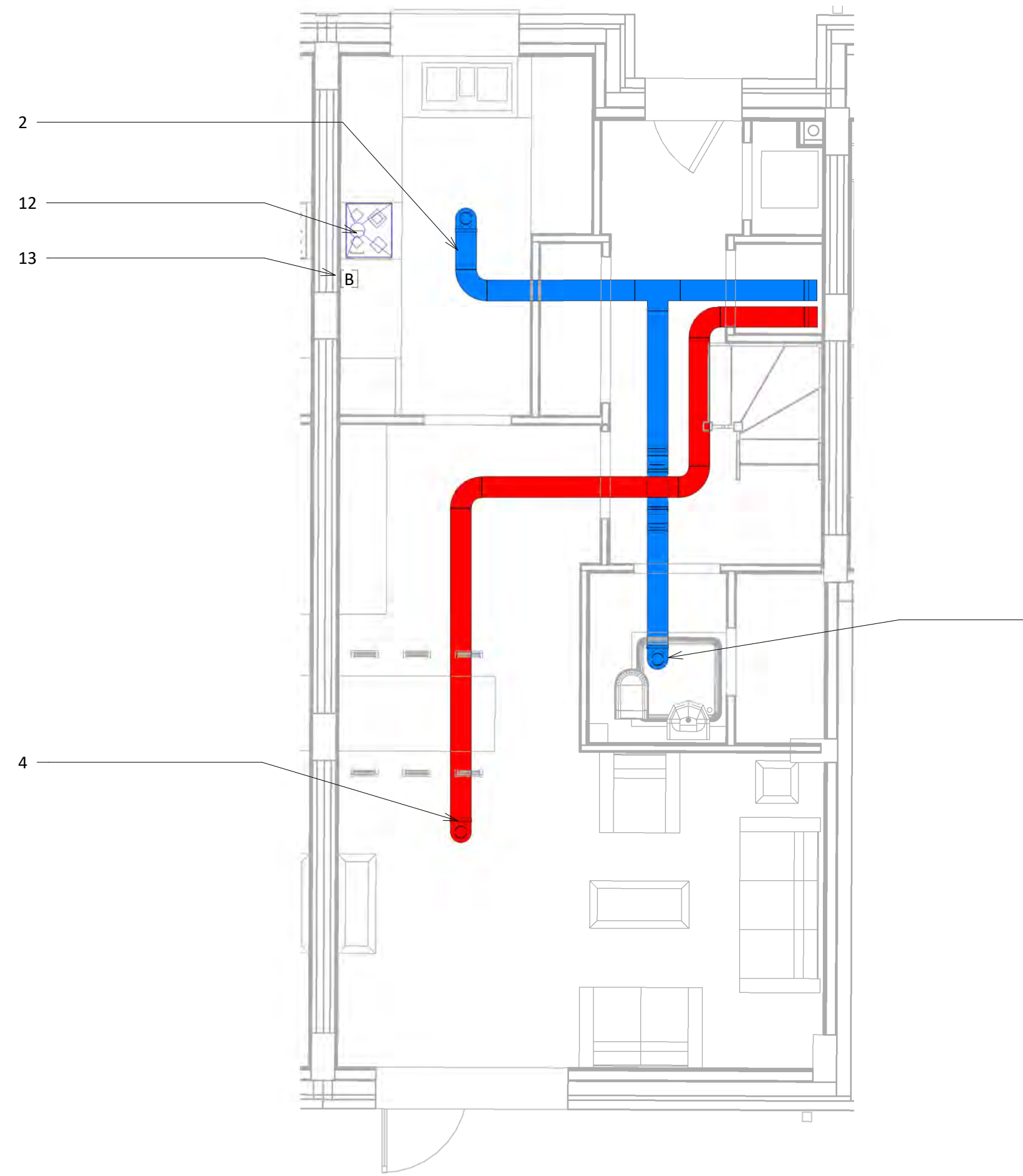
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SCALE 1 : 50@A0 DATE JAN 26 DESIGNED TT CHECKED AS

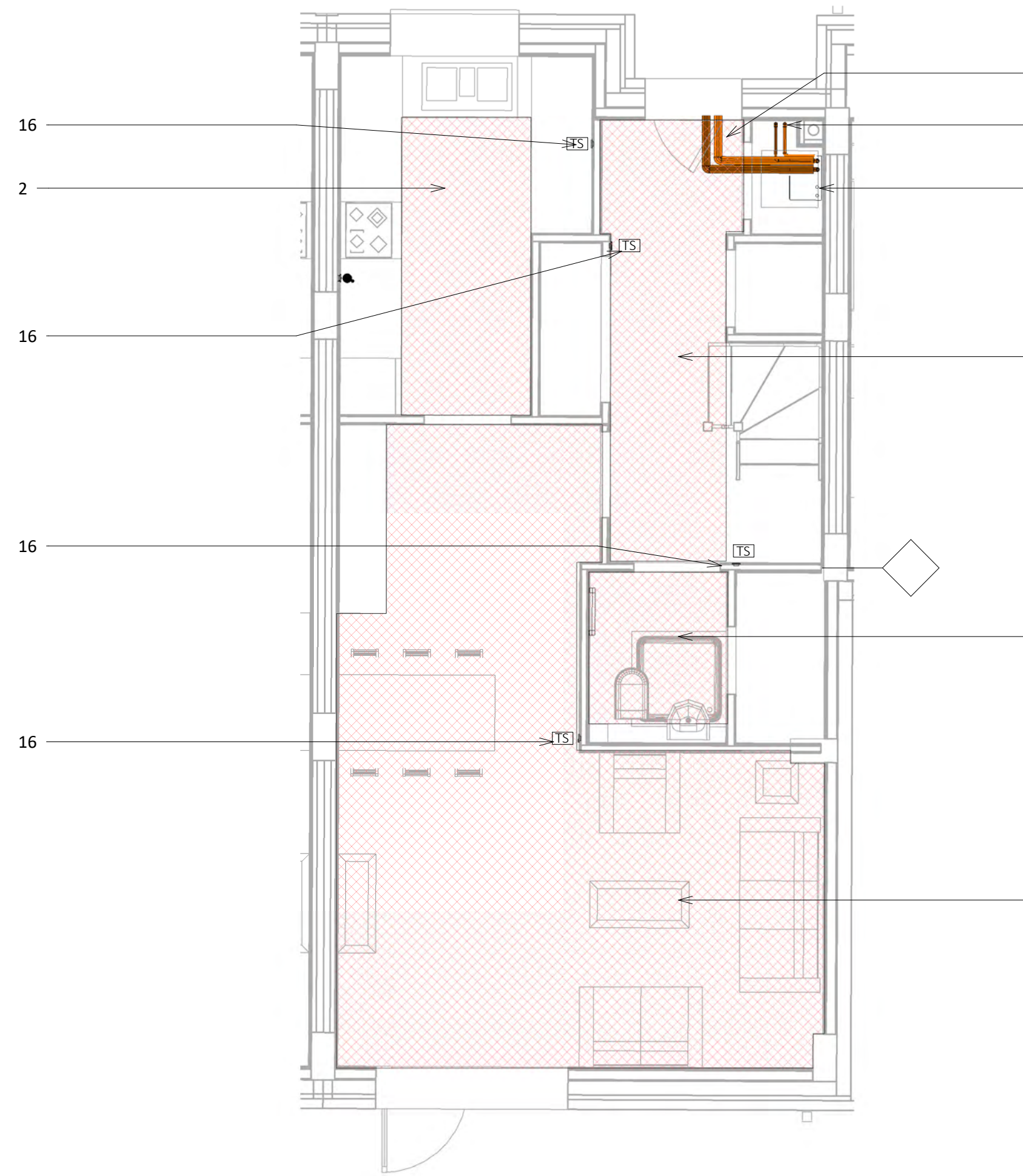
DRAWING No. TAN - CCE - ZZ - XX - DR - ME - 5404 REV PO1

UNIT 6 FORTSENVILLE BUSINESS PARK, NEWTOWNBRED, BELFAST, BT6 6AW TEL:028 9069 9720 EMAIL: ADMIN@CALDWELLCONSULTING.NET

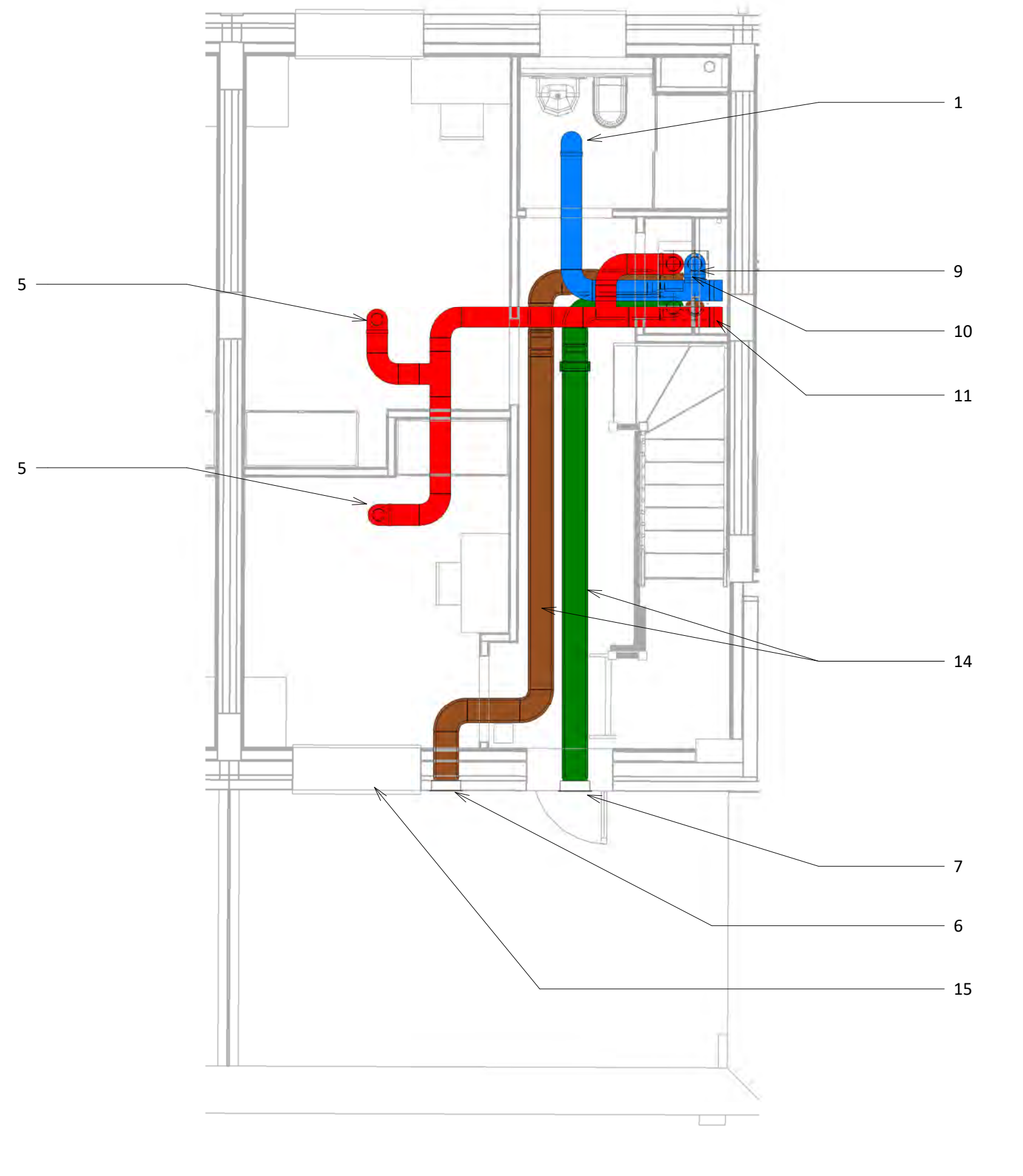
INCLUDE ALL NECESSARY OFFSETS OF SERVICES IN CEILING VOIDS, SERVICE DUCTS AND ALL OTHER AREAS TO ACHIEVE CROSSOVERS AND CO-ORDINATION OF MECHANICAL AND ELECTRICAL SERVICES



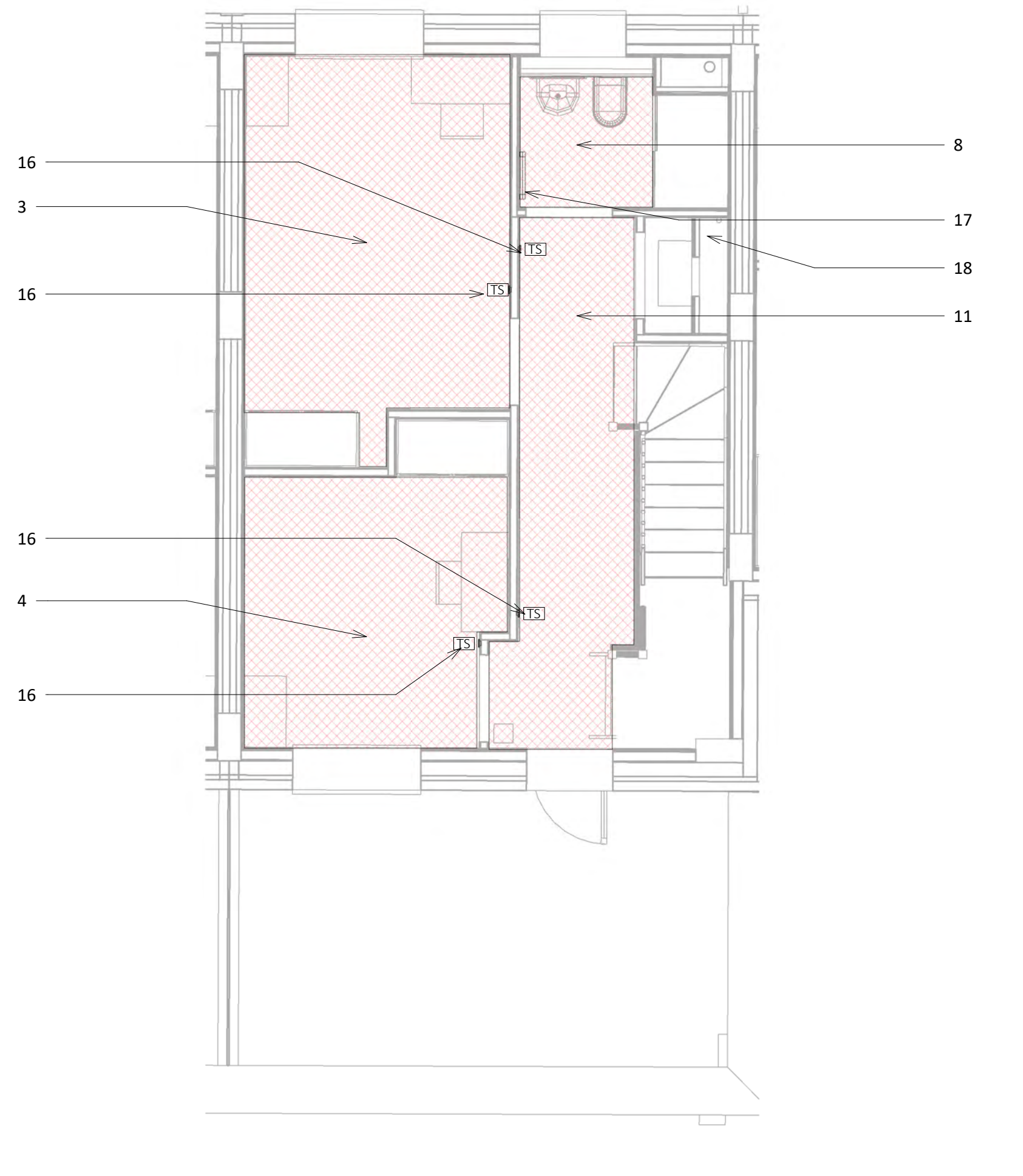
1 Flat Type 4B6P-TH-GF - Ventilation
1 : 50



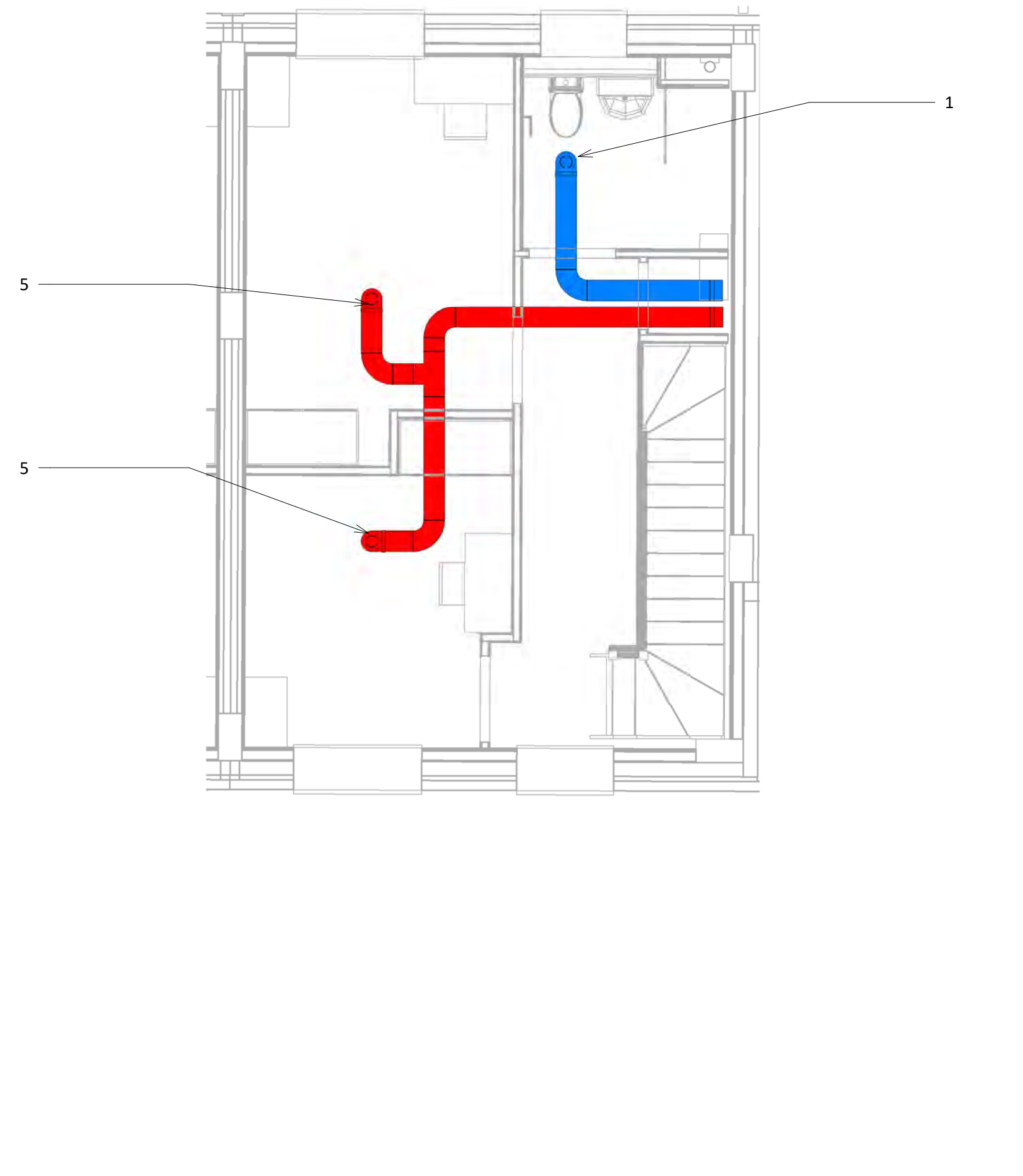
2 Flat Type 4B6P-TH-GF - Heating
1 : 50



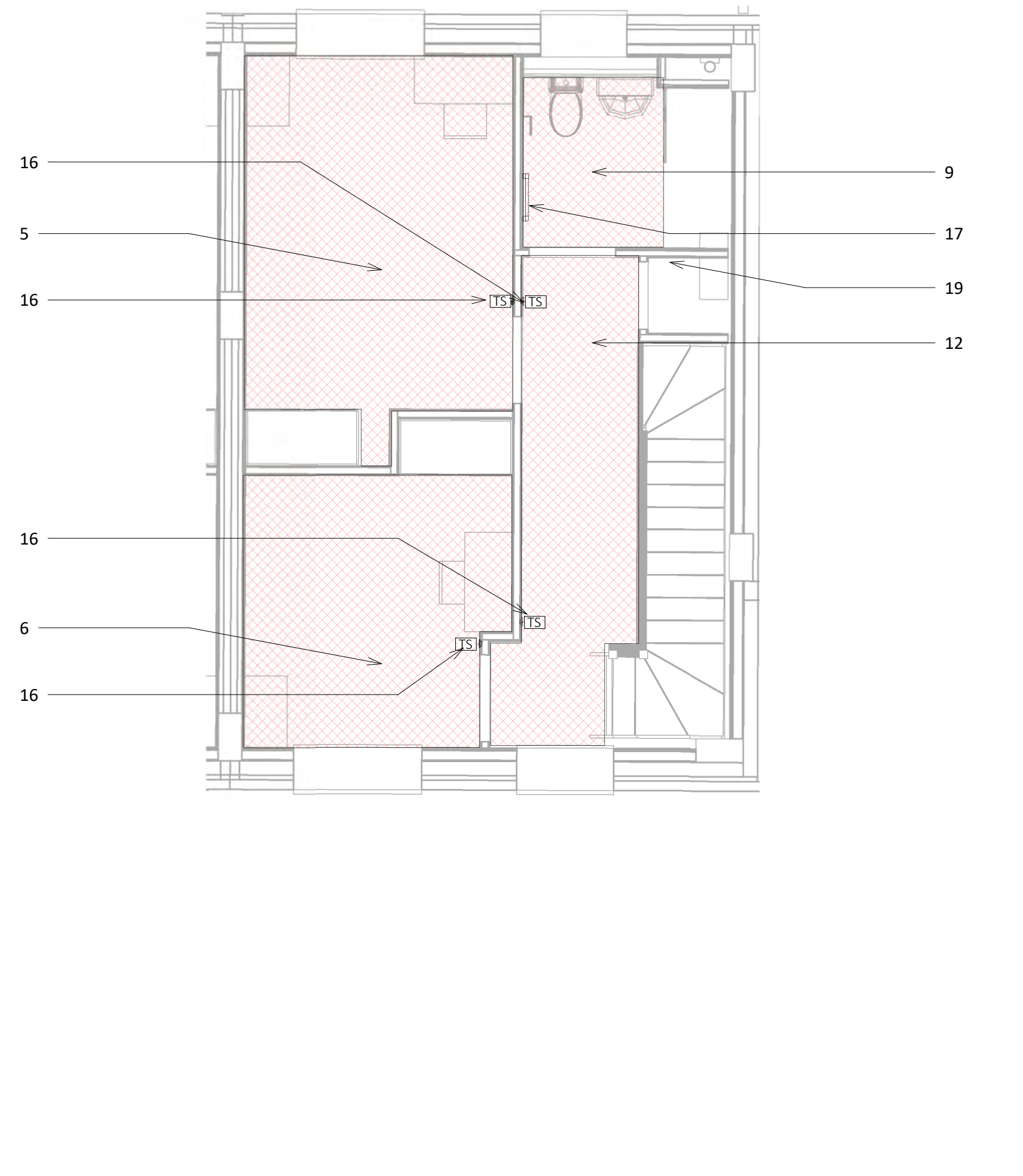
5 Flat Type 4B6P-TH-01 - Ventilation
1 : 50



6 Flat Type 4B6P-TH-01 - Heating
1 : 50



3 Flat Type 4B6P-TH-02 - Ventilation
1 : 50



4 Flat Type 4B6P-TH-02 - Heating
1 : 50

HEATING TAG NOTES:

1. UNDERFLOOR HEATING ZONE 1 - LIVING ROOM
2. UNDERFLOOR HEATING ZONE 2 - KITCHEN
3. UNDERFLOOR HEATING ZONE 3 - BEDROOM 1
4. UNDERFLOOR HEATING ZONE 4 - BEDROOM 2
5. UNDERFLOOR HEATING ZONE 5 - BEDROOM 3
6. UNDERFLOOR HEATING ZONE 6 - BEDROOM 4
7. UNDERFLOOR HEATING ZONE 7 - WC
8. UNDERFLOOR HEATING ZONE 8 - BATHROOM L01
9. UNDERFLOOR HEATING ZONE 9 - BATHROOM L02
10. UNDERFLOOR HEATING ZONE 10 - GF CIRCULATION
11. UNDERFLOOR HEATING ZONE 10 - L01 CIRCULATION
12. UNDERFLOOR HEATING ZONE 10 - L02 CIRCULATION
13. CONSTANT TEMPERATURE 2/20 LTHW F&R PIPEWORK ENTERS THE APARTMENT AT HIGH LEVEL, OFFSETTING WITHIN CEILING VOID TO UTILITY CUPBOARD.
14. HEAT INTERFACE UNIT, REFER TO MECHANICAL SPECIFICATION FOR DETAILS.
15. LTHW F&R PIPEWORK DROP TO L/L TO SERVE UNDERFLOOR HEATING MANIFOLD. SIZE TO BE CONFIRMED BY UNDERFLOOR HEATING SPECIALIST.
16. PROGRAMMABLE ROOM THERMOSTAT, EXACT LOCATION TO BE AGREED WITH ARCHITECT/INTERIOR DESIGNER.
17. ELECTRIC TOWEL RAIL TO BE PROVIDED WITHIN BATHROOMS
18. LTHW F&R PIPEWORK TO RISE F.B. TO SERVE L01 UNDERFLOOR HEATING MANIFOLD. SIZE TO BE CONFIRMED BY UNDERFLOOR HEATING SPECIALIST
19. LTHW F&R PIPEWORK TO RISE F.B. TO SERVE L02 UNDERFLOOR HEATING MANIFOLD. SIZE TO BE CONFIRMED BY UNDERFLOOR HEATING SPECIALIST

HEATING GENERAL NOTES:

LTHW FINAL CONNECTIONS WITHIN APARTMENTS TO BE COPPER TO BS EN 12579/20.

ALL HIGH POINTS TO HAVE MANUAL AND AUTOMATIC AIR VENT FITTED.

ALL LOW POINTS TO HAVE DRAIN COCK FITTED.

ALL PIPEWORK IN PLANT AREAS, CAR PARKS, EXPOSED AND SEMI-EXPOSED AREAS TO BE CLADDED IN ALUMINIUM AND INSULATED WITH CLASS 'D' INSULATION, THICKNESS TO CONFORM TO BS 5422.

ALL PIPEWORK IN CAR PARK, EXPOSED OR SEMI-EXPOSED AREAS TO BE ELECTRICALLY HEAT TRACED FOR ITS ENTIRE LENGTH.

ALL PIPEWORK LESS THAN Ø50 PENETRATING FIRE COMPARTMENTS/WALLS SHALL BE SLEEVED AND SEALED WITH INTUMESCENT MASTIC.

ALL PIPEWORK Ø50 AND GREATER PENETRATING FIRE COMPARTMENTS/WALLS SHALL BE SLEEVED WITH AN INTUMESCENT COLLAR.

ALL PIPEWORK BRANCHES SHALL HAVE ISOLATING VALVES FITTED.

VALVE JACKETS TO BE PROVIDED WITHIN PLANTROOMS/RISERS AND PRIMARY SIDE OF APARTMENT HIU.

ENSURE ALL PIPEWORK IS PRESSURE TESTED AND WITNESSED BEFORE IT IS CONCEALED.

ADEQUATE ACCESS SHALL BE PROVIDED THROUGHOUT FOR CLEANING AND TESTING THE LTHW SERVICES AND PIPEWORK.

MECHANICAL CONTRACTOR SHALL INCLUDE FOR EXTENSION PIECES TO ALL TEST POINTS TO CLEAR INSULATION AND CLADDING.

ALL PUMPS SHALL BE MOUNTED WITH FLEXIBLE CONNECTIONS TO PIPEWORK AND ON VIBRATION ISOLATORS TO SUPPORTS.

ALL PIPEWORK, FITTINGS AND EQUIPMENT SHALL BE CLEARLY LABELLED.

LOCATION OF EXPANSION BELLOWS AND ASSOCIATED ANCHOR POINTS TO BE AGREED WITH SUPPLIERS AND MECHANICAL CONTRACTORS.

EXPANSION BELLOWS TO BE INSTALLED ON ALL PIPEWORK CROSSING BUILDING EXPANSION JOINTS AND ON RUNS GREATER THAN 25 METERS IN LENGTH. ANY PROVISIONS SHOWN FOR EXPANSION, ANCHORS AND GUIDES ON THESE DRAWINGS ARE FOR GUIDANCE ONLY. THE MECHANICAL CONTRACTOR IS TO CONFIRM REQUIREMENTS AND ADVISE ON ANY STRUCTURAL IMPLICATIONS.

THIS CONTRACT SHALL INCLUDE FOR THE SUPPLY AND INSTALLATION OF ALL NECESSARY STEELWORK, BRACKETING ETC. TO SUPPORT ALL CONDUIT, TRUNKING, TRAY AND SWITCHGEAR LOCATED WITHIN BEDROOM RISER SHAFTS AND ALL MAIN SERVICE SHAFTS. ALL SERVICES SHALL BE FULLY AND INDEPENDENTLY SUPPORTED BY MEANS OF A SELF-SUPPORTING UNISTRUT FRAMING. UNISTRUT FRAMING SHALL BE SECURED AT THE TOP AND BOTTOM OF THE ONE FLOOR AND SHALL NOT BE FIRED TO THE RISER WALLS. TO COORDINATE SETTING OUT DRAWINGS SHOWING ALL RELEVANT EQUIPMENT SHALL BE PROVIDED UNDER THIS CONTRACT.

GENERAL NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND INTERIOR DESIGN DRAWINGS.
 2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT MEP SCHEMATICS AND SPECIFICATIONS.
 3. DO NOT SCALE. VERIFY ALL DIMENSIONS BY SITE MEASURE.
 4. THE MECHANICAL CONTRACTOR MUST ENSURE THE CONTRACTOR AND INSTALLATION TEAM MAKE THE NECESSARY ALLOWANCES FOR DIVERGENCES, OFFSETS AND VERTICAL ALIGNMENT NOT DEPICTED IN THE 2D DRAWING FORMAT WHICH ARE PARTICULAR TO THE BUILDING LAYOUT AND LIMITATIONS. THE CONTRACTOR SHALL USE THE INFORMATION CONTAINED WITHIN THE DETAILED DESIGN PACKAGE AND TENDER REVIT MODEL TO PRODUCE 3D COORDINATED INSTALLATION DRAWINGS, FOR COMMENT, PRIOR TO INSTALLATIONS COMMENCING ON SITE.
- #### VENTILATION TAG NOTES:
1. 204X60 EXTRACT DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE BATHROOM.
 2. 204X60 EXTRACT DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE KITCHEN/LIVING AREA.
 3. 204X60 EXTRACT DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE UTILITY ROOM.
 4. 220X90 SUPPLY DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE KITCHEN/LIVING AREA.
 5. 220X90 SUPPLY DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO GRILLE SERVING THE BEDROOM.
 6. 220X90 EXHAUST ATMOSPHERE DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO AN EXTERNAL AIR BRICK/LOUVRE.
 7. 220X90 FRESH AIR ATMOSPHERE DUCT OFFSETS WITHIN CEILING VOID BEFORE CONNECTING TO AN EXTERNAL AIR BRICK/LOUVRE. FINAL AIR BRICK LOCATIONS TO BE COORDINATED WITH ARCHITECT ELEVATIONS.
 8. IN-LINE SOUND ABSORPTION ATTENUATION.
 9. MVHR UNIT LOCATION C/W ACOUSTIC ENCLOSURE AND TOP BOX ATTENUATION AND COOLING MODULE. HANDING TO BE CHECKED WITH CONSULTANT PRIOR TO ORDER.
 10. NUIAIRE MVHR MRXBOX ECOS ANTI VIBRATION MOUNT TO BE INSTALLED.
 11. SUPPLY & EXTRACT DUCTWORK RISE T.A.
 12. KITCHEN RE-CIRCULATING EXTRACTOR FAN
 13. FAN BOOST SWITCH ADJACENT TO HOB
 14. FRESH AIR AND EXHAUST DUCTWORK TO BE FULLY INSULATED.
 15. PURGE VENTILATION TO BE ACHIEVED VIA OPENABLE WINDOWS.
 16. SUPPLY & EXTRACT DUCTWORK DROPS T.B.

VENTILATION GENERAL NOTES:

READ IN CONJUNCTION WITH ALL RELEVANT SCHEMATICS, SCHEDULES, DETAILS & SPECIFICATIONS.

REFER TO PLANT SCHEDULE FOR FURTHER DETAILS.

REFER TO ATTENUATOR SCHEDULE FOR FURTHER DETAILS.

REFER TO LOUVRE SCHEDULE FOR FURTHER DETAILS.

DUCTWORK ROUTES TO BE FULLY CO-ORDINATED WITH OTHER SERVICES.

ACCESS TO BE PROVIDED TO ALL FIRE DAMPERS (BOTH STANDARD AND MOTORISED) AND VOLUME CONTROL DAMPERS. CONTRACTOR TO PROVIDE ACCESS POINTS IN DUCTWORK TO ASSESS DAMPERS.

GRILLE LOCATIONS TO BE CO-ORDINATED WITH INTERIOR DESIGNERS COORDINATED REFLECTED CEILING PLAN.

ALL GRILLES TO BE COMPLETE WITH PLENUM BOX AND SPIGOT CONNECTION, OPPOSED BLADE DAMPER AND CONCEALED FININGS. MECHANICAL CONTRACTOR TO CONFIRM SIZE OF PLenums.

GRILLES TO BE FINISHED IN A RAL COLOUR TO BE SPECIFIED BY ARCHITECT/INTERIOR DESIGNER PRIOR TO ORDERING.

ALL GRILLES SHALL BE SIZED TO PROVIDE MAXIMUM NOISE LEVEL OF N125 OR AS DETAILED IN THE ACOUSTIC REPORT.

ALL GRILLES AS MANUFACTURED BY TROX, GILBERT OR OTHER EQUAL AND APPROVED.

ALL LOUVRES ARE TO BE ACOUSTIC LOUVRES AND CLASS A RATED.

ALL FIRE RATED DUCT WORK SHALL BE AS THOR DUCT 2 HOUR FIRE RATED DUCT WORK. TESTED TO BS EN 366-1, BS EN 13501-3 CLASSIFICATION. FIRE RESISTANT DUCT SYSTEMS MUST BE APPROVED TO BS EN 122101-7 SMOKE CONTROL DUCTING BS EN 15871. FIRE RESISTANT DUCTING MUST HAVE A CE MARKING LABEL ATTACHED TO EACH DUCT SECTION.

ALL FIRE RATED DUCTWORK TO BE THERMALLY INSULATED TO MINIMIZE HEAT RADIATION AND TRANSFER.

ALL DUCTWORK TERMINATING WITH A BELL MOUTH TO BE FITTED WITH A MESH GRILLE.

- SUPPLY DUCTWORK
- EXTRACT DUCTWORK
- EXHAUST DUCTWORK
- INTAKE AIR DUCTWORK
- ATTENUATOR
- GRILL
- BCWS- BOOSTED COLD WATER SUPPLY PIPE
- HWS- DOMESTIC HOT WATER FLOW PIPE
- SVP- SOIL AND WASTE WATER PIPE
- LTHW FLOW
- LTHW RETURN
- UNDERFLOOR HEATING
- THERMOSTAT
- TOWEL RAIL

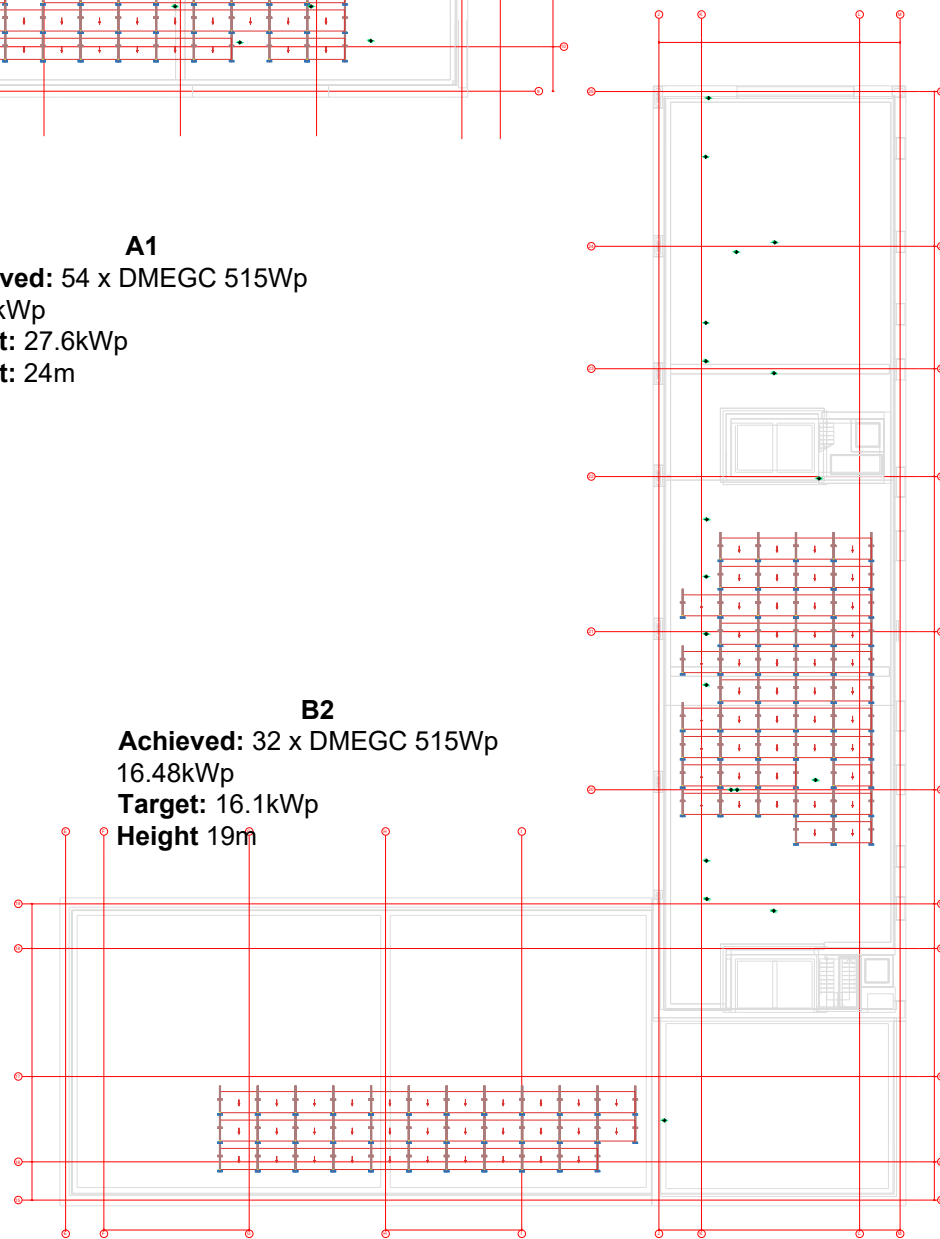
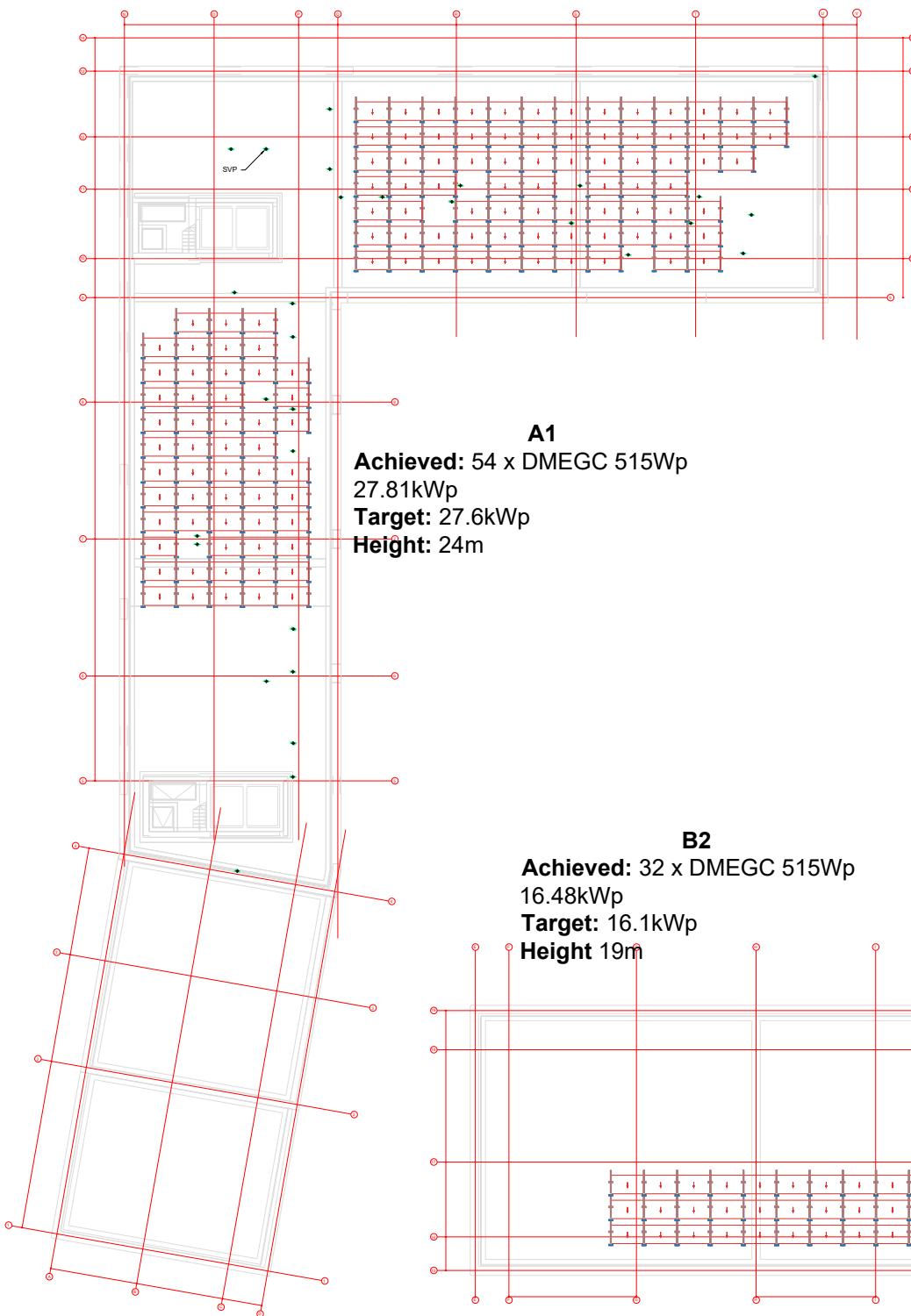
P01	30/01/26	PRELIMINARY ISSUE	KD	AS
REV	DATE	DESCRIPTION	DR	CK

Caldwell

ARCHITECT A&Q ARCHITECTS PROJECT-426 BROADWATER FARM ESTATE TANGMERE				
PROJECT STATUS S3 - SUITABLE FOR REVIEW & COMMENT DRAWING MECHANICAL SERVICES INSTALLATION TYPICAL HOUSE TYPE 4B6P-TH-02 VENTILATION AND HEATING				
SCALE 1 : 50@A0	DATE JAN 26	DESIGNED KD	CHECKED AS	
DRAWING No. TAN - CCE - ZZ - XX - DR - ME - 5407	REV P01			
UNIT 6 FORESTROVIE BUSINESS PARK, NEWTOWNBRED, BELFAST, BT6 6AW TEL:028 9069 9720 EMAIL: ADMIN@CALDWELL-CONSULTING.NET				

Appendix 7





PV Orientation (from South)	
24°	
Module	DMEGC 515Wp
Module Dims	1977×1134×30 mm
Module Wp	515 Wp
Module Qty	210
System Size	108.15 kWp
Target	See Notes
Inverter	Solis Various
Drawing Type	PV Layout
Scale	1:400
Date	26-Jan-26
Project Ref	1335 Tangmere
Revision	3
Site Address	Tangmere-Broadwater Farm, N17 6HF
Notes	
Block A1 – 27.6 kWp	
Block A2 – 39.35 kWp	
Block B1 – 23.9 kWp	
Block B2 – 16.1 kWp	
Designer	RB
E:	rob@arclinedesign.com
T:	07586 748904
W:	www.arclinedesign.com



INFINITY RT

N-type

Mono facial Module with Double Glass

DMxxxG12RT-G54HBB

510~530W

23.6%
Max. Efficiency

- **Leading manufacturing**
40+ years experience in high-tech manufacturing.
- **High environmental, social and governance responsibility (ESG)**
100% green production, transparent supply chain and excellent ESG rating in the solar industry.



Outstanding Aesthetics

Designed with aesthetics in mind and manufactured using DMEGC Advanced Black Technology.



Extended Stress Tests

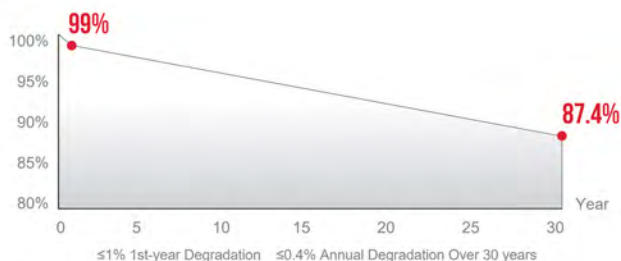
Protection against harsh environmental conditions
Certified by TÜV Rheinland.



Green Product

Focus on circular economy - low carbon footprint, PFAS-free and recyclable components.

POWER WARRANTY



COMPANY MANAGEMENT SYSTEM

SA 8000: ILO Standards, Social responsibility standards
ISO 9001: Quality management system
ISO 14001: Environmental management system
ISO 45001: Occupational health and safety management system
ISO 50001: Energy management system
ISO 27001: Information security management system

PRODUCT CERTIFICATION

IEC 61215, IEC 61730
Ammonia Corrosion (IEC 62716)
Salt Mist Corrosion (IEC 61701)
LeTID (IEC TS 63342)
Dust & Sand (IEC 60068)



Warranty partner

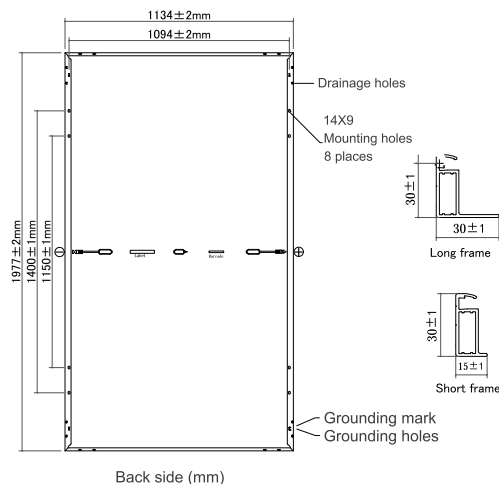
Munich RE

DMxxxG12RT-G54HBB



Module Specification

Cell Type	N type Mono-crystalline, 108(6×18)
Dimensions (mm)	1977×1134×30
Weight (kg)	27.1
Front Cover	2 mm heat strengthened glass, Anti-reflective coating
Rear Cover	2 mm heat strengthened glass
Junction Box	3 Diodes, IP68 according to IEC 62790
Output Cables (Including Connector)	4 mm ² /Portrait: 300 mm (+) /200 mm (-) Landscape: 1200 mm (+) /1200 mm (-) Length can be customized
Connector Type	PV-ZH202B or MC4-EVO 2A (1500V)



Electrical Specifications¹

Module Type	DM510G12RT-G54HBB		DM515G12RT-G54HBB		DM520G12RT-G54HBB		DM525G12RT-G54HBB		DM530G12RT-G54HBB	
Testing Condition	STC ²	NMOT ³	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power (P _{max} /W)	510	389	515	393	520	396	525	400	530	404
Maximum Power Current (I _{mp} /A)	14.84	12.06	14.88	12.09	14.92	12.12	14.96	12.16	15.00	12.19
Maximum Power Voltage (V _{mp} /V)	34.37	32.25	34.61	32.47	34.85	32.70	35.09	32.92	35.33	33.15
Short-circuit Current (I _{sc} /A)	15.78	12.72	15.83	12.76	15.88	12.80	15.93	12.84	15.98	12.88
Open-circuit Voltage (V _{oc} /V)	40.62	39.09	40.75	39.22	40.88	39.34	41.01	39.47	41.14	39.59
Module Efficiency STC (%)	22.7		22.9		23.2		23.4		23.6	

¹ Measurements according to IEC 60904-3, Measurement tolerance: I_{sc}: ±4%, V_{oc}: ±3%, Test uncertainty for P_{max}: ±3%, Bifaciality: 80%±5%

² STC (Standard Test Condition): Radiation 1000 W/m², Module temperature 25°C, AM = 1.5

³ NMOT: Radiation 800 W/m², Ambient temperature 20°C, AM = 1.5, Wind Speed 1 m/s



Operating Conditions

Operating Temperature (°C)	-40 to +85
Maximum System Voltage (V)	1500 DC(IEC)
Overcurrent Protection Rating (A)	25
Power Output Tolerance (%)	0~3
Protection Class	Class II
Max. Test Load, Push/Pull (Pa)	Front 5400 / Back 2400
Max. Design Load, Push/Pull (Pa)	Front 3600 / Back 1600



Packaging

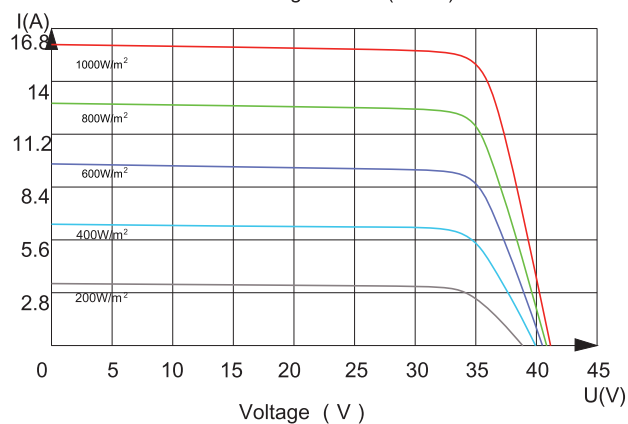
Container	40HQ
Pallet Dimensions (mm)	1985x1140x1250
Pieces per Pallet	36
Pieces per Container	864



Temperature Characteristics

Nominal Module Operating Temperature (NMOT)	42±2°C
Temperature Coefficient of P _{max} (%/°C)	-0.29
Temperature Coefficient of V _{oc} (%/°C)	-0.25
Temperature Coefficient of I _{sc} (%/°C)	+0.048

Current-Voltage Curve (530W)



Hengdian Group DMEGC Magnetics Co.,Ltd.

Add: Hengdian Industrial Zone, Dongyang City Zhejiang Province, China 322118

Tel: 0086-579-8658-8826 E-mail: solar@dmegc.com.cn Website: www.dmegcsolar.com

DMEGC Renewable Energy B.V.

Add: Industrieweg 2,2641 RM Pijnacker, The Netherlands.

Tel: +31 (0) 8 58200765 E-mail: contact@dmegc.eu

Statement: The installation instructions and the warranty conditions must be followed. Due to technological progress, product parameters will be adjusted accordingly. When signing the contract, the latest data of the company shall prevail. All information in this data sheet corresponds to EN 50380.Changes and errors excepted. Document: EN DS-G12RT-G54HBB Plus-20250711.

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Appendix 8





CLADE

ACER RANGE

**LOW NOISE CO2 HEAT PUMP
for HEATING AND HOT WATER**

APRIL 2025 //

April 2025 //



ACER RANGE //

The Acer, our flagship low-noise, natural refrigerant heat pump. Its modern design, whisper-quiet operation and low space take, making it the perfect heat source for retrofit or new build applications including schools, apartment complexes, and libraries.



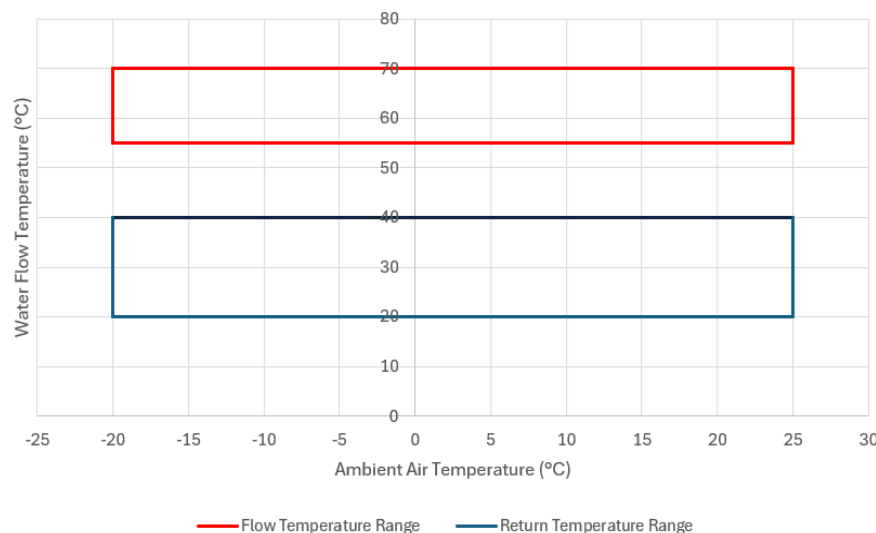
Model	-5°C capacity	+7°C capacity
Acer 65/50	50KW	65KW
Acer 95/75	75KW	95KW
Acer 130/100	100KW	130KW

- Future proof refrigerant which is non toxic and non flammable
- GWP =1
- ODP = 0
- Low and standard noise models
- Up to 70°C flow temperature
- Up to 40 °C return temperature
- Coated coil option
- Can be multiplexed using Clade Multi Controller
- Built in BMS interface
- Leak detection and vent fan included
- Inverter controlled
- Manufactured in the UK
- Full UK based technical support



CO₂ REFRIGERANT //

ACER REFRIGERANT OPERATING ENVELOPE



As a refrigerant CO₂ is excellent with unique thermodynamic properties which are fantastic for heat pumps.

CO₂ produces high temperatures efficiently whilst also being

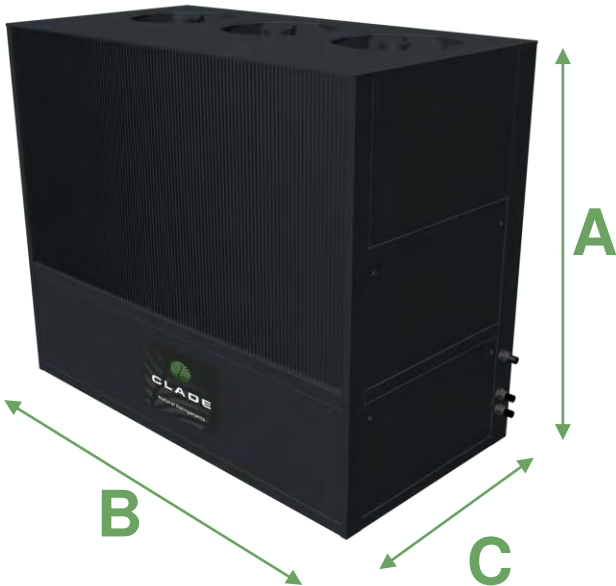
- Non flammable
- GWP of 1
- Non toxic & non PFAS
- High COP at high output temperatures

In order to delivery these benefits CO₂ requires a low return temperature from the heating system. This is a result of the unique thermodynamic properties of the refrigerant.

The heating system must be designed, installed and commissioned for a wide delta T. Design return temperatures should be 30°C which allows for operational variation up to 40°C whilst aiming for highest efficiency.



DIMENSIONAL INFORMATION //



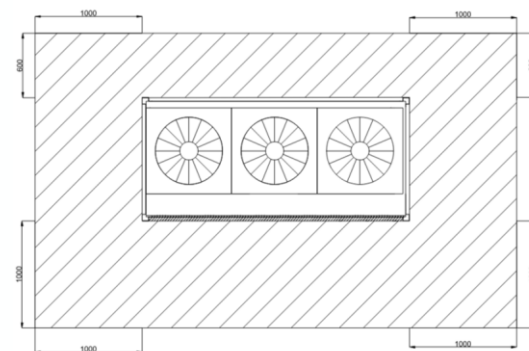
Unit	Height 'A' (mm)	Width 'B' (mm)	Depth 'C' (mm)	Operating Weight (kg)
Acer 65/50kW LN	2395	1959	1159	1008
Acer 65/50kW SN	1907	1959	1159	943
Acer 95/75kW LN	2395	2815	1156	1375
Acer 95/75kW SN	1907	2815	1156	1270
Acer 130/100kW LN	2396	2815	1451	1605
Acer 130/100kW SN	1907	2815	1450	1302



TECHNICAL DETAIL SUMMARY //

		ACER 65/50	ACER 95/75	ACER 130/100
REFRIGERATION SIDE				
Compressor Type	-	Reciprocating		
Compressor Qty	Pcs.	1		
Refrigerant	-	CO ₂	CO ₂	CO ₂
Refrigerant Circuits	Pcs	1		
Variable speed drive (VSD)	Pcs.	1	1	1
Refrigerant charge (CO ₂)	kg	5	7	10
No. evaporators	Pcs.	1		
Evaporators Type	-	Flat bed		
Fin Material	-	AL/MG		
Defrost Type	-	Hot Gas CO ₂		
Defrost medium	-	CO ₂		
Defrost design/condition	-	> +6c ambient Off Cycle / < +6c ambient Cool Gas		
Electrical supply	-	3~ 400V 50 HZ		
WATER SIDE				
Type of internal exchanger	-	Stainless steel plate heat exchanger		
Exchanger Water content	l	3.9	3.9	5
Connections waterside Flow/Return	DN	28mm Copper	35mm Copper	42mm Copper
Connections waterside Pressure Rating	PN	6		
Waterside Burst Disk (supplied by installer)	PN	6		
Control Methodology	-	Pump		
Water flow rates				
Nominal dT 40 K	l/s	0.37	0.55	0.73
Nominal dT 35 K	l/s	0.43	0.63	0.84
Nominal dT 30 K	l/s	0.42	0.73	0.98
Minimum Water Flow Rate	l/s	0.12	0.18	0.23
Minimum water volume in heating	l	303	443	606
Total internal water volume	l	4.3	6.3	8.4

		ACER 65/50	ACER 95/75	ACER 130/100
FANS SECTION				
Fans type	-	Axial fans		
N° fans	Pcs.	2	3	3
Standard air-flow	m³/h	17,640	26,280	31,320
Additional Static Pressure Available	Pa	0	0	0
Fan regulation	-	0-10V		
Fan Power Input	kW	1.4	2	2.7
ELECTRICAL DATA				
Total Absorbed Power (at 7°C ambient)	kW	25.3	32.3	51.1
Total Current per phase	A	46.1	69.2	93.2
Starting Method	-	Soft Start		
Starting Current (at -5°C ambient)	A	22	32.5	43.5
Total kVA	kVA	32	48	64.5
Electrical supply	-	3~ 400V 50 HZ		
Communication protocol	-	BACNET over IP (optional extra)		
IP-Class	-	IP54		
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

Low noise models

Clade use proprietary technology to reduce noise levels to market leading levels.

We have had our heat pumps tested and certified in real environments by industry recognised experts which means you can be 100% confident in meeting your planning requirements.

Data is given in accordance with BS EN ISO 4871: 2009 and Measured in Accordance with BS EN ISO 9614 - Part 1: 2009

Acer Range	Acer 65 / 50		Acer 95 / 75		Acer 130 / 100	
	Standard	Low Noise	Standard	Low Noise	Standard	Low Noise
Sound Power Level, $L_{W(A)}$ (dB)	82	72	83	74	85	76
Sound Pressure Level at 10m (dB)	50	44	51	45	53	46
Uncertainty (dB)	4	4	4	4	4	4



HEAT PUMP PERFORMANCE ACER 65/50 POWER MODE //

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
70/35	2.5	40.8	20.6	2	45.5	21.2	2.1	50.5	21.6	2.3	55.7	21.9	2.5	57.8	22	2.6	57.8	19.6	3	57.8	17.9	3.2
65/35	2.5	40.8	20.6	2	45.5	21.2	2.1	50.5	21.6	2.3	55.7	21.9	2.5	57.8	22	2.6	57.8	19.6	3	57.8	17.9	3.2
60/35	2.5	40.8	20.6	2	45.5	21.2	2.1	50.5	21.6	2.3	55.7	21.9	2.5	57.8	22	2.6	57.8	19.6	3	57.8	17.9	3.2
70/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	53.6	21.1	2.5	59.3	21.5	2.8	61.6	21.6	2.8	61.6	20.5	3	61.6	18.7	3.3
65/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	53.6	21.1	2.5	59.3	21.5	2.8	61.6	21.6	2.8	61.6	20.5	3	61.6	18.7	3.3
60/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	53.6	21.1	2.5	59.3	21.5	2.8	61.6	21.6	2.8	61.6	20.5	3	61.6	18.7	3.3
55/35	2.5	40.8	20.6	2	45.5	21.2	2.1	50.5	21.6	2.3	55.7	21.9	2.5	57.8	22	2.6	57.8	19.6	3	57.8	17.9	3.2
55/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	53.6	21.1	2.5	59.3	21.5	2.8	61.6	21.6	2.8	61.6	20.5	3	61.6	18.7	3.3
70/40	2.2	38.2	21.7	1.8	42.6	22.3	1.9	47.2	22.7	2.1	52.1	23	2.3	54.1	23.1	2.3	54.1	19.2	2.8	54.1	17.5	3.1
65/40	2.2	38.2	21.7	1.8	42.6	22.3	1.9	47.2	22.7	2.1	52.1	23	2.3	54.1	23.1	2.3	54.1	19.2	2.8	54.1	17.5	3.1
60/40	2.2	38.2	21.7	1.8	42.6	22.3	1.9	47.2	22.7	2.1	52.1	23	2.3	54.1	23.1	2.3	54.1	19.2	2.8	54.1	17.5	3.1



HEAT PUMP PERFORMANCE ACER 65/50 EFFICIENCY MODE //

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
70/35	2.6	40.8	20.6	2.0	45.5	21.2	2.1	45.5	18.4	2.5	45.5	16.8	2.7	45.5	16.2	2.8	45.5	15.3	3.0	45.5	13.9	3.3
65/35	2.6	40.8	20.6	2.0	45.5	21.2	2.1	45.5	18.4	2.5	45.5	16.8	2.7	45.5	16.2	2.8	45.5	15.3	3.0	45.5	13.9	3.3
60/35	2.6	40.8	20.6	2.0	45.5	21.2	2.1	45.5	18.4	2.5	45.5	16.8	2.7	45.5	16.2	2.8	45.5	15.3	3.0	45.5	13.9	3.3
70/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	48.2	18.9	2.6	48.2	17.2	2.8	48.2	16.6	2.9	48.2	15.7	3.1	48.2	14.2	3.4
65/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	48.2	18.9	2.6	48.2	17.2	2.8	48.2	16.6	2.9	48.2	15.7	3.1	48.2	14.2	3.4
60/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	48.2	18.9	2.6	48.2	17.2	2.8	48.2	16.6	2.9	48.2	15.7	3.1	48.2	14.2	3.4
55/35	2.6	40.8	20.6	2.0	45.5	21.2	2.1	45.5	18.4	2.5	45.5	16.8	2.7	45.5	16.2	2.8	45.5	15.3	3.0	45.5	13.9	3.3
55/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	48.2	18.9	2.6	48.2	17.2	2.8	48.2	16.6	2.9	48.2	15.7	3.1	48.2	14.2	3.4
70/40	2.4	38.2	21.7	1.8	42.6	22.3	1.9	42.6	18.0	2.4	42.6	16.5	2.6	42.6	15.9	2.7	42.6	15.1	2.8	42.6	13.7	3.1
65/40	2.4	38.2	21.7	1.8	42.6	22.3	1.9	42.6	18.0	2.4	42.6	16.5	2.6	42.6	15.9	2.7	42.6	15.1	2.8	42.6	13.7	3.1
60/40	2.4	38.2	21.7	1.8	42.6	22.3	1.9	42.6	18.0	2.4	42.6	16.5	2.6	42.6	15.9	2.7	42.6	15.1	2.8	42.6	13.7	3.1

HEAT PUMP PERFORMANCE ACER 95/75 POWER MODE //

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
70/35	2.4	61.1	30.9	2.0	68.1	31.8	2.1	75.6	32.6	2.3	83.4	33.1	2.5	86.7	33.2	2.6	86.7	29.7	2.9	86.7	27.2	3.2
65/35	2.4	61.1	30.9	2.0	68.1	31.8	2.1	75.6	32.6	2.3	83.4	33.1	2.5	86.7	33.2	2.6	86.7	29.7	2.9	86.7	27.2	3.2
60/35	2.4	61.1	30.9	2.0	68.1	31.8	2.1	75.6	32.6	2.3	83.4	33.1	2.5	86.7	33.2	2.6	86.7	29.7	2.9	86.7	27.2	3.2
70/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	80.5	31.9	2.5	88.8	32.4	2.7	92.2	32.6	2.8	92.2	31.0	3.0	92.2	28.4	3.2
65/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	80.5	31.9	2.5	88.8	32.4	2.7	92.2	32.6	2.8	92.2	31.0	3.0	92.2	28.4	3.2
60/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	80.5	31.9	2.5	88.8	32.4	2.7	92.2	32.6	2.8	92.2	31.0	3.0	92.2	28.4	3.2
55/35	2.4	61.1	30.9	2.0	68.1	31.8	2.1	75.6	32.6	2.3	83.4	33.1	2.5	86.7	33.2	2.6	86.7	29.7	2.9	86.7	27.2	3.2
55/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	80.5	31.9	2.5	88.8	32.4	2.7	92.2	32.6	2.8	92.2	31.0	3.0	92.2	28.4	3.2
70/40	2.2	57.2	32.4	1.8	63.7	33.4	1.9	70.8	34.2	2.1	78.1	34.8	2.2	81.1	34.9	2.3	81.1	29.2	2.8	81.1	26.7	3.0
65/40	2.2	57.2	32.4	1.8	63.7	33.4	1.9	70.8	34.2	2.1	78.1	34.8	2.2	81.1	34.9	2.3	81.1	29.2	2.8	81.1	26.7	3.0
60/40	2.2	57.2	32.4	1.8	63.7	33.4	1.9	70.8	34.2	2.1	78.1	34.8	2.2	81.1	34.9	2.3	81.1	29.2	2.8	81.1	26.7	3.0



HEAT PUMP PERFORMANCE ACER 95/75 EFFICIENCY MODE //

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
70/35	2.6	61.1	30.9	2.0	68.1	31.8	2.1	68.1	27.6	2.5	68.1	25.4	2.7	68.1	24.5	2.8	68.1	23.3	2.9	68.1	21.2	3.2
65/35	2.6	61.1	30.9	2.0	68.1	31.8	2.1	68.1	27.6	2.5	68.1	25.4	2.7	68.1	24.5	2.8	68.1	23.3	2.9	68.1	21.2	3.2
60/35	2.6	61.1	30.9	2.0	68.1	31.8	2.1	68.1	27.6	2.5	68.1	25.4	2.7	68.1	24.5	2.8	68.1	23.3	2.9	68.1	21.2	3.2
70/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	72.4	28.8	2.5	72.4	26.5	2.7	72.4	25.6	2.8	72.4	24.3	3.0	72.4	22.2	3.3
65/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	72.4	28.8	2.5	72.4	26.5	2.7	72.4	25.6	2.8	72.4	24.3	3.0	72.4	22.2	3.3
60/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	72.4	28.8	2.5	72.4	26.5	2.7	72.4	25.6	2.8	72.4	24.3	3.0	72.4	22.2	3.3
55/35	2.6	61.1	30.9	2.0	68.1	31.8	2.1	68.1	27.6	2.5	68.1	25.4	2.7	68.1	24.5	2.8	68.1	23.3	2.9	68.1	21.2	3.2
55/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	72.4	28.8	2.5	72.4	26.5	2.7	72.4	25.6	2.8	72.4	24.3	3.0	72.4	22.2	3.3
70/40	2.4	57.2	32.4	1.8	63.7	33.4	1.9	63.7	27.2	2.3	63.7	24.9	2.6	63.7	24.1	2.6	63.7	22.8	2.8	63.7	20.8	3.1
65/40	2.4	57.2	32.4	1.8	63.7	33.4	1.9	63.7	27.2	2.3	63.7	24.9	2.6	63.7	24.1	2.6	63.7	22.8	2.8	63.7	20.8	3.1
60/40	2.4	57.2	32.4	1.8	63.7	33.4	1.9	63.7	27.2	2.3	63.7	24.9	2.6	63.7	24.1	2.6	63.7	22.8	2.8	63.7	20.8	3.1



HEAT PUMP PERFORMANCE ACER 130/100 POWER MODE //

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
70/35	2.4	79.1	39.4	2	89.1	41.1	2.2	99.8	42.7	2.3	110.9	44.2	2.5	115.5	44.7	2.6	115.5	40.4	2.9	115.5	37.6	3.1
65/35	2.4	79.1	39.4	2	89.1	41.1	2.2	99.8	42.7	2.3	110.9	44.2	2.5	115.5	44.7	2.6	115.5	40.4	2.9	115.5	37.6	3.1
60/35	2.4	79.1	39.4	2	89.1	41.1	2.2	99.8	42.7	2.3	110.9	44.2	2.5	115.5	44.7	2.6	115.5	40.4	2.9	115.5	37.6	3.1
70/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	106.2	41.9	2.5	118	43.3	2.7	122.9	43.8	2.8	122.9	42	2.9	122.9	39.2	3.1
65/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	106.2	41.9	2.5	118	43.3	2.7	122.9	43.8	2.8	122.9	42	2.9	122.9	39.2	3.1
60/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	106.2	41.9	2.5	118	43.3	2.7	122.9	43.8	2.8	122.9	42	2.9	122.9	39.2	3.1
55/35	2.4	79.1	39.4	2	89.1	41.1	2.2	99.8	42.7	2.3	110.9	44.2	2.5	115.5	44.7	2.6	115.5	40.4	2.9	115.5	37.6	3.1
55/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	106.2	41.9	2.5	118	43.3	2.7	122.9	43.8	2.8	122.9	42	2.9	122.9	39.2	3.1
70/40	2.2	74	41.3	1.8	83.4	43.2	1.9	93.4	44.9	2.1	103.9	46.4	2.2	108.2	46.9	2.3	108.2	39.8	2.7	108.2	37	2.9
65/40	2.2	74	41.3	1.8	83.4	43.2	1.9	93.4	44.9	2.1	103.9	46.4	2.2	108.2	46.9	2.3	108.2	39.8	2.7	108.2	37	2.9
60/40	2.2	74	41.3	1.8	83.4	43.2	1.9	93.4	44.9	2.1	103.9	46.4	2.2	108.2	46.9	2.3	108.2	39.8	2.7	108.2	37	2.9

HEAT PUMP PERFORMANCE ACER 130/100 POWER MODE //

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
70/35	2.5	79.1	39.4	2	89.1	41.1	2.2	89.1	36.1	2.5	89.1	33.7	2.6	89.1	32.7	2.7	89.1	31.3	2.8	89.1	29	3.1
65/35	2.5	79.1	39.4	2	89.1	41.1	2.2	89.1	36.1	2.5	89.1	33.7	2.6	89.1	32.7	2.7	89.1	31.3	2.8	89.1	29	3.1
60/35	2.5	79.1	39.4	2	89.1	41.1	2.2	89.1	36.1	2.5	89.1	33.7	2.6	89.1	32.7	2.7	89.1	31.3	2.8	89.1	29	3.1
70/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	94.8	37.6	2.5	94.8	35	2.7	94.8	34	2.8	94.8	32.6	2.9	94.8	30.2	3.1
65/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	94.8	37.6	2.5	94.8	35	2.7	94.8	34	2.8	94.8	32.6	2.9	94.8	30.2	3.1
60/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	94.8	37.6	2.5	94.8	35	2.7	94.8	34	2.8	94.8	32.6	2.9	94.8	30.2	3.1
55/35	2.5	79.1	39.4	2	89.1	41.1	2.2	89.1	36.1	2.5	89.1	33.7	2.6	89.1	32.7	2.7	89.1	31.3	2.8	89.1	29	3.1
55/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	94.8	37.6	2.5	94.8	35	2.7	94.8	34	2.8	94.8	32.6	2.9	94.8	30.2	3.1
70/40	2.4	74	41.3	1.8	83.4	43.2	1.9	83.4	35.6	2.3	83.4	33.1	2.5	83.4	32.2	2.6	83.4	30.8	2.7	83.4	28.5	2.9
65/40	2.4	74	41.3	1.8	83.4	43.2	1.9	83.4	35.6	2.3	83.4	33.1	2.5	83.4	32.2	2.6	83.4	30.8	2.7	83.4	28.5	2.9
60/40	2.4	74	41.3	1.8	83.4	43.2	1.9	83.4	35.6	2.3	83.4	33.1	2.5	83.4	32.2	2.6	83.4	30.8	2.7	83.4	28.5	2.9



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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Appendix 9





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.

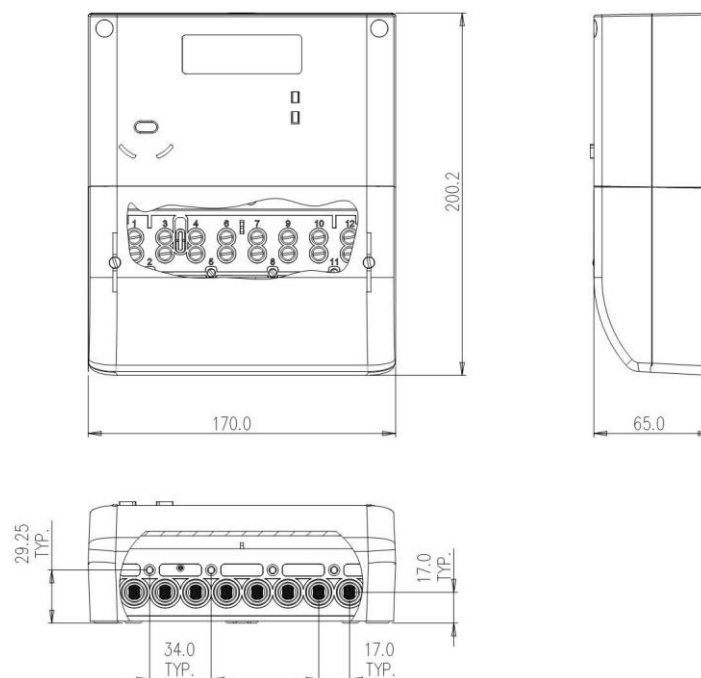


Technical Data - Meter

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	Class B, to EN 50470 1-3*
		Class 2, to IEC 62053-23
Environmental	Temperature Range	-25°C to +55°C
	Ingress protection	IP54, to BS EN60529
Physical	Terminal arrangement	DIN43857-Part 2, fixing centres of 150 ± 1 mm
	Main Terminal size	8.2mm $\varnothing$ $\pm$ 0.2
	Terminal Construction	Solid brass

Dimensions



NB * denotes standard setting

BWF Tangmere Energy Strategy

The consented scheme and planning condition (43a) are linked back to the master energy strategy as submitted at planning. The whole scheme development consists of 294 units across 3 phases, 5 blocks and a number of townhouses. The Tangmere phase consists of 122 apartments and 17 townhouses, total 139 units.

The master energy strategy is designed on the delivery of the new energy center which is to be developed in phase 3 for completion c.June 2029.

The intent has always to deliver Broadwater Farm New Homes on a phased approach with the energy center construction always intended to be delivered in the later phases to allow the whole and existing estate to connect to this new DEN. The intended interim position of the phases being constructed prior to the completion of the new DEN was for these to have temporary connections to the existing energy center.

Due to the ongoing operational issues of the existing energy center and the concerns raised back in 2022 on the water quality that would have potential to contaminate the new buildings systems the decision was taken to revert install ASHP to have these in the interim position until the new energy center is completed and commissioned. On completion of the final energy center the ASHP located at Tangmere will feed into the overall heat system that serves all new properties and the wider estate.

The option to revert to a temporary state and permanent state of the energy arrangements was debated with the wider team firstly in 2022.

In the final state on completion of the energy center the system will perform as intended and in accordance with the approved planning energy strategy.

The team have highlighted that since the original approval systems there design and efficiencies has moved on and approved and the final state installation will be above that of the approved strategy assumptions.

The location of the temporary state to serve the earlier phases has been considered and on final completion will all feed into the new energy center and then into the wider estate.

The heat pumps consist of 5 no. Clade Acer 130/100 heat pumps. To provide duty/standby source of heat whilst the heat network is being developed. These are located on the Core B2 Level 5 roof with access from the adjacent stair core. The main heating plantroom is located at Ground Level and there is a future connection point to the boundary as per the original design.

The carbon offset position will be achieved on the completion on the energy centre construction to be in accordance with the approved energy strategy or better. The current position of the Tangmere development is as set out in the Tangmere Energy Statement dated March 2026 achieving a total of 74% CO₂ savings.

The system as installed at Tangmere is in accordance with the wider final completed energy design and requirements proposed specifications of the communal ASHP system is compatible with the future DEN heating network delivering a low-temperature 4G system to be connected to the wider BWF new DEN on completion.

Diagram below showing plant room location and pipework infrastructure installed to boundary for future DEN connection (highlighted in orange).

