

Energy Assessment Report

Proposed Development of

32 Norwich Road, Northwood, HA6 1NB

to provide 4 no. residential flats (1 x 1 bed, 2 x 2 bed plus 1 x 3 bed)



November 2022

Client: Mr A Ismat

Architects: Amasia Architects Ltd

Prepared by



accredited SAP assessors

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1.0 EXECUTIVE SUMMARY

1.1 Brief

Monitor Energy Consultancy has been instructed by Mr A Ismat to undertake an Energy Report to establish the carbon footprint of the proposed development of 4 residential flats (1 x 1 bed, 2 x 2 bed plus 1 x 3 bed) at 32 Norwich Road, Northwood HA6 1NB and to demonstrate compliance with Policy SI 2 “Minimising Greenhouse Gas Emissions” of the London Plan 2021, delivering energy efficiency measures which would achieve and surpass a 35% reduction in regulated CO₂ emissions, compared to compliance with the Building Regulations Part L1A 2013 requirements and also Policy DMEI 2 of the Hillingdon Local Plan Part 2 – Development Management Policies (2020) requiring all developments to make the fullest contribution to minimising CO₂ emissions in accordance with London Plan targets.

The new development aims to achieve exemplary sustainability, to maximise energy efficiency and reduce carbon emissions whilst providing a viable and deliverable solution. The design approach to achieve this target follows the most recognised method of achieving sustainability, the Mayor of London’s Energy Hierarchy (summarised as ‘*be Lean, be Clean, be Green*’) This report demonstrates how a scheme meets the relevant on-site CO₂ emissions reduction target by following the energy hierarchy below:

- 1. Maximise energy efficiency using fabric first approach to ensure all the thermal elements are insulated to a high standard in the first instance. (Be Lean).
- 2. Supply energy efficiently using low carbon heating and cooling systems (Be Clean).
- 3. Incorporate renewable energy by the addition of photovoltaic panels (Be Green).

The proposed energy reduction measures are summarised in the table below.

Be Lean Use less energy, minimise energy demand through efficient design and the incorporation of passive measures	Building Fabric • Enhanced standards of insulation for floor, walls and roof • High performance double glazed windows and doors • High levels of air tightness • Reduction of thermal bridging through the use of accredited/bespoke details Energy Efficiency • Energy efficient lighting and controls • Energy efficient heating controls • Appropriate energy metering and monitoring • Energy efficient appliances
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Be Clean Supply energy efficiently. Reduce energy consumption through use of low carbon technology	Energy Efficient Energy Supply • The site is not within viable connection distance to potential decentralised heat networks • An on-site heat network/CHP is not considered appropriate for this site • Air source heat pumps proposed
Be Green Use renewable energy systems	Renewable Technologies • Photovoltaic array to supply renewable electricity to the development to reduce regulated CO2 emissions to zero.

2.0 ENERGY EFFICIENCY

2.1 APPROACH

The basic approach for the energy strategy is as follows:

1. To establish the baseline energy demand to ensure that the Standard Case dwelling carbon emission rates meet compliance with the statutory requirements of the Building Regulations 2013 Part L1A. The dwellings have all been modelled using SAP 2012, with the TER (Target Emission Rate) calculated. The results are tabulated in **Section 2.2**
2. Following the **“Be Lean”** principle, passive design and efficiency measures were considered first to optimise the reduction of energy use within the development. These are described and the results are tabulated in **Section 2.3**
3. Localised and decentralised energy networks such as combined heat and power (CHP) or community/district heating schemes were considered to meet the **“Be Clean”** requirement. The proposed heating strategy is described and the results are tabulated in **Section 2.4**.
4. The potential viability of six low and zero carbon technologies were considered for integration within the proposed development as part of the **“Be Green”** stage and the feasibility assessments are described in **Section 2.5**
5. The actual energy demand for the dwellings as proposed has been calculated, to include the enhanced thermal and mechanical services specification and incorporating renewable technology deemed most suitable as a result of the above considerations. The

actual DERs (Dwelling Emission Rates) for the regulated loads for each dwelling have been calculated and the results are tabulated in **Section 2.6**

2.2 ESTABLISHING TARGET CO₂ EMISSIONS

This section of the energy statement identifies the carbon footprint of the development if constructed to the standard required to achieve compliance with England and Wales Building Regulations 2013. The Standard Case TER carbon emissions for all four flats have been calculated using SAP 2012.

Table 1 illustrates the CO₂ regulated loads associated with each dwelling and totalled across the site. These figures have been used to assess the total energy usage and CO₂ emissions and to set the 35% carbon off-set required for regulated emissions only to satisfy the London Borough of Islington planning requirement. The full figures calculated are tabulated in summary below and can be found in **Appendix A**

	Total Area GI m ²	Standard Case TER CO ₂ kg/m ² /yr	Total CO ₂ kg/yr
Flat 1	116.85	16.95	1 980.61
Flat 2	70.47	21.61	1 522.86
Flat 3	70.38	19.02	1 338.63
Flat 4	37.5	20.33	762.38
Total	295.20		5 604.47

Table 1 Standard Case TER results for all dwellings (Baseline Case)

To comply with Building Regulations 2013, the total site wide carbon dioxide emissions for the dwellings would be **5 604.47 kgCO₂/yr**. To satisfy the Planning requirement, 35% of carbon dioxide emissions to be off-set for this development would be **5 604.47 x 35% = 1 961.56 kg CO₂/yr**. The total CO₂ emissions for all 4 dwellings would need to be **5 604.47 - 1 961.56 = 3 642.90 kg CO₂/yr** or lower as indicated in Table 2 below.

Standard Case total regulated CO2 Emissions	5 604.47
Minimum 35% reduction of regulated emissions required	1 961.56
Target total Regulated Emissions to be achieved	3 642.90

Table 2. Site wide regulated CO2 emissions used to derive the required 35% carbon off-set of regulated emissions.

2.3 PROPOSED PASSIVE AND LOW ENERGY EFFICIENCY MEASURES

To satisfy the Planning requirement, a reduction of 10% of the total CO2 emissions would need to be achieved for the “**Be Lean**” case as indicated in Table 3 below.

Standard Case total regulated CO2 Emissions	5 604.47
Minimum 10% reduction of regulated emissions required	560.45
Target total Regulated Emissions to be achieved	5 044.02

Table 3. Site wide regulated CO2 emissions used to derive the required 10% carbon off-set of regulated emissions.

10% of carbon dioxide emissions required to be off-set for this development would be $5\,604.47 \times 0.1 = 560.45$ **kg CO2/yr**. The maximum emissions to be achieved at this stage of the process = $5\,604.47 - 560.45 = 5\,044.02$ **kg CO2/yr** or lower.

In order to achieve this, all the thermal elements are to be built to higher thermal standards than required under the Building Regulations Part L1A 2013 incorporating U-values of:

- Floors: 0.11 W/m2 (compared to Building Regulations standard of 0.22 W/m2K)
- Walls: 0.14W/m2K (compared to Building Regulations standard of 0.28 W/m2K)
- Roofs 0.14 W/m2K (compared to Building Regulations standard of 0.18 W/m2K)
- Windows 0.8 W/m2K (compared to Building Regulations standard of 1.6 W/m2K)
- Party walls fully insulated with sealed edges: U value 0.0 W/m2K (compared to Building Regulations standard of 0.2 W/m2K .)
- Low design air permeability rate: 3m3/hm2@50Pa compared to Building Regulations standard of 10 m3/hm2@50Pa for tested dwellings.

- High standard thermal bridging details at junctions to minimise cold bridging and achieve an average 'y' value of 0.05 (compared to a default figure of 0.15)

Additional energy efficient appliance and fittings are to be installed

- Highly efficient mechanical ventilation with heat recovery system (MVHR) to Flat 1.
- Lighting: 100% of all fittings to be low energy compared to 75% as required for Building Regulations.
- 'A' rated or above appliances to be installed throughout.

The above measures, together with a standard gas boiler 88% efficient have all been incorporated into the "**Be Lean**" assessment and a summary of the results tabulated below.

The full figures can be found in **Appendix A**

	Total Area GI m2	Be Lean Case DER CO₂ kg/m2/yr	Total CO₂ kg/yr
Flat 1	116.85	11.55	1 349.62
Flat 2	70.47	16.54	1 165.57
Flat 3	70.38	16.07	1 131.01
Flat 4	37.5	17.30	648.75
Total	295.20		4 292.95

Table 3 Be Lean Case DER results for all dwellings

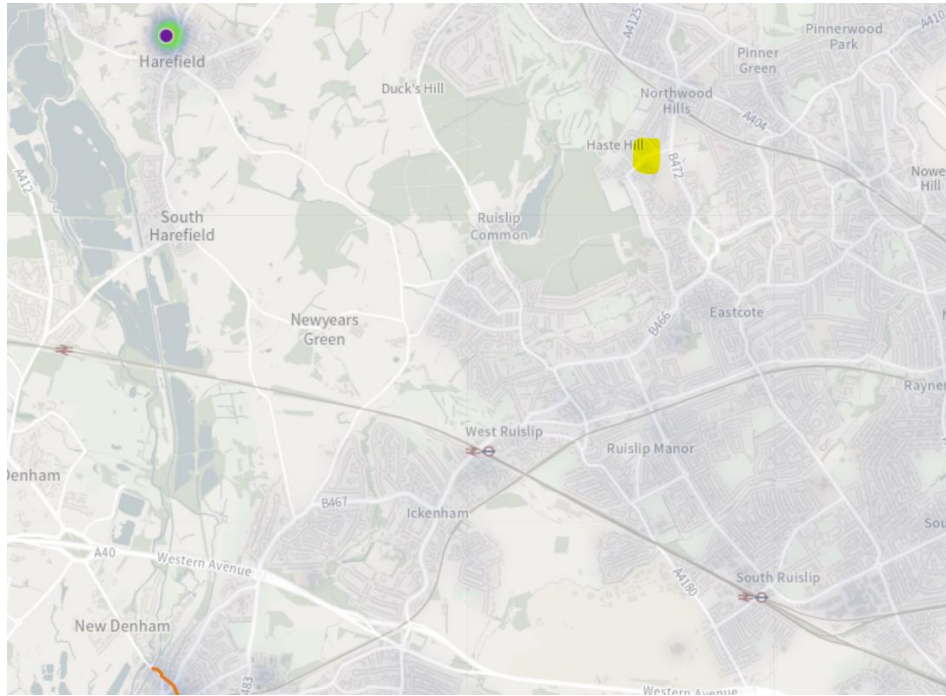
The above Table demonstrates that the requirement to offset a minimum of 10% CO₂ emissions has been met.

A maximum of **9,633.49 kg CO₂/yr** for the total emissions for this development was calculated as necessary to satisfy the Planning requirement.

The actual emissions to be achieved by the scheme as proposed will be **4 292.95 CO₂/yr**, representing a **1 309.52 kg CO₂/yr** or **23.37 %** reduction beyond 2012 Building Regulations target emissions, therefore it meets this requirement of the Planning policy.

2.4 ENERGY EFFICIENT SUPPLY

For the “Be Clean” assessment , a study of the London Heat Map below shows that there is no existing or proposed heat network within an economically viable distance for this proposed scheme, (location shown highlighted) and due to the size of this development, it is unlikely to be cost effective for a future connection.



The heating system proposed for this site are Ecodan or similar air heat pumps with zone controls and highly insulated hot water cylinders to all flats. These has been incorporated into the “Be Clean” Assessment. The resulting revised emission rates are summarised in Table 4 below. The full figures calculated can be found in **Appendix B**

	Total Area GI m2	Be Clean Case DER CO ₂ kg/m2/yr	Total CO ₂ kg/yr
Flat 1	116.85	9.78	1 142.79
Flat 2	70.47	14.32	1 009.13
Flat 3	70.38	13.66	961.39
Flat 4	37.5	17.04	639.00
Total	295.20		3 752.31

Table 4 Be Clean Case DER results for all dwellings

This demonstrates that a total reduction in CO₂ emissions of **5 604.47 – 3 752.31 = 1 852.16 kg CO₂/yr** has been achieved through the incorporation of air source heat pumps, making the total reduction **33.05 %** for this stage of the process.

2.5 RENEWABLE ENERGY TECHNOLOGIES ASSESSMENT

In this section, the potential on-site low and zero carbon technologies that could further reduce the developments CO₂ emissions have been considered, taking into account the scale of this particular development and constraints such as location, visual impact, space limitations, local pollution concerns, cost and payback for both initial payment and ongoing maintenance and suitability. In conclusion, both PV panels and air source heat pumps have been considered as suitable for adoption for this development.

2.5.1 Photovoltaic Cells

There is an opportunity to install photovoltaic cells on the flat roof over the second floor. A total of 8kWp of PV panels are proposed.

2.5.2 Solar Water Heating

The development has the potential to use solar water heating panels however these would be competing for the same space as the PV panels and the carbon reduction achieved would not be as good as using the PV panels.

2.5.3 Ground Source Heat Pump

Approximately 10m of trench for slinky pipes would be required to obtain 1kW output of heating. For a small to average heat pump of 6kW this would require 60m for each unit, therefore there would not be adequate space on the site for this option. The alternative method involving drilling a borehole would be extremely expensive and not generally considered a feasible option for small scale domestic applications.

2.5.4 Air Source Heat Pump

With the current ideology of moving away from fossil fuels, high efficiency air heat pumps with time and temperature zone controls have been selected to provide the heating and hot water for each dwelling on the site.

2.5.5 Wind Power

Wind turbines are only appropriate where the average wind velocity is in excess of 6m/s. The DECC wind speed database estimates the average wind speed in this location is less than 4.07m/s at an average height of 20m above ground level which would not create a viable supply of energy. In addition, a wind turbine would be both visually and audibly intrusive and not suitable for this small site where there is insufficient space to accommodate it. This option has therefore been discarded.

2.5.6 Biomass

Biomass boilers are less efficient than the heat pumps proposed, they would require increased management, maintenance and space for both a central plant room and biomass store. In addition, there would be a requirement for biomass deliveries via heavy vehicles, therefore it is considered that for this site and its location this would not be appropriate.

2.6 ESTABLISHING ACTUAL PROPOSED CO₂ EMISSIONS

For the “**Be Green**” stage of the assessment, the low and zero carbon technology proposed for this project is an array of PV panels providing 8 kWp of electricity to further reduce CO₂ emissions. These have been apportioned on a pro rata basis with the floor area of each flat.

The Actual Case DER carbon emissions for all four flats incorporating the improvements detailed above, specifically the fabric efficiency measures, heating system as described together with 8 kWp of photovoltaic panels have been calculated using SAP 2012. The results are summarised in Table 5 below and the full figures can be found in **Appendix C**

	Total Area GI m ²	Be Green Case DER CO ₂ kg/m ² /yr	Total CO ₂ kg/yr
Flat 1	116.85	-2.38	-278.10
Flat 2	70.47	-0.9	-63.42
Flat 3	70.38	-0.12	-8.45
Flat 4	37.5	4.97	186.38
Total	295.20		-163.60

Table 5 Be Green Case DER results for all dwellings

2.7 CONCLUSIONS

The total carbon emissions for the proposed development after each stage of the domestic Energy Hierarchy have been calculated and are tabulated below

		Regulated Carbon Dioxide Emissions (Tonnes CO ₂ /yr)
A	Baseline: Part L1B 2013 of the Building Regulations Compliant Development	5.604
B	After energy demand reduction due to passive energy efficiency measures (Be Lean)	4.292
C	After low carbon heating system installed (Be Clean)	3.752
D	After renewable energy (Be Green)	-0.163

Table 6 Carbon Dioxide Emissions after each stage of the Energy Hierarchy

	Regulated Carbon Dioxide Savings	
	(Tonnes CO ₂ per yr)	(%)
Savings from energy demand reduction (A-B)	1.172	23.37
Savings from heat network/CHP (B-C)	0.540	9.68
Savings from renewable energy (C-D)	1.433	69.87
Cumulative On Site Savings (A-D=E)	5.768	102.92
Carbon Shortfall (A-E=F)	-163.60	
Cumulative savings for offset payment (F x 30 years) = G	0	

Table 7 Carbon Dioxide Emissions savings after each stage of the Energy Hierarchy

This report identifies how **102.92 %** of regulated carbon emissions for which this development is responsible, are proposed to be off-set by the various energy efficiency measures described, compared to a Building Regulations Part L1A 2013 compliant scheme.

By incorporating energy efficient construction and installations, the CO₂ regulated loads for this development will be **better than carbon neutral**, based on the SAP calculation method.

The maximum total emissions of **3 642.90 kg CO₂/yr** has been calculated as necessary to satisfy the Planning requirement. The total emissions for the scheme as proposed will be **5 604.47 – 5 768.07 = -163.60 kg CO₂/yr** representing a **102.92 %** reduction, therefore the scheme as proposed exceeds the requirements of the London Borough of Hillingdon's energy reduction target.

3. CO₂ EMISSIONS FOR UNREGULATED LOADS

The CO₂ emissions for the unregulated loads associated with this development have also been assessed. These are the same for all stages of the energy hierarchy and the results are tabulated below and the full figures can be found in **Appendix D**.

	Total Area GI m ²	Appliances CO ₂ kg/m ² /yr	Cooking CO ₂ kg/m ² /yr	Total CO ₂ Kg/m ² /yr	Total CO ₂ Kg/yr
Flat 1	116.85	14.25	1.6	16.08	1 878.95
Flat 2	70.47	16.68	2.46	16.63	1 775.14
Flat 3	70.38	2.46	2.46	19.61	1 729.94
Flat 4	37.50	16.66	2.44	19.02	1 257.00
Total	295.20				6 641.03

Table 8 CO₂ emissions of unregulated results for all dwellings

4. FABRIC ENERGY EFFICIENCY STANDARD ASSESSMENT

The target fabric energy efficiency (TFEE) and actual as designed fabric energy (DFEE) efficiency have been modelled for each flat using SAP 2012 and a summary of the results can be found in **Appendix E**.

5. OVERHEATING ASSESMENT

A mechanical ventilation system with heat recovery is proposed for the ground floor flat where windows cannot be left open at night time for security purposes. The first floor flats will have natural ventilation.

An overheating risk assessment has been prepared for each dwelling using SAP 2012 to check for compliance with Criterion 3 of Part L1A of the building Regulations and copies of the assessments can be found in **Appendix F**.

6. MONITORING

Following the completion of the work, the actual CO₂ emissions will be re-calculated to account for any changes to the specification and the report will be updated to demonstrate that the resulting building still complies with the Requirements.

In addition, monitoring equipment will be installed in the form of smart meters to enable occupants to monitor and reduce their energy use as appropriate.

APPENDIX A - SAP 2012 CALCULATIONS FOR THE BE LEAN CASE

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122159			Issued on Date	02/11/2022	
Assessment Reference	001 - be lean			Prop Type Ref		
Property	Flat 1, 32, Norwich Road, Northwood, HA6 1NB					
SAP Rating	88 B	DER	11.55	TER	16.95	
Environmental	90 B	% DER<TER	31.84			
CO ₂ Emissions (t/year)	1.12	DFEE	33.90	TFEE	53.99	
General Requirements Compliance	Pass	% DFEE<TFEE	37.20			
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com			Assessor ID	L706-0001	
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 117 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.95 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.55 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.85 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 88%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

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: 0.53
Maximum 1.5 OK
MVHR efficiency: 95%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South East: 3.24 m², No overhang
Windows facing South: 3.65 m², No overhang
Windows facing South West: 3.05 m², No overhang
Windows facing North West: 10.76 m², No overhang
Air change rate: 1.80 ach
Blinds/curtains: None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Floor U-value	0.11 W/m ² K
Window U-value	0.80 W/m ² K
Thermal bridging y-value	0.017 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	116.8500 (1b)	x 2.6000 (2b)	= 303.8100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 303.8100 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.7500 (23c)
Effective ac	0.2445	0.2416	0.2387	0.2241	0.2212	0.2067	0.2067	0.2038	0.2125	0.2212	0.2270	0.2328 (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						
Opening Type 1 (Uw = 0.80)			20.7000	0.7752	16.0465			(27)					
Opening Type 2			1.8900	1.4000	2.6460			(26)					
Heat Loss Floor 1			116.8500	0.1100	12.8535			(28a)					
External Wall 1	96.8200	20.7000	76.1200	0.1400	10.6568			(29a)					
External Wall 2	34.3200	1.8900	32.4300	0.1321	4.2824			(29a)					
Total net area of external elements Aum(A, m2)			247.9900					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	46.4852			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.2289 (36)					
Total fabric heat loss						(33) + (36) =	50.7141	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.5098	Feb 24.2184	Mar 23.9270	Apr 22.4702	May 22.1788	Jun 20.7219	Jul 20.7219	Aug 20.4306	Sep 21.3047	Oct 22.1788	Nov 22.7615	Dec 23.3443	(38)
Heat transfer coeff	75.2239	74.9325	74.6411	73.1843	72.8929	71.4360	71.4360	71.1447	72.0188	72.8929	73.4757	74.0584	(39)
Average = Sum(39)m / 12 =												73.1114	(39)
HLP	Jan 0.6438	Feb 0.6413	Mar 0.6388	Apr 0.6263	May 0.6238	Jun 0.6113	Jul 0.6113	Aug 0.6089	Sep 0.6163	Oct 0.6238	Nov 0.6288	Dec 0.6338	(40)
HLP (average)												0.6257	(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												2.8503 (42)
Average daily hot water use (litres/day)												101.8940 (43)
Daily hot water use	Jan 112.0835	Feb 108.0077	Mar 103.9319	Apr 99.8562	May 95.7804	Jun 91.7046	Jul 91.7046	Aug 95.7804	Sep 99.8562	Oct 103.9319	Nov 108.0077	Dec 112.0835 (44)
Energy conte	166.2165	145.3740	150.0130	130.7850	125.4913	108.2894	100.3461	115.1486	116.5238	135.7973	148.2334	160.9718 (45)
Energy content (annual)												Total = Sum(45)m = 1603.1902 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9325	21.8061	22.5019	19.6177	18.8237	16.2434	15.0519	17.2723	17.4786	20.3696	22.2350	24.1458 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	49.2441	48.8086	45.2242	46.7317	48.8086	49.2441	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	217.1754	191.4014	200.9719	180.0291	174.2999	153.5136	147.0778	163.9572	165.7680	186.7562	197.5484	211.9307 (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	217.1754	191.4014	200.9719	180.0291	174.2999	153.5136	147.0778	163.9572	165.7680	186.7562	197.5484	211.9307 (64)
Heat gains from water heating, kWh/month	68.0067	59.8437	62.6190	55.7970	53.9280	47.3123	45.0480	50.4891	51.0552	57.8923	61.6164	66.2629 (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	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.3075	23.3661	19.0026	14.3862	10.7538	9.0788	9.8100	12.7514	17.1149	21.7313	25.3637	27.0386	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0537	283.9702	276.6208	260.9748	241.2246	222.6622	210.2614	207.3449	214.6943	230.3402	250.0905	268.6529	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	(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)	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	(71)
Water heating gains (Table 5)	91.4069	89.0531	84.1654	77.4959	72.4839	65.7115	60.5484	67.8616	70.9100	77.8123	85.5783	89.0630	(72)
Total internal gains	467.5222	465.1435	448.5429	421.6110	393.2165	366.2067	349.3739	356.7121	371.4733	398.6380	429.7865	453.5086	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				3.2400	36.7938	0.5700	0.7000	0.7700	32.9630 (77)			
South				3.6500	46.7521	0.5700	0.7000	0.7700	47.1845 (78)			
Southwest				3.0500	36.7938	0.5700	0.7000	0.7700	31.0299 (79)			
Northwest				10.7600	11.2829	0.5700	0.7000	0.7700	33.5692 (81)			
Solar gains	144.7466	254.6108	370.6903	498.2334	594.6946	606.8003	578.1711	503.5046	414.3314	287.3277	174.8172	122.9507 (83)
Total gains	612.2688	719.7543	819.2332	919.8444	987.9111	973.0070	927.5450	860.2167	785.8047	685.9656	604.6038	576.4593 (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	107.8724	108.2919	108.7146	110.8788	111.3220	113.5923	113.5923	114.0575	112.6731	111.3220	110.4391	109.5701	
alpha	8.1915	8.2195	8.2476	8.3919	8.4215	8.5728	8.5728	8.6038	8.5115	8.4215	8.3626	8.3047	
util living area	0.9986	0.9942	0.9735	0.8758	0.6769	0.4695	0.3389	0.3804	0.6276	0.9328	0.9949	0.9991	(86)
MIT	20.4291	20.5652	20.7476	20.9290	20.9918	20.9997	21.0000	21.0000	20.9967	20.8949	20.6272	20.4072	(87)
Th 2	20.3908	20.3930	20.3952	20.4064	20.4086	20.4198	20.4198	20.4220	20.4153	20.4086	20.4041	20.3997	(88)
util rest of house	0.9981	0.9924	0.9661	0.8500	0.6369	0.4271	0.2942	0.3326	0.5765	0.9114	0.9931	0.9988	(89)
MIT 2	19.8602	19.9974	20.1775	20.3529	20.4037	20.4197	20.4198	20.4220	20.4137	20.3288	20.0692	19.8462	(90)
Living area fraction									fLA = Living area / (4) =			0.4203	(91)
MIT	20.0993	20.2360	20.4171	20.5950	20.6509	20.6634	20.6636	20.6649	20.6587	20.5667	20.3037	20.0819	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.0993	20.2360	20.4171	20.5950	20.6509	20.6634	20.6636	20.6649	20.6587	20.5667	20.3037	20.0819	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	610.9688	713.9286	791.7443	789.7937	645.5839	432.9136	290.2807	303.4011	469.8548	629.4766	600.1843	575.6708	(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	1188.4834	1149.1667	1038.7903	855.8912	652.4546	433.1469	290.2901	303.4262	472.3499	726.5039	970.1537	1176.1912	(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	429.6708	292.4800	183.8023	47.5902	5.1118	0.0000	0.0000	0.0000	0.0000	72.1883	266.3780	446.7871	(98)
Space heating												1744.0085	(98)
Space heating per m2												14.9252	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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 %)													88.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1981.8278 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	429.6708	292.4800	183.8023	47.5902	5.1118	0.0000	0.0000	0.0000	0.0000	72.1883	266.3780	446.7871	(98)
Space heating efficiency (main heating system 1)	88.0000	88.0000	88.0000	88.0000	88.0000	0.0000	0.0000	0.0000	0.0000	88.0000	88.0000	88.0000	(210)
Space heating fuel (main heating system)	488.2623	332.3636	208.8662	54.0798	5.8088	0.0000	0.0000	0.0000	0.0000	82.0322	302.7022	507.7126	(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	217.1754	191.4014	200.9719	180.0291	174.2999	153.5136	147.0778	163.9572	165.7680	186.7562	197.5484	211.9307	(64)
Efficiency of water heater (217)m	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	(216)
Fuel for water heating, kWh/month	246.7903	217.5016	228.3771	204.5785	198.0681	174.4473	167.1338	186.3150	188.3727	212.2229	224.4868	240.8304	(219)
Water heating fuel used												2489.1247	(219)
Annual totals kWh/year													
Space heating fuel - main system												1981.8278	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)													245.5544 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													275.5544 (231)
Electricity for lighting (calculated in Appendix L)													464.5983 (232)
Total delivered energy for all uses													5211.1052 (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	1981.8278	0.2160	428.0748 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2489.1247	0.2160	537.6509 (264)
Space and water heating			965.7257 (265)
Pumps and fans	275.5544	0.5190	143.0128 (267)
Energy for lighting	464.5983	0.5190	241.1265 (268)
Total CO2, kg/year			1349.8650 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.5500 (273)

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

DER			11.5500 ZC1
Total Floor Area		TFA	116.8500
Assumed number of occupants		N	2.8503
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			14.2530 ZC2
CO2 emissions from cooking, equation (L16)			1.6038 ZC3
Total CO2 emissions			27.4068 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			27.4068 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	116.8500 (1b)	x 2.6000 (2b)	= 303.8100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 303.8100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1317 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3817 (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) =				0.2958 (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	0.3771	0.3697	0.3623	0.3254	0.3180	0.2810	0.2810	0.2736	0.2958	0.3180	0.3328	0.3476 (22b)
Effective ac	0.5711	0.5684	0.5656	0.5529	0.5506	0.5395	0.5395	0.5374	0.5437	0.5506	0.5554	0.5604 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.7000	1.3258	27.4432		(27)
Heat Loss Floor 1			116.8500	0.1300	15.1905		(28a)
External Wall 1	96.8200	20.7000	76.1200	0.1800	13.7016		(29a)
External Wall 2	34.3200	1.8900	32.4300	0.1800	5.8374		(29a)
Total net area of external elements Aum(A, m ²)			247.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.0627		(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)							11.4414 (36)
Total fabric heat loss						(33) + (36) =	75.5041 (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	57.2583	56.9814	56.7100	55.4354	55.1970	54.0868	54.0868	53.8812	54.5144	55.1970	55.6794	56.1837 (38)
Heat transfer coeff	132.7623	132.4855	132.2141	130.9395	130.7010	129.5909	129.5909	129.3853	130.0185	130.7010	131.1835	131.6878 (39)
Average = Sum(39)m / 12 =												130.9384 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1362	1.1338	1.1315	1.1206	1.1185	1.1090	1.1090	1.1073	1.1127	1.1185	1.1227	1.1270 (40)
HLP (average)												1.1206 (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												2.8503 (42)
Average daily hot water use (litres/day)												101.8940 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.0835	108.0077	103.9319	99.8562	95.7804	91.7046	91.7046	95.7804	99.8562	103.9319	108.0077	112.0835 (44)
Energy conte	166.2165	145.3740	150.0130	130.7850	125.4913	108.2894	100.3461	115.1486	116.5238	135.7973	148.2334	160.9718 (45)
Energy content (annual)										Total = Sum(45)m =		1603.1902 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9325	21.8061	22.5019	19.6177	18.8237	16.2434	15.0519	17.2723	17.4786	20.3696	22.2350	24.1458 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	50.9589	46.0274	50.9589	49.2441	48.8086	45.2242	46.7317	48.8086	49.2441	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	217.1754	191.4014	200.9719	180.0291	174.2999	153.5136	147.0778	163.9572	165.7680	186.7562	197.5484	211.9307 (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	217.1754	191.4014	200.9719	180.0291	174.2999	153.5136	147.0778	163.9572	165.7680	186.7562	197.5484	211.9307 (64)
Heat gains from water heating, kWh/month	68.0067	59.8437	62.6190	55.7970	53.9280	47.3123	45.0480	50.4891	51.0552	57.8923	61.6164	66.2629 (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	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6579	22.7891	18.5333	14.0309	10.4883	8.8546	9.5678	12.4365	16.6923	21.1947	24.7373	26.3710 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0537	283.9702	276.6208	260.9748	241.2246	222.6622	210.2614	207.3449	214.6943	230.3402	250.0905	268.6529 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514 (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)	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110 (71)
Water heating gains (Table 5)	91.4069	89.0531	84.1654	77.4959	72.4839	65.7115	60.5484	67.8616	70.9100	77.8123	85.5783	89.0630 (72)
Total internal gains	466.8726	464.5665	448.0736	421.2558	392.9509	365.9825	349.1316	356.3972	371.0507	398.1013	429.1602	452.8410 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Southeast				3.2400	36.7938	0.6300	0.7000		0.7700		36.4327 (77)	
South				3.6500	46.7521	0.6300	0.7000		0.7700		52.1513 (78)	
Southwest				3.0500	36.7938	0.6300	0.7000		0.7700		34.2963 (79)	
Northwest				10.7600	11.2829	0.6300	0.7000		0.7700		37.1028 (81)	

Solar gains	159.9831	281.4119	409.7104	550.6790	657.2940	670.6741	639.0313	556.5051	457.9452	317.5727	193.2191	135.8928 (83)
Total gains	626.8557	745.9784	857.7840	971.9348	1050.2450	1036.6566	988.1629	912.9023	828.9959	715.6740	622.3793	588.7338 (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	61.1211	61.2488	61.3746	61.9720	62.0851	62.6169	62.6169	62.7164	62.4110	62.0851	61.8568	61.6198
alpha	5.0747	5.0833	5.0916	5.1315	5.1390	5.1745	5.1745	5.1811	5.1607	5.1390	5.1238	5.1080
util living area	0.9988	0.9969	0.9907	0.9669	0.8917	0.7326	0.5624	0.6253	0.8689	0.9821	0.9973	0.9992 (86)
MIT	19.7180	19.8800	20.1393	20.4791	20.7744	20.9434	20.9883	20.9803	20.8569	20.4694	20.0285	19.6891 (87)
Th 2	19.9714	19.9733	19.9752	19.9841	19.9857	19.9935	19.9935	19.9949	19.9905	19.9857	19.9824	19.9789 (88)
util rest of house	0.9984	0.9958	0.9873	0.9538	0.8497	0.6429	0.4413	0.5018	0.8028	0.9729	0.9962	0.9989 (89)
MIT 2	18.2546	18.4926	18.8711	19.3636	19.7601	19.9550	19.9890	19.9865	19.8715	19.3577	18.7166	18.2177 (90)
Living area fraction	18.8697	19.0757	19.4041	19.8324	20.1864	20.3704	20.4090	20.4042	20.2857	19.8249	19.2679	18.8361 (92)
MIT	18.8697	19.0757	19.4041	19.8324	20.1864	20.3704	20.4090	20.4042	20.2857	19.8249	19.2679	18.8361 (93)
Temperature adjustment												0.0000
adjusted MIT	18.8697	19.0757	19.4041	19.8324	20.1864	20.3704	20.4090	20.4042	20.2857	19.8249	19.2679	18.8361 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9978	0.9945	0.9848	0.9515	0.8591	0.6786	0.4925	0.5541	0.8247	0.9710	0.9951	0.9984 (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	1934.3023	1878.0741	1706.1078	1431.4838	1109.1795	747.7880	493.6110	518.0852	804.2501	1205.7054	1596.2323	1927.3980 (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	973.7771	763.5450	640.8722	364.8463	153.9663	0.0000	0.0000	0.0000	0.0000	380.0426	703.3736	996.6784 (98)
Space heating												4977.1015 (98)
Space heating per m2										(98) / (4) =		42.5939 (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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5328.8025 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	973.7771	763.5450	640.8722	364.8463	153.9663	0.0000	0.0000	0.0000	0.0000	380.0426	703.3736	996.6784	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	1042.5880	817.5000	686.1587	390.6277	164.8462	0.0000	0.0000	0.0000	0.0000	406.8978	753.0767	1067.1074	(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	217.1754	191.4014	200.9719	180.0291	174.2999	153.5136	147.0778	163.9572	165.7680	186.7562	197.5484	211.9307	(64)
Efficiency of water heater (217)m	88.3731	88.1771	87.7647	86.7931	84.7406	80.3000	80.3000	80.3000	80.3000	86.8026	87.9737	80.3000	(216)
Fuel for water heating, kWh/month	245.7485	217.0649	228.9894	207.4233	205.6864	191.1751	183.1603	204.1809	206.4358	215.1504	224.5540	239.6072	(219)
Water heating fuel used												2569.1762	(219)
Annual totals kWh/year													
Space heating fuel - main system												5328.8025	(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)												453.1259	(232)
Total delivered energy for all uses												8426.1045	(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	5328.8025	0.2160	1151.0213 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2569.1762	0.2160	554.9421 (264)
Space and water heating			1705.9634 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	453.1259	0.5190	235.1723 (268)
Total CO2, kg/m2/year			1980.0607 (272)
Emissions per m2 for space and water heating			14.5996 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0126 (272b)
Emissions per m2 for pumps and fans			0.3331 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5996 * 1.00) + 2.0126 + 0.3331, rounded to 2 d.p.			16.9500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122160			Issued on Date	02/11/2022
Assessment Reference	002 - be lean	Prop Type Ref			
Property	Flat 2, 32, Norwich Road, Northwood, HA6 1NB				
SAP Rating	85 B	DER	16.54	TER	21.61
Environmental	88 B	% DER<TER	23.46		
CO ₂ Emissions (t/year)	0.97	DFEE	35.53	TFEE	65.77
General Requirements Compliance	Pass	% DFEE<TFEE	45.98		
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com			Assessor ID	L706-0001
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 70 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.61 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.54 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 65.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 35.5 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	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.87 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 88%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South West: 3.05 m², No overhang
Windows facing North West: 10.76 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.80 W/m²K
Thermal bridging y-value 0.029 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.4700 (1b)	x 2.6000 (2b)	= 183.2220 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.2220 (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					1 * 10 = 10.0000 (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) =				10.0000 / (5) = 0.0546 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2046 (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) =				0.1585 (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	0.2021	0.1982	0.1942	0.1744	0.1704	0.1506	0.1506	0.1467	0.1585	0.1704	0.1784	0.1863 (22b)
Effective ac	0.5204	0.5196	0.5189	0.5152	0.5145	0.5113	0.5113	0.5108	0.5126	0.5145	0.5159	0.5174 (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						
Opening Type 1 (Uw = 0.80)			13.8100	0.7752	10.7054			(27)					
Opening Type 2			1.8900	1.4000	2.6460			(26)					
External Wall 1	68.8200	13.8100	55.0100	0.1400	7.7014			(29a)					
External Wall 2	18.7200	1.8900	16.8300	0.1321	2.2224			(29a)					
External Roof 1	49.6700		49.6700	0.1400	6.9538			(30)					
Total net area of external elements Aum(A, m2)			137.2100					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	30.2290			(33)					
Party Wall 1			16.1200	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.0160 (36)					
Total fabric heat loss						(33) + (36) =		34.2450 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 31.4670	Feb 31.4191	Mar 31.3720	Apr 31.1512	May 31.1098	Jun 30.9175	Jul 30.9175	Aug 30.8819	Sep 30.9916	Oct 31.1098	Nov 31.1934	Dec 31.2808	(38)
Heat transfer coeff	65.7120	65.6641	65.6170	65.3962	65.3549	65.1625	65.1625	65.1269	65.2366	65.3549	65.4384	65.5258	(39)
Average = Sum(39)m / 12 =												65.3960	(39)
HLP	Jan 0.9325	Feb 0.9318	Mar 0.9311	Apr 0.9280	May 0.9274	Jun 0.9247	Jul 0.9247	Aug 0.9242	Sep 0.9257	Oct 0.9274	Nov 0.9286	Dec 0.9298	(40)
HLP (average)												0.9280	(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												2.2575 (42)
Average daily hot water use (litres/day)												87.8152 (43)
Daily hot water use	96.5967	93.0841	89.5715	86.0589	82.5463	79.0337	79.0337	82.5463	86.0589	89.5715	93.0841	96.5967 (44)
Energy conte	143.2501	125.2875	129.2854	112.7142	108.1519	93.3269	86.4811	99.2383	100.4235	117.0339	127.7517	138.7301 (45)
Energy content (annual)										Total = Sum(45)m =		1381.6747 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.4875	18.7931	19.3928	16.9071	16.2228	13.9990	12.9722	14.8857	15.0635	17.5551	19.1628	20.8095 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	49.2246	42.8442	45.6446	42.4400	42.0647	38.9755	40.2747	42.0647	42.4400	45.6446	45.9045	49.2246 (61)
Solar input	192.4747	168.1316	174.9301	155.1542	150.2166	132.3024	126.7558	141.3030	142.8635	162.6786	173.6562	187.9547 (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	192.4747	168.1316	174.9301	155.1542	150.2166	132.3024	126.7558	141.3030	142.8635	162.6786	173.6562	187.9547 (64)
	59.9368	52.3691	54.3986	48.0875	46.4767	40.7751	38.8236	43.5129	44.0008	50.3249	53.9536	58.4339 (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	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2133	16.1769	13.1559	9.9599	7.4451	6.2855	6.7917	8.8281	11.8491	15.0451	17.5599	18.7195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.3915	200.4502	195.2624	184.2181	170.2768	157.1738	148.4203	146.3616	151.5494	162.5937	176.5350	189.6380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	(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)	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	(71)
Water heating gains (Table 5)	80.5602	77.9302	73.1164	66.7881	62.4687	56.6320	52.1823	58.4851	61.1123	67.6411	74.9355	78.5402	(72)
Total internal gains	357.0273	354.4196	341.3969	320.8284	300.0528	279.9536	267.2565	273.5370	284.3730	305.1421	328.8926	346.7599	(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
Southwest					3.0500	36.7938	0.5700	0.7000			0.7700			31.0299 (79)
Northwest					10.7600	11.2829	0.5700	0.7000			0.7700			33.5692 (81)
Solar gains	64.5991	121.1865	195.4300	291.7902	372.1413	389.3813	367.1107	304.1181	228.3188	141.9225	79.4054	53.9694 (83)		
Total gains	421.6264	475.6061	536.8269	612.6186	672.1941	669.3349	634.3672	577.6551	512.6918	447.0646	408.2981	400.7293 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.4727	74.5271	74.5805	74.8324	74.8797	75.1007	75.1007	75.1418	75.0154	74.8797	74.7840	74.6843	
alpha	5.9648	5.9685	5.9720	5.9888	5.9920	6.0067	6.0067	6.0095	6.0010	5.9920	5.9856	5.9790	
util living area	0.9979	0.9953	0.9854	0.9414	0.8105	0.6089	0.4499	0.5137	0.7959	0.9706	0.9954	0.9985	(86)
MIT	20.0610	20.1897	20.4136	20.7020	20.9125	20.9868	20.9981	20.9961	20.9415	20.6586	20.3012	20.0271	(87)
Th 2	20.1400	20.1406	20.1411	20.1438	20.1443	20.1466	20.1466	20.1470	20.1457	20.1443	20.1433	20.1422	(88)
util rest of house	0.9973	0.9938	0.9806	0.9224	0.7608	0.5338	0.3638	0.4211	0.7255	0.9573	0.9936	0.9980	(89)
MIT 2	19.2791	19.4076	19.6293	19.9074	20.0880	20.1408	20.1461	20.1459	20.1145	19.8723	19.5214	19.2471	(90)
Living area fraction	19.5716	19.7002	19.9227	20.2046	20.3964	20.4572	20.4648	20.4639	20.4239	20.1665	19.8131	19.5389	(91)
MIT	19.5716	19.7002	19.9227	20.2046	20.3964	20.4572	20.4648	20.4639	20.4239	20.1665	19.8131	19.5389	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5716	19.7002	19.9227	20.2046	20.3964	20.4572	20.4648	20.4639	20.4239	20.1665	19.8131	19.5389	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	420.2367	472.1702	525.5728	566.0335	521.8414	375.9425	251.2490	263.3475	384.5670	428.1804	405.3420	399.7410	(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	1003.5260	971.8392	880.7590	739.2788	568.3527	381.6723	251.8407	264.6700	412.5479	625.2144	831.9244	1005.0940	(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	433.9672	335.7776	264.2586	124.7366	34.6044	0.0000	0.0000	0.0000	0.0000	146.5933	307.1393	450.3827	(98)
Space heating												2097.4597	(98)
Space heating per m2												29.7639	(99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													88.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2383.4769 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	433.9672	335.7776	264.2586	124.7366	34.6044	0.0000	0.0000	0.0000	0.0000	146.5933	307.1393	450.3827	(98)
Space heating efficiency (main heating system 1)	88.0000	88.0000	88.0000	88.0000	88.0000	0.0000	0.0000	0.0000	0.0000	88.0000	88.0000	88.0000	(210)
Space heating fuel (main heating system)	493.1446	381.5655	300.2938	141.7461	39.3232	0.0000	0.0000	0.0000	0.0000	166.5833	349.0220	511.7985	(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	192.4747	168.1316	174.9301	155.1542	150.2166	132.3024	126.7558	141.3030	142.8635	162.6786	173.6562	187.9547	(64)
Efficiency of water heater	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	(216)
Fuel for water heating, kWh/month	218.7213	191.0587	198.7842	176.3116	170.7007	150.3436	144.0407	160.5716	162.3449	184.8620	197.3366	213.5849	(219)
Water heating fuel used												2168.6607	(219)
Annual totals kWh/year													
Space heating fuel - main system												2383.4769	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
Total electricity for the above, kWh/year												30.0000	(231)
Electricity for lighting (calculated in Appendix L)												321.6528	(232)
Total delivered energy for all uses												4903.7904	(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	2383.4769	0.2160	514.8310 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2168.6607	0.2160	468.4307 (264)
Space and water heating			983.2617 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	321.6528	0.5190	166.9378 (268)
Total CO2, kg/year			1165.7695 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.5400 (273)

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

DER		16.5400	ZC1
Total Floor Area		70.4700	
Assumed number of occupants	TFA	2.2575	
CO2 emission factor in Table 12 for electricity displaced from grid	N	0.5190	
CO2 emissions from appliances, equation (L14)	EF	16.6827	ZC2
CO2 emissions from cooking, equation (L16)		2.4575	ZC3
Total CO2 emissions		35.6801	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		35.6801	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	70.4700 (1b)	x 2.6000 (2b)	= 183.2220 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.2220 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1637 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4137 (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) =				0.3206 (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	0.4088	0.4008	0.3928	0.3527	0.3447	0.3046	0.3046	0.2966	0.3206	0.3447	0.3607	0.3768 (22b)
Effective ac	0.5836	0.5803	0.5771	0.5622	0.5594	0.5464	0.5464	0.5440	0.5514	0.5594	0.5651	0.5710 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.8100	1.3258	18.3087		(27)
External Wall 1	68.8200	13.8100	55.0100	0.1800	9.9018		(29a)
External Wall 2	18.7200	1.8900	16.8300	0.1800	3.0294		(29a)
External Roof 1	49.6700		49.6700	0.1300	6.4571		(30)
Total net area of external elements Aum(A, m ²)			137.2100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.5870	(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)							20.3951 (36)
Total fabric heat loss						(33) + (36) =	59.9821 (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	35.2844	35.0882	34.8959	33.9926	33.8236	33.0368	33.0368	32.8911	33.3398	33.8236	34.1655	34.5229 (38)
Heat transfer coeff	95.2665	95.0703	94.8780	93.9747	93.8057	93.0189	93.0189	92.8732	93.3220	93.8057	94.1476	94.5050 (39)
Average = Sum(39)m / 12 =												93.9739 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3519	1.3491	1.3464	1.3335	1.3311	1.3200	1.3200	1.3179	1.3243	1.3311	1.3360	1.3411 (40)
HLP (average)												1.3335 (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												2.2575 (42)
Average daily hot water use (litres/day)												87.8152 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5967	93.0841	89.5715	86.0589	82.5463	79.0337	79.0337	82.5463	86.0589	89.5715	93.0841	96.5967 (44)
Energy conte	143.2501	125.2875	129.2854	112.7142	108.1519	93.3269	86.4811	99.2383	100.4235	117.0339	127.7517	138.7301 (45)
Energy content (annual)												Total = Sum(45)m = 1381.6747 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4875	18.7931	19.3928	16.9071	16.2228	13.9990	12.9722	14.8857	15.0635	17.5551	19.1628	20.8095 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	49.2246	42.8442	45.6446	42.4400	42.0647	38.9755	40.2747	42.0647	42.4400	45.6446	45.9045	49.2246 (61)
Total heat required for water heating calculated for each month	192.4747	168.1316	174.9301	155.1542	150.2166	132.3024	126.7558	141.3030	142.8635	162.6786	173.6562	187.9547 (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	192.4747	168.1316	174.9301	155.1542	150.2166	132.3024	126.7558	141.3030	142.8635	162.6786	173.6562	187.9547 (64)
Heat gains from water heating, kWh/month	59.9368	52.3691	54.3986	48.0875	46.4767	40.7751	38.8236	43.5129	44.0008	50.3249	53.9536	58.4339 (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	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8515	15.8556	12.8946	9.7620	7.2972	6.1606	6.6568	8.6527	11.6137	14.7463	17.2111	18.3477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.3915	200.4502	195.2624	184.2181	170.2768	157.1738	148.4203	146.3616	151.5494	162.5937	176.5350	189.6380 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874 (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)	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992 (71)
Water heating gains (Table 5)	80.5602	77.9302	73.1164	66.7881	62.4687	56.6320	52.1823	58.4851	61.1123	67.6411	74.9355	78.5402 (72)
Total internal gains	356.6655	354.0982	341.1356	320.6305	299.9049	279.8287	267.1216	273.3617	284.1376	304.8432	328.5438	346.3880 (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
Southwest					3.0500	36.7938	0.6300	0.7000			0.7700	34.2963 (79)
Northwest					10.7600	11.2829	0.6300	0.7000			0.7700	37.1028 (81)

Solar gains	71.3990	133.9430	216.0015	322.5050	411.3140	430.3688	405.7539	336.1305	252.3523	156.8617	87.7639	59.6504 (83)
Total gains	428.0645	488.0412	557.1371	643.1356	711.2189	710.1976	672.8755	609.4922	536.4899	461.7049	416.3077	406.0385 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.3690	51.4751	51.5794	52.0752	52.1690	52.6103	52.6103	52.6928	52.4394	52.1690	51.9796	51.7830
alpha	4.4246	4.4317	4.4386	4.4717	4.4779	4.5074	4.5074	4.5129	4.4960	4.4779	4.4653	4.4522
util living area	0.9978	0.9957	0.9892	0.9645	0.8901	0.7398	0.5812	0.6518	0.8840	0.9812	0.9959	0.9983 (86)
MIT	19.5040	19.6564	19.9389	20.3335	20.6912	20.9096	20.9764	20.9613	20.7809	20.3258	19.8475	19.4773 (87)
Th 2	19.8004	19.8026	19.8047	19.8147	19.8165	19.8252	19.8252	19.8268	19.8219	19.8165	19.8127	19.8088 (88)
util rest of house	0.9970	0.9942	0.9850	0.9498	0.8442	0.6398	0.4393	0.5085	0.8161	0.9710	0.9941	0.9977 (89)
MIT 2	17.8238	18.0478	18.4600	19.0311	19.5123	19.7652	19.8169	19.8110	19.6400	19.0300	18.3344	17.7904 (90)
Living area fraction									fLA = Living area / (4) =			0.3741 (91)
MIT	18.4523	18.6495	19.0132	19.5183	19.9533	20.1933	20.2506	20.2413	20.0667	19.5147	18.9004	18.4214 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4523	18.6495	19.0132	19.5183	19.9533	20.1933	20.2506	20.2413	20.0667	19.5147	18.9004	18.4214 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9957	0.9920	0.9812	0.9452	0.8503	0.6738	0.4929	0.5625	0.8329	0.9674	0.9922	0.9966 (94)
Ext temp.	4.2369	4.8000	5.4676	6.0789	6.6044	7.1795	7.7381	8.3337	8.9587	9.6576	10.4018	11.2000 (95)
Heat loss rate W	4.3000	4.9000	5.5000	6.1000	6.7000	7.3000	7.9000	8.5000	9.1000	9.7000	10.3000	10.9000 (96)
Month fracti	1348.2387	1307.1707	1187.2295	997.8511	774.2045	520.2811	339.5757	356.7549	556.8285	836.2492	1110.9816	1343.9948 (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	685.9694	553.0775	476.5717	280.7798	126.0522	0.0000	0.0000	0.0000	0.0000	289.8562	502.5166	698.8632 (98)
Space heating per m2										(98) / (4) =		51.2798 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3869.0434 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	685.9694	553.0775	476.5717	280.7798	126.0522	0.0000	0.0000	0.0000	0.0000	289.8562	502.5166	698.8632	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	734.4426	592.1600	510.2481	300.6208	134.9595	0.0000	0.0000	0.0000	0.0000	310.3385	538.0263	748.2475	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	192.4747	168.1316	174.9301	155.1542	150.2166	132.3024	126.7558	141.3030	142.8635	162.6786	173.6562	187.9547	(64)
Efficiency of water heater	87.9755	87.8248	87.4468	86.5266	84.6133	80.3000	80.3000	80.3000	80.3000	86.4894	87.5712	88.0527	(216)
(217)m	87.9755	87.8248	87.4468	86.5266	84.6133	80.3000	80.3000	80.3000	80.3000	86.4894	87.5712	88.0527	(217)
Fuel for water heating, kWh/month	218.7823	191.4398	200.0418	179.3139	177.5331	164.7602	157.8528	175.9689	177.9122	188.0909	198.3028	213.4570	(219)
Water heating fuel used												2243.4556	(219)
Annual totals kWh/year													
Space heating fuel - main system												3869.0434	(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)												315.2633	(232)
Total delivered energy for all uses												6502.7623	(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	3869.0434	0.2160	835.7134 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2243.4556	0.2160	484.5864 (264)
Space and water heating			1320.2998 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	315.2633	0.5190	163.6216 (268)
Total CO2, kg/m2/year			1522.8464 (272)
Emissions per m2 for space and water heating			18.7356 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3219 (272b)
Emissions per m2 for pumps and fans			0.5524 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.7356 * 1.00) + 2.3219 + 0.5524, rounded to 2 d.p.			21.6100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122161			Issued on Date	02/11/2022
Assessment Reference	003 - be lean	Prop Type Ref			
Property	Flat 3, 32, Norwich Road, Northwood, HA6 1NB				
SAP Rating	85 B	DER	16.07	TER	19.02
Environmental	88 B	% DER<TER	15.51		
CO ₂ Emissions (t/year)	0.95	DFEE	34.27	TFEE	52.56
General Requirements Compliance	Pass	% DFEE<TFEE	34.81		
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com			Assessor ID	L706-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 70 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.02 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.07 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 34.3 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	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.87 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 88%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 1.20 m², No overhang
Windows facing South East: 6.43 m², No overhang
Windows facing South West: 6.17 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.80 W/m²K
Thermal bridging y-value 0.034 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	4.8700 (1b)	x 2.6000 (2b)	= 12.6620 (1b) - (3b)
First floor	65.5100 (1c)	x 2.5000 (2c)	= 163.7750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.4370 (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							1 * 10 =	10.0000 (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) =						10.0000 / (5) =	0.0567 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.2067 (18)					
Number of sides sheltered							1 (19)					
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1912 (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	0.2438	0.2390	0.2342	0.2103	0.2055	0.1816	0.1816	0.1768	0.1912	0.2055	0.2151	0.2246 (22b)
Effective ac	0.5297	0.5286	0.5274	0.5221	0.5211	0.5165	0.5165	0.5156	0.5183	0.5211	0.5231	0.5252 (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					
Opening Type 1 (Uw = 0.80)			13.8000	0.7752	10.6977		(27)					
Opening Type 2			1.8900	1.4000	2.6460		(26)					
External Wall 1	87.7500	13.8000	73.9500	0.1400	10.3530		(29a)					
External Wall 2	3.9000	1.8900	2.0100	0.1321	0.2654		(29a)					
External Roof 1	65.5100		65.5100	0.1400	9.1714		(30)					
Total net area of external elements Aum(A, m2)			157.1600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		33.1335		(33)					
Party Wall 1			28.1800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3678 (36)					
Total fabric heat loss						(33) + (36) =	38.5013 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.8418	Feb 30.7746	Mar 30.7088	Apr 30.3995	May 30.3417	Jun 30.0724	Jul 30.0724	Aug 30.0225	Sep 30.1761	Oct 30.3417	Nov 30.4587	Dec 30.5811 (38)
Heat transfer coeff	69.3431	69.2759	69.2101	68.9008	68.8430	68.5737	68.5737	68.5238	68.6774	68.8430	68.9600	69.0824 (39)
Average = Sum(39)m / 12 =												68.9006 (39)
HLP	Jan 0.9853	Feb 0.9843	Mar 0.9834	Apr 0.9790	May 0.9782	Jun 0.9743	Jul 0.9743	Aug 0.9736	Sep 0.9758	Oct 0.9782	Nov 0.9798	Dec 0.9816 (40)
HLP (average)												0.9790 (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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	Jan 96.5401	Feb 93.0296	Mar 89.5190	Apr 86.0085	May 82.4979	Jun 78.9874	Jul 78.9874	Aug 82.4979	Sep 86.0085	Oct 89.5190	Nov 93.0296	Dec 96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)										Total = Sum(45)m =		1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	49.1958	42.8191	45.6179	42.4151	42.0400	38.9527	40.2511	42.0400	42.4151	45.6179	45.8776	49.1958 (61)
Total heat required for water heating calculated for each month	192.3620	168.0331	174.8276	155.0633	150.1286	132.2249	126.6815	141.2202	142.7798	162.5833	173.5545	187.8446 (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	192.3620	168.0331	174.8276	155.0633	150.1286	132.2249	126.6815	141.2202	142.7798	162.5833	173.5545	187.8446 (64)
Heat gains from water heating, kWh/month	59.9017	52.3384	54.3667	48.0593	46.4495	40.7512	38.8009	43.4874	43.9750	50.2955	53.9220	58.3997 (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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1923	16.1583	13.1408	9.9484	7.4366	6.2783	6.7839	8.8179	11.8354	15.0278	17.5396	18.6979 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766 (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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126 (71)
Water heating gains (Table 5)	80.5130	77.8846	73.0735	66.7490	62.4321	56.5989	52.1517	58.4508	61.0765	67.6014	74.8916	78.4942 (72)
Total internal gains	356.7174	354.1114	341.1005	320.5510	299.7956	279.7150	267.0291	273.3058	284.1312	304.8812	328.6099	346.4598 (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
Northeast	1.2000	11.2829	0.5700	0.7000	0.7700	3.7438 (75)
Southeast	6.4300	36.7938	0.5700	0.7000	0.7700	65.4172 (77)
Southwest	6.1700	36.7938	0.5700	0.7000	0.7700	62.7721 (79)

Solar gains	131.9331	225.9743	312.4910	392.7279	444.9413	443.9465	427.0868	387.7934	340.2251	250.6404	158.2518	112.7607 (83)
Total gains	488.6505	580.0857	653.5915	713.2789	744.7369	723.6615	694.1159	661.0992	624.3564	555.5215	486.8617	459.2205 (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	70.4829	70.5512	70.6183	70.9353	70.9949	71.2737	71.2737	71.3256	71.1661	70.9949	70.8744	70.7489
alpha	5.6989	5.7034	5.7079	5.7290	5.7330	5.7516	5.7516	5.7550	5.7444	5.7330	5.7250	5.7166
util living area	0.9958	0.9883	0.9680	0.9091	0.7803	0.5925	0.4326	0.4733	0.7145	0.9361	0.9897	0.9970 (86)
MIT	20.0763	20.2542	20.4896	20.7448	20.9186	20.9861	20.9980	20.9968	20.9618	20.7301	20.3435	20.0326 (87)
Th 2	20.0956	20.0964	20.0972	20.1009	20.1016	20.1048	20.1048	20.1054	20.1035	20.1016	20.1002	20.0987 (88)
util rest of house	0.9944	0.9847	0.9582	0.8828	0.7268	0.5156	0.3457	0.3831	0.6383	0.9114	0.9859	0.9960 (89)
MIT 2	19.2573	19.4339	19.6640	19.9052	20.0505	20.0988	20.1043	20.1045	20.0846	19.8980	19.5266	19.2164 (90)
Living area fraction	19.5860	19.7632	19.9954	20.2422	20.3989	20.4550	20.4630	20.4626	20.4367	20.2320	19.8545	19.5440 (92)
Temperature adjustment	19.5860	19.7632	19.9954	20.2422	20.3989	20.4550	20.4630	20.4626	20.4367	20.2320	19.8545	19.5440 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9934	0.9831	0.9569	0.8873	0.7455	0.5463	0.3807	0.4194	0.6679	0.9156	0.9846	0.9952 (94)
Ext temp.	485.4405	570.2756	625.4535	632.9203	555.1806	395.3465	264.2586	277.2742	417.0124	508.6085	479.3642	457.0314 (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	1059.9800	1029.6583	934.0198	781.4873	598.8596	401.4964	264.9025	278.3881	435.1868	663.0946	879.5530	1059.9996 (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	427.4574	308.7052	229.5733	106.9683	32.4972	0.0000	0.0000	0.0000	0.0000	114.9377	288.1359	448.6083 (98)
												1956.8832 (98)
												27.8045 (99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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 %)													88.0000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2223.7309 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	427.4574	308.7052	229.5733	106.9683	32.4972	0.0000	0.0000	0.0000	0.0000	114.9377	288.1359	448.6083	(98)
Space heating efficiency (main heating system 1)	88.0000	88.0000	88.0000	88.0000	88.0000	0.0000	0.0000	0.0000	0.0000	88.0000	88.0000	88.0000	(210)
Space heating fuel (main heating system)	485.7470	350.8014	260.8787	121.5548	36.9286	0.0000	0.0000	0.0000	0.0000	130.6110	327.4272	509.7822	(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	192.3620	168.0331	174.8276	155.0633	150.1286	132.2249	126.6815	141.2202	142.7798	162.5833	173.5545	187.8446	(64)
Efficiency of water heater (217)m	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	(216)
Fuel for water heating, kWh/month	218.5931	190.9468	198.6677	176.2083	170.6007	150.2556	143.9563	160.4775	162.2498	184.7537	197.2210	213.4598	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2223.7309 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													30.0000 (231)
Electricity for lighting (calculated in Appendix L)													321.2820 (232)
Total delivered energy for all uses													4742.4031 (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	2223.7309	0.2160	480.3259 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2167.3902	0.2160	468.1563 (264)
Space and water heating			948.4822 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	321.2820	0.5190	166.7454 (268)
Total CO2, kg/year			1130.7975 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.0700 (273)

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

DER			16.0700 ZC1
Total Floor Area	TFA		70.3800
Assumed number of occupants	N		2.2553
CO2 emission factor in Table 12 for electricity displaced from grid	EF		0.5190
CO2 emissions from appliances, equation (L14)			16.6864 ZC2
CO2 emissions from cooking, equation (L16)			2.4599 ZC3
Total CO2 emissions			35.2163 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			35.2163 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	4.8700 (1b)	x 2.6000 (2b)	= 12.6620 (1b) - (3b)
First floor	65.5100 (1c)	x 2.5000 (2c)	= 163.7750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.4370 (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																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1700 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4200 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3885 (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	0.4954	0.4857	0.4759	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565	(22b)				
Effective ac	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			13.8000	1.3258	18.2955		(27)					
External Wall 1	87.7500	13.8000	73.9500	0.1800	13.3110		(29a)					
External Wall 2	3.9000	1.8900	2.0100	0.1800	0.3618		(29a)					
External Roof 1	65.5100		65.5100	0.1300	8.5163		(30)					
Total net area of external elements Aum(A, m2)			157.1600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.3746		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1980 (36)					
Total fabric heat loss						(33) + (36) =	51.5726 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.2561	Feb 35.9787	Mar 35.7068	Apr 34.4296	May 34.1907	Jun 33.0783	Jul 33.0783	Aug 32.8723	Sep 33.5067	Oct 34.1907	Nov 34.6741	Dec 35.1794 (38)
Heat transfer coeff	87.8287	87.5513	87.2794	86.0022	85.7632	84.6508	84.6508	84.4448	85.0793	85.7632	86.2466	86.7520 (39)
Average = Sum(39)m / 12 =												86.0010 (39)
HLP	Jan 1.2479	Feb 1.2440	Mar 1.2401	Apr 1.2220	May 1.2186	Jun 1.2028	Jul 1.2028	Aug 1.1998	Sep 1.2089	Oct 1.2186	Nov 1.2254	Dec 1.2326 (40)
HLP (average)												1.2220 (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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	Jan 96.5401	Feb 93.0296	Mar 89.5190	Apr 86.0085	May 82.4979	Jun 78.9874	Jul 78.9874	Aug 82.4979	Sep 86.0085	Oct 89.5190	Nov 93.0296	Dec 96.5401 (44)
Energy content	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)										Total = Sum(45)m =		1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	49.1958	42.8191	45.6179	42.4151	42.0400	38.9527	40.2511	42.0400	42.4151	45.6179	45.8776	49.1958 (61)
Solar input	192.3620	168.0331	174.8276	155.0633	150.1286	132.2249	126.6815	141.2202	142.7798	162.5833	173.5545	187.8446 (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	192.3620	168.0331	174.8276	155.0633	150.1286	132.2249	126.6815	141.2202	142.7798	162.5833	173.5545	187.8446 (64)
	59.9017	52.3384	54.3667	48.0593	46.4495	40.7512	38.8009	43.4874	43.9750	50.2955	53.9220	58.3997 (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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8315	15.8378	12.8802	9.7511	7.2891	6.1537	6.6493	8.6431	11.6007	14.7298	17.1918	18.3271	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	80.5130	77.8846	73.0735	66.7490	62.4321	56.5989	52.1517	58.4508	61.0765	67.6014	74.8916	78.4942	(72)
Total internal gains	356.3566	353.7910	340.8399	320.3538	299.6481	279.5904	266.8946	273.1309	283.8965	304.5831	328.2620	346.0890	(73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast	1.2000				11.2829		0.6300		0.7000		0.7700		4.1379 (75)	
Southeast	6.4300				36.7938		0.6300		0.7000		0.7700		72.3033 (77)	
Southwest	6.1700				36.7938		0.6300		0.7000		0.7700		69.3796 (79)	
Solar gains	145.8207	249.7611	345.3848	434.0676	491.7772	490.6778	472.0433	428.6138	376.0383	277.0236	174.9099	124.6302	(83)	
Total gains	502.1774	603.5521	686.2247	754.4214	791.4253	770.2682	738.9379	701.7447	659.9348	581.6067	503.1720	470.7192	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.6481	55.8244	55.9984	56.8300	56.9883	57.7372	57.7372	57.8780	57.4464	56.9883	56.6689	56.3388	
alpha	4.7099	4.7216	4.7332	4.7887	4.7992	4.8491	4.8491	4.8585	4.8298	4.7992	4.7779	4.7559	
util living area	0.9958	0.9895	0.9740	0.9302	0.8308	0.6599	0.4949	0.5391	0.7767	0.9512	0.9908	0.9969	(86)
MIT	19.7326	19.9342	20.2160	20.5537	20.8153	20.9558	20.9910	20.9866	20.9016	20.5536	20.0782	19.7009	(87)
Th 2	19.8819	19.8850	19.8880	19.9025	19.9052	19.9178	19.9178	19.9201	19.9129	19.9052	19.8997	19.8940	(88)
util rest of house	0.9943	0.9860	0.9651	0.9062	0.7756	0.5656	0.3779	0.4198	0.6921	0.9293	0.9871	0.9958	(89)
MIT 2	18.2128	18.5075	18.9147	19.3959	19.7317	19.8898	19.9147	19.9150	19.8398	19.4080	18.7290	18.1750	(90)
Living area fraction	18.8229	19.0802	19.4370	19.8606	20.1667	20.3177	20.3467	20.3451	20.2660	19.8678	19.2705	18.7875	(92)
Temperature adjustment	18.8229	19.0802	19.4370	19.8606	20.1667	20.3177	20.3467	20.3451	20.2660	19.8678	19.2705	18.7875	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	498.3846	593.0890	659.1801	682.8647	625.3116	463.7709	314.1454	328.3967	476.4607	539.9497	495.2517	468.0305	(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	1275.5247	1241.4942	1129.1324	942.6392	726.1308	484.0069	317.1628	333.1459	524.6016	794.8394	1049.6671	1265.4956	(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	578.1923	435.7284	349.6445	187.0376	75.0095	0.0000	0.0000	0.0000	0.0000	189.6380	399.1791	593.3140	(98)
Space heating												2807.7433	(98)
Space heating per m2												39.8941	(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 %)												93.4000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3006.1491 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	578.1923	435.7284	349.6445	187.0376	75.0095	0.0000	0.0000	0.0000	0.0000	189.6380	399.1791	593.3140 (98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000 (210)
Space heating fuel (main heating system)	619.0496	466.5186	374.3517	200.2544	80.3099	0.0000	0.0000	0.0000	0.0000	203.0385	427.3866	635.2398 (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	192.3620	168.0331	174.8276	155.0633	150.1286	132.2249	126.6815	141.2202	142.7798	162.5833	173.5545	187.8446 (64)
Efficiency of water heater (217)m	87.6479	87.3425	86.7623	85.5242	83.4046	80.3000	80.3000	80.3000	80.3000	85.4395	87.0810	80.3000 (216)
Fuel for water heating, kWh/month	219.4713	192.3841	201.5018	181.3093	180.0003	164.6636	157.7603	175.8658	177.8080	190.2905	199.3024	214.0775 (219)
Water heating fuel used												2254.4349 (219)
Annual totals kWh/year												
Space heating fuel - main system												3006.1491 (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)												314.9105 (232)
Total delivered energy for all uses												5650.4945 (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	3006.1491	0.2160	649.3282 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2254.4349	0.2160	486.9579 (264)
Space and water heating			1136.2862 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	314.9105	0.5190	163.4385 (268)
Total CO2, kg/m2/year			1338.6497 (272)
Emissions per m2 for space and water heating			16.1450 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3222 (272b)
Emissions per m2 for pumps and fans			0.5531 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.1450 * 1.00) + 2.3222 + 0.5531, rounded to 2 d.p.			19.0200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122162			Issued on Date	02/11/2022	
Assessment Reference	004 - be lean		Prop Type Ref			
Property	Flat 4, 32, Norwich Road, Northwood, HA6 1NB					
SAP Rating	84 B	DER	17.30	TER	20.33	
Environmental	91 B	% DER<TER	14.90			
CO ₂ Emissions (t/year)	0.56	DFEE	27.24	TFEE	42.09	
General Requirements Compliance	Pass	% DFEE<TFEE	35.29			
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com			Assessor ID	L706-0001	
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 38 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.33 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.30 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)27.2 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	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.92 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
tbc tbc
Combi boiler
Efficiency: 88%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls: No cylinder

Boiler interlock Yes OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South East: 3.38 m², No overhang
Windows facing South: 3.65 m², No overhang
Windows facing South West: 0.92 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.80 W/m²K
Thermal bridging y-value 0.035 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	37.5000 (1b)	x 2.6000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (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					1 * 10 = 10.0000 (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) =				10.0000 / (5) = 0.1026 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2526 (18)
Number of sides sheltered					4 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1768 (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	0.2254	0.2210	0.2166	0.1945	0.1901	0.1680	0.1680	0.1635	0.1768	0.1901	0.1989	0.2077 (22b)
Effective ac	0.5254	0.5244	0.5235	0.5189	0.5181	0.5141	0.5141	0.5134	0.5156	0.5181	0.5198	0.5216 (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						
Opening Type 1 (Uw = 0.80)			7.9500	0.7752	6.1628			(27)					
Opening Type 2			1.8900	1.4000	2.6460			(26)					
External Wall 1	37.4400	7.9500	29.4900	0.1400	4.1286			(29a)					
External Wall 2	13.7800	1.8900	11.8900	0.1321	1.5701			(29a)					
External Roof 1	17.4100		17.4100	0.1400	2.4374			(30)					
Total net area of external elements Aum(A, m2)			68.6300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.9449			(33)					
Party Wall 1			20.9800	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								2.4208 (36)					
Total fabric heat loss						(33) + (36) =	19.3657	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 16.9049	Feb 16.8732	Mar 16.8421	Apr 16.6959	May 16.6686	Jun 16.5413	Jul 16.5413	Aug 16.5177	Sep 16.5903	Oct 16.6686	Nov 16.7239	Dec 16.7817	(38)
Heat transfer coeff	36.2706	36.2389	36.2077	36.0616	36.0343	35.9070	35.9070	35.8834	35.9560	36.0343	36.0896	36.1474	(39)
Average = Sum(39)m / 12 =												36.0615	(39)
HLP	Jan 0.9672	Feb 0.9664	Mar 0.9655	Apr 0.9616	May 0.9609	Jun 0.9575	Jul 0.9575	Aug 0.9569	Sep 0.9588	Oct 0.9609	Nov 0.9624	Dec 0.9639	(40)
HLP (average)												0.9616	(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												1.3416 (42)
Average daily hot water use (litres/day)												66.0628 (43)
Daily hot water use	72.6691	70.0266	67.3841	64.7415	62.0990	59.4565	59.4565	62.0990	64.7415	67.3841	70.0266	72.6691 (44)
Energy conte	107.7661	94.2530	97.2606	84.7942	81.3620	70.2092	65.0592	74.6563	75.5480	88.0439	96.1068	104.3658 (45)
Energy content (annual)												1039.4250 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	16.1649	14.1379	14.5891	12.7191	12.2043	10.5314	9.7589	11.1985	11.3322	13.2066	14.4160	15.6549 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Total heat required for water heating calculated for each month	37.0314	32.2314	34.3382	31.9273	31.6450	29.3210	30.2984	31.6450	31.9273	34.3382	34.5336	37.0314 (61)
Solar input	144.7975	126.4844	131.5988	116.7215	113.0070	99.5303	95.3576	106.3013	107.4753	122.3821	130.6404	141.3971 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	144.7975	126.4844	131.5988	116.7215	113.0070	99.5303	95.3576	106.3013	107.4753	122.3821	130.6404	141.3971 (64)
Heat gains from water heating, kWh/month	45.0901	39.3970	40.9237	36.1759	34.9641	30.6748	29.2068	32.7345	33.1015	37.8591	40.5889	43.9595 (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	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.4505	9.2820	7.5486	5.7148	4.2719	3.6065	3.8970	5.0654	6.7988	8.6326	10.0755	10.7409	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	(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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	(71)
Water heating gains (Table 5)	60.6050	58.6264	55.0050	50.2443	46.9948	42.6039	39.2564	43.9980	45.9744	50.8859	56.3735	59.0853	(72)
Total internal gains	232.4805	230.5300	222.1601	209.1469	196.3520	183.6806	175.5362	180.2497	186.9745	200.1387	215.1716	226.1639	(73)

6. Solar gains

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

Southeast				3.3800	36.7938	0.5700	0.7000			0.7700			34.3873 (77)
South				3.6500	46.7521	0.5700	0.7000			0.7700			47.1845 (78)
Southwest				0.9200	36.7938	0.5700	0.7000			0.7700			9.3599 (79)

Solar gains	90.9317	151.7937	200.3943	237.5853	257.4351	252.0485	244.4470	229.9831	213.2272	165.7073	108.3288	78.2102	(83)
Total gains	323.4122	382.3237	422.5544	446.7322	453.7871	435.7292	419.9832	410.2328	400.2018	365.8460	323.5004	304.3741	(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	71.7983	71.8612	71.9229	72.2144	72.2692	72.5254	72.5254	72.5730	72.4265	72.2692	72.1584	72.0430
alpha	5.7866	5.7907	5.7949	5.8143	5.8179	5.8350	5.8350	5.8382	5.8284	5.8179	5.8106	5.8029
util living area	0.9875	0.9684	0.9281	0.8430	0.7006	0.5214	0.3754	0.4012	0.6048	0.8634	0.9708	0.9909 (86)
MIT	20.2581	20.4476	20.6557	20.8451	20.9554	20.9932	20.9991	20.9987	20.9843	20.8473	20.5135	20.2076 (87)
Th 2	20.1107	20.1115	20.1121	20.1154	20.1160	20.1189	20.1189	20.1194	20.1178	20.1160	20.1148	20.1135 (88)
util rest of house	0.9838	0.9598	0.9099	0.8077	0.6456	0.4523	0.3007	0.3250	0.5337	0.8243	0.9613	0.9881 (89)
MIT 2	19.4494	19.6340	19.8312	20.0023	20.0893	20.1160	20.1187	20.1191	20.1105	20.0088	19.7032	19.4020 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.6845	19.8705	20.0709	20.2472	20.3410	20.3710	20.3746	20.3748	20.3645	20.2525	19.9388	19.6361 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6845	19.8705	20.0709	20.2472	20.3410	20.3710	20.3746	20.3748	20.3645	20.2525	19.9388	19.6361 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9816	0.9571	0.9089	0.8133	0.6601	0.4723	0.3224	0.3472	0.5540	0.8309	0.9590	0.9863 (94)
Useful gains	317.4752	365.9207	384.0599	363.3428	299.5435	205.7890	135.4095	142.4331	221.7223	303.9914	310.2472	300.1990 (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	558.0035	542.5121	491.3710	409.1998	311.3738	207.2191	135.5345	142.6282	225.2466	347.8221	463.3454	557.9767 (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	178.9530	118.6694	79.8394	33.0171	8.8017	0.0000	0.0000	0.0000	0.0000	32.6101	110.2306	191.7866 (98)
Space heating												753.9080 (98)
Space heating per m2										(98) / (4) =		20.1042 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 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 %)												88.0000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												856.7136 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	178.9530	118.6694	79.8394	33.0171	8.8017	0.0000	0.0000	0.0000	0.0000	32.6101	110.2306	191.7866 (98)
Space heating efficiency (main heating system 1)	88.0000	88.0000	88.0000	88.0000	88.0000	0.0000	0.0000	0.0000	0.0000	88.0000	88.0000	88.0000 (210)
Space heating fuel (main heating system)	203.3557	134.8516	90.7266	37.5194	10.0020	0.0000	0.0000	0.0000	0.0000	37.0569	125.2621	217.9394 (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	144.7975	126.4844	131.5988	116.7215	113.0070	99.5303	95.3576	106.3013	107.4753	122.3821	130.6404	141.3971 (64)
Efficiency of water heater (217)m	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000 (216)
Fuel for water heating, kWh/month	164.5426	143.7322	149.5441	132.6381	128.4170	113.1026	108.3609	120.7970	122.1310	139.0705	148.4550	160.6785 (219)
Water heating fuel used												1631.4696 (219)
Annual totals kWh/year												
Space heating fuel - main system												856.7136 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
Total electricity for the above, kWh/year												30.0000 (231)
Electricity for lighting (calculated in Appendix L)												184.5583 (232)
Total delivered energy for all uses												2702.7415 (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	856.7136	0.2160	185.0501 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1631.4696	0.2160	352.3974 (264)
Space and water heating			537.4476 (265)
Pumps and fans	30.0000	0.5190	15.5700 (267)
Energy for lighting	184.5583	0.5190	95.7858 (268)
Total CO2, kg/year			648.8033 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3000 (273)

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

DER		17.3000 ZC1
Total Floor Area	TFA	37.5000
Assumed number of occupants	N	1.3416
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		18.2200 ZC2
CO2 emissions from cooking, equation (L16)		4.0320 ZC3
Total CO2 emissions		39.5520 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		39.5520 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	37.5000 (1b)	x 2.6000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.2051 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4551 (18)
Number of sides sheltered					4 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3186 (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	0.4062	0.3982	0.3903	0.3504	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	0.3743 (22b)
Effective ac	0.5825	0.5793	0.5762	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5701 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			7.4900	1.3258	9.9299		(27)
External Wall 1	37.4400	7.4900	29.9500	0.1800	5.3910		(29a)
External Wall 2	13.7800	1.8900	11.8900	0.1800	2.1402		(29a)
External Roof 1	17.4100		17.4100	0.1300	2.2633		(30)
Total net area of external elements Aum(A, m ²)			68.6300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 21.6144		(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)							3.8090 (36)
Total fabric heat loss						(33) + (36) =	25.4234 (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	18.7419	18.6389	18.5378	18.0633	17.9745	17.5612	17.5612	17.4846	17.7204	17.9745	18.1541	18.3419 (38)
Heat transfer coeff	44.1654	44.0623	43.9613	43.4867	43.3979	42.9846	42.9846	42.9081	43.1438	43.3979	43.5775	43.7653 (39)
Average = Sum(39)m / 12 =												43.4863 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1777	1.1750	1.1723	1.1596	1.1573	1.1463	1.1463	1.1442	1.1505	1.1573	1.1621	1.1671 (40)
HLP (average)												1.1596 (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												1.3416 (42)
Average daily hot water use (litres/day)												66.0628 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	72.6691	70.0266	67.3841	64.7415	62.0990	59.4565	59.4565	62.0990	64.7415	67.3841	70.0266	72.6691 (44)
Energy conte	107.7661	94.2530	97.2606	84.7942	81.3620	70.2092	65.0592	74.6563	75.5480	88.0439	96.1068	104.3658 (45)
Energy content (annual)												Total = Sum(45)m = 1039.4250 (45)
Distribution loss (46)m = 0.15 x (45)m	16.1649	14.1379	14.5891	12.7191	12.2043	10.5314	9.7589	11.1985	11.3322	13.2066	14.4160	15.6549 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

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Combi loss	37.0314	32.2314	34.3382	31.9273	31.6450	29.3210	30.2984	31.6450	31.9273	34.3382	34.5336	37.0314 (61)
Total heat required for water heating calculated for each month	144.7975	126.4844	131.5988	116.7215	113.0070	99.5303	95.3576	106.3013	107.4753	122.3821	130.6404	141.3971 (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	144.7975	126.4844	131.5988	116.7215	113.0070	99.5303	95.3576	106.3013	107.4753	122.3821	130.6404	141.3971 (64)
Heat gains from water heating, kWh/month	45.0901	39.3970	40.9237	36.1759	34.9641	30.6748	29.2068	32.7345	33.1015	37.8591	40.5889	43.9595 (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	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.3530	9.1955	7.4783	5.6615	4.2321	3.5729	3.8606	5.0182	6.7354	8.5521	9.9816	10.6408 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080 (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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637 (71)
Water heating gains (Table 5)	60.6050	58.6264	55.0050	50.2443	46.9948	42.6039	39.2564	43.9980	45.9744	50.8859	56.3735	59.0853 (72)
Total internal gains	232.3831	230.4435	222.0898	209.0937	196.3122	183.6470	175.4999	180.2025	186.9112	200.0582	215.0777	226.0638 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast				3.1800	36.7938		0.6300		0.7000		0.7700		35.7581 (77)
South				3.4400	46.7521		0.6300		0.7000		0.7700		49.1509 (78)
Southwest				0.8700	36.7938		0.6300		0.7000		0.7700		9.7829 (79)
Solar gains	94.6918	158.0695	208.6770	247.4016	268.0684	262.4581	254.5431	239.4840	222.0391	172.5577	112.8081		81.4444 (83)
Total gains	327.0749	388.5130	430.7668	456.4952	464.3806	446.1051	430.0430	419.6865	408.9503	372.6159	327.8857	307.5082	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.9640	59.1019	59.2378	59.8842	60.0067	60.5837	60.5837	60.6918	60.3602	60.0067	59.7594	59.5030
alpha	4.9309	4.9401	4.9492	4.9923	5.0004	5.0389	5.0389	5.0461	5.0240	5.0004	4.9840	4.9669
util living area	0.9898	0.9762	0.9484	0.8863	0.7700	0.5948	0.4358	0.4647	0.6808	0.9021	0.9779	0.9923 (86)
MIT	19.9688	20.1770	20.4290	20.6960	20.8849	20.9756	20.9957	20.9941	20.9517	20.7119	20.2876	19.9261 (87)
Th 2	19.9378	19.9401	19.9422	19.9524	19.9543	19.9632	19.9632	19.9649	19.9598	19.9543	19.9505	19.9464 (88)
util rest of house	0.9866	0.9691	0.9331	0.8538	0.7104	0.5076	0.3352	0.3630	0.5959	0.8669	0.9700	0.9899 (89)
MIT 2	18.5950	18.8951	19.2518	19.6197	19.8505	19.9483	19.9618	19.9627	19.9264	19.6505	19.0650	18.5395 (90)
Living area fraction	18.9943	19.2677	19.5940	19.9325	20.1512	20.2469	20.2623	20.2625	20.2244	19.9590	19.4203	18.9425 (92)
Temperature adjustment	18.9943	19.2677	19.5940	19.9325	20.1512	20.2469	20.2623	20.2625	20.2244	19.9590	19.4203	18.9425 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	321.4475	374.2778	399.3469	389.4486	335.4833	237.4406	156.7911	164.8060	253.0021	323.0964	316.3528	303.4026 (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	648.9793	633.0726	575.6282	479.7691	366.7636	242.7282	157.4234	165.7320	264.2299	406.1626	536.8898	645.2114 (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	243.6837	173.9101	131.1533	65.0307	23.2725	0.0000	0.0000	0.0000	0.0000	61.8013	158.7867	254.3057 (98)
Space heating												1111.9440 (98)
Space heating per m2												29.6518 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1190.5182 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	243.6837	173.9101	131.1533	65.0307	23.2725	0.0000	0.0000	0.0000	0.0000	61.8013	158.7867	254.3057	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	260.9033	186.1992	140.4211	69.6260	24.9171	0.0000	0.0000	0.0000	0.0000	66.1684	170.0071	272.2760	(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	144.7975	126.4844	131.5988	116.7215	113.0070	99.5303	95.3576	106.3013	107.4753	122.3821	130.6404	141.3971	(64)
Efficiency of water heater	86.3517	85.8532	85.0427	83.6437	81.8619	80.3000	80.3000	80.3000	80.3000	83.4276	85.5434	86.5118	(216)
Fuel for water heating, kWh/month	167.6834	147.3263	154.7444	139.5461	138.0459	123.9480	118.7516	132.3802	133.8422	146.6926	152.7183	163.4426	(219)
Water heating fuel used												1719.1218	(219)
Annual totals kWh/year													
Space heating fuel - main system												1190.5182	(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)												182.8380	(232)
Total delivered energy for all uses												3167.4779	(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	1190.5182	0.2160	257.1519 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1719.1218	0.2160	371.3303 (264)
Space and water heating			628.4822 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	182.8380	0.5190	94.8929 (268)
Total CO2, kg/m2/year			762.3002 (272)
Emissions per m2 for space and water heating			16.7595 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5305 (272b)
Emissions per m2 for pumps and fans			1.0380 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.7595 * 1.00) + 2.5305 + 1.0380, rounded to 2 d.p.			20.3300 (273)

APPENDIX B – SAP CALCULATIONS FOR THE BE CLEAN CASE

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122159			Issued on Date	01/11/2022	
Assessment Reference	001 be clean		Prop Type Ref			
Property	Flat 1, 32, Norwich Road, Northwood, HA6 1NB					
SAP Rating	91 B	DER	9.78	TER	24.46	
Environmental	92 A	% DER<TER	60.01			
CO ₂ Emissions (t/year)	0.93	DFEE	33.91	TFEE	53.99	
General Requirements Compliance	Pass	% DFEE<TFEE	37.19			
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com			Assessor ID	L706-0001	
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 117 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
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.46 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.78 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.85 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 5.0 kW PUZ-WM50VHA

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 0.98 kWh/day
Permitted by DBSCG 2.03 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

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: 0.53
Maximum 1.5 OK
MVHR efficiency: 95%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South East: 3.24 m², No overhang
Windows facing South: 3.65 m², No overhang
Windows facing South West: 3.05 m², No overhang
Windows facing North West: 10.76 m², No overhang
Air change rate: 1.90 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Floor U-value 0.11 W/m²K
Window U-value 0.80 W/m²K
Thermal bridging y-value 0.017 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	116.8500 (1b)	x 2.6000 (2b)	= 303.8100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 303.8100 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.7500 (23c)
Effective ac	0.2445	0.2416	0.2387	0.2241	0.2212	0.2067	0.2067	0.2038	0.2125	0.2212	0.2270	0.2328 (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						
Opening Type 1 (Uw = 0.80)			20.7000	0.7752	16.0465			(27)					
Opening Type 2			1.8900	1.4000	2.6460			(26)					
Heat Loss Floor 1			116.8500	0.1100	12.8535			(28a)					
External Wall 1	96.8200	20.7000	76.1200	0.1400	10.6568			(29a)					
External Wall 2	34.3200	1.8900	32.4300	0.1321	4.2824			(29a)					
Total net area of external elements Aum(A, m2)			247.9900					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		46.4852			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.2445 (36)					
Total fabric heat loss						(33) + (36) =		50.7297 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.5098	Feb 24.2184	Mar 23.9270	Apr 22.4702	May 22.1788	Jun 20.7219	Jul 20.7219	Aug 20.4306	Sep 21.3047	Oct 22.1788	Nov 22.7615	Dec 23.3443	(38)
Heat transfer coeff	75.2395	74.9481	74.6567	73.1999	72.9085	71.4516	71.4516	71.1603	72.0344	72.9085	73.4913	74.0740	(39)
Average = Sum(39)m / 12 =												73.1270	(39)
HLP	Jan 0.6439	Feb 0.6414	Mar 0.6389	Apr 0.6264	May 0.6239	Jun 0.6115	Jul 0.6115	Aug 0.6090	Sep 0.6165	Oct 0.6239	Nov 0.6289	Dec 0.6339	(40)
HLP (average)												0.6258	(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												2.8503 (42)
Average daily hot water use (litres/day)												101.8940 (43)
Daily hot water use	Jan 112.0835	Feb 108.0077	Mar 103.9319	Apr 99.8562	May 95.7804	Jun 91.7046	Jul 91.7046	Aug 95.7804	Sep 99.8562	Oct 103.9319	Nov 108.0077	Dec 112.0835 (44)
Energy conte	166.2165	145.3740	150.0130	130.7850	125.4913	108.2894	100.3461	115.1486	116.5238	135.7973	148.2334	160.9718 (45)
Energy content (annual)												Total = Sum(45)m = 1603.1902 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9325	21.8061	22.5019	19.6177	18.8237	16.2434	15.0519	17.2723	17.4786	20.3696	22.2350	24.1458 (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												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9800 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5292 (55)
Total storage loss												
16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052	(56)
If cylinder contains dedicated solar storage												
16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052	(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												
205.8841	181.2028	189.6806	169.1730	165.1589	146.6774	140.0137	154.8162	154.9118	175.4649	186.6214	200.6394	(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 =												
Output from w/h												
205.8841	181.2028	189.6806	169.1730	165.1589	146.6774	140.0137	154.8162	154.9118	175.4649	186.6214	200.6394	(64)
Heat gains from water heating, kWh/month												
87.0011	76.9999	81.6134	74.1964	73.4599	66.7166	65.0991	70.0210	69.4546	76.8867	79.9980	85.2572	(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	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
26.3075	23.3661	19.0026	14.3862	10.7538	9.0788	9.8100	12.7514	17.1149	21.7313	25.3637	27.0386	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
281.0537	283.9702	276.6208	260.9748	241.2246	222.6622	210.2614	207.3449	214.6943	230.3402	250.0905	268.6529	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	(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)												
-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	(71)
Water heating gains (Table 5)												
116.9369	114.5832	109.6954	103.0506	98.7365	92.6620	87.4989	94.1142	96.4647	103.3423	111.1083	114.5930	(72)
Total internal gains												
490.0523	487.6736	471.0729	444.1657	416.4690	390.1572	373.3244	379.9647	394.0280	421.1680	452.3166	476.0387	(73)

6. Solar gains

[Jan]												
	Area	Solar flux	Specific data	g	Specific data	FF	Access	Gains				
	m2	Table 6a	or Table 6b	W/m2	or Table 6c		factor	W				
							Table 6d					
Southeast	3.2400	36.7938	0.5700	0.7000	0.7700	32.9630	(77)					
South	3.6500	46.7521	0.5700	0.7000	0.7700	47.1845	(78)					
Southwest	3.0500	36.7938	0.5700	0.7000	0.7700	31.0299	(79)					
Northwest	10.7600	11.2829	0.5700	0.7000	0.7700	33.5692	(81)					
Solar gains	144.7466	254.6108	370.6903	498.2334	594.6946	606.8003	578.1711	503.5046	414.3314	287.3277	174.8172	122.9507 (83)
Total gains	634.7989	742.2843	841.7633	942.3991	1011.1636	996.9575	951.4955	883.4693	808.3594	708.4957	627.1338	598.9894 (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	107.8501	108.2693	108.6919	110.8551	111.2982	113.5675	113.5675	114.0325	112.6487	111.2982	110.4156	109.5470
alpha	8.1900	8.2180	8.2461	8.3903	8.4199	8.5712	8.5712	8.6022	8.5099	8.4199	8.3610	8.3031
util living area												
0.9982	0.9928	0.9690	0.8638	0.6627	0.4584	0.3304	0.3705	0.6111	0.9216	0.9934	0.9988	(86)
Tweekday	19.7803	19.9300	20.1240	20.3064	20.3564	20.3729	20.3730	20.3754	20.3668	20.2840	20.0088	19.7649
Tweekend	20.7111	20.7768	20.8640	20.9481	20.9756	20.9793	20.9794	20.9795	20.9779	20.9337	20.8073	20.7008
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.5541	20.6548	20.7900	20.9189	20.9624	20.9682	20.9682	20.9683	20.9656	20.8976	20.6991	20.5383 (87)
Th 2	20.3907	20.3929	20.3951	20.4063	20.4085	20.4197	20.4197	20.4219	20.4152	20.4085	20.4040	20.3996 (88)
util rest of house												
0.9976	0.9907	0.9606	0.8370	0.6232	0.4170	0.2868	0.3239	0.5609	0.8980	0.9911	0.9984	(89)
Tweekday	19.7803	19.9300	20.1240	20.3064	20.3564	20.3729	20.3730	20.3754	20.3668	20.2840	20.0088	19.7649
Tweekend	19.7803	19.9300	20.1240	20.3064	20.3564	20.3729	20.3730	20.3754	20.3668	20.2840	20.0088	19.7649
MIT 2	19.7803	19.9300	20.1240	20.3064	20.3564	20.3729	20.3730	20.3754	20.3668	20.2840	20.0088	19.7649 (90)
Living area fraction												
MIT	20.1055	20.2346	20.4039	20.5639	20.6111	20.6231	20.6232	20.6246	20.6184	20.5419	20.2989	0.4203 (91)
Temperature adjustment												
adjusted MIT	20.1055	20.2346	20.4039	20.5639	20.6111	20.6231	20.6232	20.6246	20.6184	20.5419	20.2989	20.0899 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9973	0.9901	0.9608	0.8444	0.6369	0.4315	0.3021	0.3403	0.5785	0.9037	0.9906	0.9982 (94)
Useful gains	633.0618	734.9180	808.7399	795.7829	644.0034	430.1775	287.4564	300.6065	467.6065	640.3012	621.2535	597.9091 (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												
	1189.2013	1149.2989	1038.0208	853.7927	649.6943	430.3601	287.4634	300.6251	469.5512	724.8468	970.0063	1177.0304 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating kWh	413.7678	278.4640	170.5850	41.7670	4.2340	0.0000	0.0000	0.0000	0.0000	62.9019	251.1020	430.8662 (98)
Space heating												1653.6880 (98)
Space heating per m2												(98) / (4) = 14.1522 (99)

8c. Space cooling requirement

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 %)												224.8730 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												735.3876 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	413.7678	278.4640	170.5850	41.7670	4.2340	0.0000	0.0000	0.0000	0.0000	62.9019	251.1020	430.8662 (98)
Space heating efficiency (main heating system 1)	224.8730	224.8730	224.8730	224.8730	224.8730	0.0000	0.0000	0.0000	0.0000	224.8730	224.8730	224.8730 (210)
Space heating fuel (main heating system)	184.0007	123.8317	75.8584	18.5736	1.8829	0.0000	0.0000	0.0000	0.0000	27.9722	111.6639	191.6043 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	205.8841	181.2028	189.6806	169.1730	165.1589	146.6774	140.0137	154.8162	154.9118	175.4649	186.6214	200.6394 (64)
Efficiency of water heater	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000 (216)
(217)m	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000 (217)
Fuel for water heating, kWh/month	75.2500	66.2291	69.3277	61.8322	60.3651	53.6102	51.1746	56.5849	56.6198	64.1319	68.2096	73.3331 (219)
Water heating fuel used												756.6682 (219)
Annual totals kWh/year												
Space heating fuel - main system												735.3876 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)												
mechanical ventilation fans (SFP = 0.6625)												245.5544 (230a)
Total electricity for the above, kWh/year												245.5544 (231)
Electricity for lighting (calculated in Appendix L)												464.5983 (232)
Total delivered energy for all uses												2202.2086 (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	735.3876	0.5190	381.6662 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	756.6682	0.5190	392.7108 (264)
Space and water heating			774.3769 (265)
Pumps and fans	245.5544	0.5190	127.4428 (267)
Energy for lighting	464.5983	0.5190	241.1265 (268)
Total CO2, kg/year			1142.9462 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			9.7800 (273)

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

DER			9.7800 ZC1
Total Floor Area	TFA	116.8500	
Assumed number of occupants	N	2.8503	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		14.2530	ZC2
CO2 emissions from cooking, equation (L16)		1.6038	ZC3
Total CO2 emissions		25.6368	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		25.6368	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	116.8500 (1b)	x 2.6000 (2b)	= 303.8100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 303.8100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1317 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3817 (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) =				0.2958 (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	0.3771	0.3697	0.3623	0.3254	0.3180	0.2810	0.2810	0.2736	0.2958	0.3180	0.3328	0.3476 (22b)
Effective ac	0.5711	0.5684	0.5656	0.5529	0.5506	0.5395	0.5395	0.5374	0.5437	0.5506	0.5554	0.5604 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.7000	1.3258	27.4432		(27)
Heat Loss Floor 1			116.8500	0.1300	15.1905		(28a)
External Wall 1	96.8200	20.7000	76.1200	0.1800	13.7016		(29a)
External Wall 2	34.3200	1.8900	32.4300	0.1800	5.8374		(29a)
Total net area of external elements Aum(A, m ²)			247.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.0627		(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)							11.4414 (36)
Total fabric heat loss						(33) + (36) =	75.5041 (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	57.2583	56.9814	56.7100	55.4354	55.1970	54.0868	54.0868	53.8812	54.5144	55.1970	55.6794	56.1837 (38)
Heat transfer coeff	132.7623	132.4855	132.2141	130.9395	130.7010	129.5909	129.5909	129.3853	130.0185	130.7010	131.1835	131.6878 (39)
Average = Sum(39)m / 12 =												130.9384 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1362	1.1338	1.1315	1.1206	1.1185	1.1090	1.1090	1.1073	1.1127	1.1185	1.1227	1.1270 (40)
HLP (average)												1.1206 (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												2.8503 (42)
Average daily hot water use (litres/day)												101.8940 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.0835	108.0077	103.9319	99.8562	95.7804	91.7046	91.7046	95.7804	99.8562	103.9319	108.0077	112.0835 (44)
Energy conte	166.2165	145.3740	150.0130	130.7850	125.4913	108.2894	100.3461	115.1486	116.5238	135.7973	148.2334	160.9718 (45)
Energy content (annual)										Total = Sum(45)m =		1603.1902 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9325	21.8061	22.5019	19.6177	18.8237	16.2434	15.0519	17.2723	17.4786	20.3696	22.2350	24.1458 (46)
Water storage loss:												170.0000 (47)
Store volume												1.5003 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8102 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (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	214.5942	189.0700	198.3907	177.6021	173.8690	155.1066	148.7238	163.5263	163.3410	184.1750	195.0505	209.3495 (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	214.5942	189.0700	198.3907	177.6021	173.8690	155.1066	148.7238	163.5263	163.3410	184.1750	195.0505	209.3495 (64)
Heat gains from water heating, kWh/month	93.9692	83.2937	88.5815	80.9397	80.4280	73.4599	72.0672	76.9891	76.1979	83.8548	86.7413	92.2253 (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	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6579	22.7891	18.5333	14.0309	10.4883	8.8546	9.5678	12.4365	16.6923	21.1947	24.7373	26.3710 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0537	283.9702	276.6208	260.9748	241.2246	222.6622	210.2614	207.3449	214.6943	230.3402	250.0905	268.6529 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514 (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)	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110 (71)	
Water heating gains (Table 5)	126.3026	123.9489	119.0611	112.4163	108.1022	102.0277	96.8646	103.4799	105.8304	112.7080	120.4740	123.9587 (72)	
Total internal gains	501.7683	499.4623	482.9694	456.1761	428.5692	402.2987	385.4478	392.0155	405.9711	432.9971	464.0560	487.7367 (73)	

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast				3.2400	36.7938		0.6300		0.7000		0.7700		36.4327 (77)
South				3.6500	46.7521		0.6300		0.7000		0.7700		52.1513 (78)
Southwest				3.0500	36.7938		0.6300		0.7000		0.7700		34.2963 (79)
Northwest				10.7600	11.2829		0.6300		0.7000		0.7700		37.1028 (81)
Solar gains	159.9831	281.4119	409.7104	550.6790	657.2940	670.6741	639.0313	556.5051	457.9452	317.5727	193.2191		135.8928 (83)
Total gains	661.7515	780.8742	892.6798	1006.8552	1085.8632	1072.9727	1024.4791	948.5206	863.9163	750.5698	657.2750		623.6296 (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	61.1211	61.2488	61.3746	61.9720	62.0851	62.6169	62.6169	62.7164	62.4110	62.0851	61.8568	61.6198	
alpha	5.0747	5.0833	5.0916	5.1315	5.1390	5.1745	5.1745	5.1811	5.1607	5.1390	5.1238	5.1080	
util living area	0.9985	0.9962	0.9890	0.9621	0.8804	0.7148	0.5443	0.6053	0.8531	0.9783	0.9966	0.9989 (86)	
MIT	19.7459	19.9076	20.1659	20.5025	20.7902	20.9495	20.9899	20.9830	20.8704	20.4947	20.0562	19.7172 (87)	
Th 2	19.9714	19.9733	19.9752	19.9841	19.9857	19.9935	19.9935	19.9949	19.9905	19.9857	19.9824	19.9789 (88)	
util rest of house	0.9980	0.9948	0.9850	0.9475	0.8360	0.6248	0.4262	0.4841	0.7834	0.9673	0.9951	0.9985 (89)	
MIT 2	18.2954	18.5327	18.9094	19.3955	19.7783	19.9596	19.9897	19.9878	19.8849	19.3929	18.7569	18.2586 (90)	
Living area fraction									fLA = Living area / (4) =			0.4203 (91)	
MIT	18.9050	19.1106	19.4375	19.8607	20.2036	20.3756	20.4100	20.4061	20.2991	19.8560	19.3029	18.8716 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9050	19.1106	19.4375	19.8607	20.2036	20.3756	20.4100	20.4061	20.2991	19.8560	19.3029	18.8716 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9972	0.9933	0.9822	0.9454	0.8467	0.6609	0.4762	0.5354	0.8073	0.9655	0.9938	0.9979 (94)	
Useful gains	659.8863	775.6363	876.8111	951.8563	919.3885	709.0982	487.8262	507.8066	697.4236	724.6795	653.2087	622.3186 (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	1938.9966	1882.6935	1710.5193	1435.1908	1111.4294	748.4689	493.7472	518.3254	805.9942	1209.7689	1600.8248	1932.0737 (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	951.6580	743.9425	620.2789	348.0008	142.8784	0.0000	0.0000	0.0000	0.0000	360.9065	682.2836	974.4578 (98)	
Space heating												4824.4065 (98)	
Space heating per m2												(98) / (4) =	41.2872 (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												5159.7931 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	951.6580	743.9425	620.2789	348.0008	142.8784	0.0000	0.0000	0.0000	0.0000	360.9065	682.2836	974.4578 (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)	1017.8161	795.6604	663.3999	372.1934	152.8112	0.0000	0.0000	0.0000	0.0000	385.9962	729.7151	1042.2008 (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	214.5942	189.0700	198.3907	177.6021	173.8690	155.1066	148.7238	163.5263	163.3410	184.1750	195.0505	209.3495 (64)
Efficiency of water heater (217)m	88.3209	88.1060	87.6519	86.5774	84.2957	79.8000	79.8000	79.8000	79.8000	86.5776	87.8803	79.8000 (216)
Fuel for water heating, kWh/month	242.9710	214.5938	226.3393	205.1368	206.2609	194.3691	186.3706	204.9202	204.6879	212.7283	221.9502	236.8107 (219)
Water heating fuel used												2557.1388 (219)
Annual totals kWh/year												
Space heating fuel - main system												5159.7931 (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)												453.1259 (232)
Total delivered energy for all uses												8245.0577 (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	5159.7931	0.2160	1114.5153 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2557.1388	0.2160	552.3420 (264)
Space and water heating			1666.8573 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	453.1259	0.5190	235.1723 (268)
Total CO2, kg/m2/year			1940.9546 (272)
Emissions per m2 for space and water heating			14.2649 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.0126 (272b)
Emissions per m2 for pumps and fans			0.3331 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.2649 * 1.55) + 2.0126 + 0.3331, rounded to 2 d.p.			24.4600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122160	Issued on Date	01/11/2022
Assessment Reference	002 be clean	Prop Type Ref	
Property	Flat 2, 32, Norwich Road, Northwood, HA6 1NB		
SAP Rating	89 B	DER	14.32
Environmental	90 B	TER	31.41
CO ₂ Emissions (t/year)	0.82	% DER<TER	54.41
General Requirements Compliance	Pass	DFEE	35.53
		TFEE	65.77
		% DFEE<TFEE	45.98
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com		Assessor ID
Client	L706-0001		

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 70 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 31.41 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.32 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)65.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)35.5 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	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.87 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 5.0 kW PUZ-WM50VHA

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 0.98 kWh/day	
Permitted by DBSCG 2.03	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading:	Average
Windows facing South West:	3.05 m ² , No overhang
Windows facing North West:	10.76 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.80 W/m ² K
Thermal bridging y-value	0.029 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.4700 (1b)	x 2.6000 (2b)	= 183.2220 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.2220 (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					1 * 10 = 10.0000 (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) =				10.0000 / (5) = 0.0546 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2046 (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) =				0.1585 (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	0.2021	0.1982	0.1942	0.1744	0.1704	0.1506	0.1506	0.1467	0.1585	0.1704	0.1784	0.1863 (22b)
Effective ac	0.5204	0.5196	0.5189	0.5152	0.5145	0.5113	0.5113	0.5108	0.5126	0.5145	0.5159	0.5174 (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						
Opening Type 1 (Uw = 0.80)			13.8100	0.7752	10.7054			(27)					
Opening Type 2			1.8900	1.4000	2.6460			(26)					
External Wall 1	68.8200	13.8100	55.0100	0.1400	7.7014			(29a)					
External Wall 2	18.7200	1.8900	16.8300	0.1321	2.2224			(29a)					
External Roof 1	49.6700		49.6700	0.1400	6.9538			(30)					
Total net area of external elements Aum(A, m2)			137.2100					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	30.2290			(33)					
Party Wall 1			16.1200	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.0160 (36)					
Total fabric heat loss						(33) + (36) =		34.2450 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 31.4670	Feb 31.4191	Mar 31.3720	Apr 31.1512	May 31.1098	Jun 30.9175	Jul 30.9175	Aug 30.8819	Sep 30.9916	Oct 31.1098	Nov 31.1934	Dec 31.2808	(38)
Heat transfer coeff	65.7120	65.6641	65.6170	65.3962	65.3549	65.1625	65.1625	65.1269	65.2366	65.3549	65.4384	65.5258	(39)
Average = Sum(39)m / 12 =												65.3960	(39)
HLP	Jan 0.9325	Feb 0.9318	Mar 0.9311	Apr 0.9280	May 0.9274	Jun 0.9247	Jul 0.9247	Aug 0.9242	Sep 0.9257	Oct 0.9274	Nov 0.9286	Dec 0.9298	(40)
HLP (average)												0.9280	(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												2.2575 (42)
Average daily hot water use (litres/day)												87.8152 (43)
Daily hot water use	96.5967	93.0841	89.5715	86.0589	82.5463	79.0337	79.0337	82.5463	86.0589	89.5715	93.0841	96.5967 (44)
Energy conte	143.2501	125.2875	129.2854	112.7142	108.1519	93.3269	86.4811	99.2383	100.4235	117.0339	127.7517	138.7301 (45)
Energy content (annual)										Total = Sum(45)m =		1381.6747 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.4875	18.7931	19.3928	16.9071	16.2228	13.9990	12.9722	14.8857	15.0635	17.5551	19.1628		20.8095 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9800 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Enter (49) or (54) in (55)												0.5292 (55)
Total storage loss	16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052 (56)
If cylinder contains dedicated solar storage	16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052 (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	182.9177	161.1163	168.9530	151.1022	147.8195	131.7149	126.1487	138.9059	138.8115	156.7015	166.1397	178.3977 (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	182.9177	161.1163	168.9530	151.1022	147.8195	131.7149	126.1487	138.9059	138.8115	156.7015	166.1397	178.3977 (64)
Heat gains from water heating, kWh/month	79.3647	70.3211	74.7215	68.1879	67.6946	61.7416	60.4890	64.7308	64.1012	70.6479	73.1878	77.8618 (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	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2133	16.1769	13.1559	9.9599	7.4451	6.2855	6.7917	8.8281	11.8491	15.0451	17.5599	18.7195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.3915	200.4502	195.2624	184.2181	170.2768	157.1738	148.4203	146.3616	151.5494	162.5937	176.5350	189.6380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	(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)	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	(71)
Water heating gains (Table 5)	106.6730	104.6445	100.4321	94.7054	90.9874	85.7522	81.3025	87.0038	89.0295	94.9568	101.6498	104.6530	(72)
Total internal gains	380.1401	378.1338	365.7127	345.7456	325.5715	306.0738	293.3767	299.0557	309.2902	329.4578	352.6069	369.8727	(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	
Southwest					3.0500	36.7938	0.5700	0.7000	0.7700		31.0299 (79)	
Northwest					10.7600	11.2829	0.5700	0.7000	0.7700		33.5692 (81)	

Solar gains	64.5991	121.1865	195.4300	291.7902	372.1413	389.3813	367.1107	304.1181	228.3188	141.9225	79.4054	53.9694 (83)
Total gains	444.7392	499.3204	561.1426	637.5359	697.7128	695.4551	660.4874	603.1738	537.6090	471.3803	432.0123	423.8421 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.4727	74.5271	74.5805	74.8324	74.8797	75.1007	75.1007	75.1418	75.0154	74.8797	74.7840	74.6843
alpha	5.9648	5.9685	5.9720	5.9888	5.9920	6.0067	6.0067	6.0095	6.0010	5.9920	5.9856	5.9790
util living area	0.9973	0.9940	0.9820	0.9316	0.7918	0.5882	0.4325	0.4929	0.7713	0.9629	0.9939	0.9980 (86)
Tweekday	19.1620	19.3033	19.5448	19.8409	20.0242	20.0750	20.0798	20.0797	20.0511	19.8071	19.4281	19.1271
Tweekend	20.5306	20.5931	20.7011	20.8377	20.9334	20.9654	20.9700	20.9692	20.9468	20.8186	20.6473	20.5143
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2755	20.3706	20.5387	20.7466	20.8972	20.9468	20.9537	20.9525	20.9170	20.7200	20.4492	20.2504 (87)
Th 2	20.1400	20.1406	20.1411	20.1438	20.1443	20.1466	20.1466	20.1470	20.1457	20.1443	20.1433	20.1422 (88)
util rest of house	0.9964	0.9920	0.9761	0.9103	0.7406	0.5148	0.3495	0.4035	0.6992	0.9469	0.9915	0.9973 (89)
Tweekday	19.1620	19.3033	19.5448	19.8409	20.0242	20.0750	20.0798	20.0797	20.0511	19.8071	19.4281	19.1271
Tweekend	19.1620	19.3033	19.5448	19.8409	20.0242	20.0750	20.0798	20.0797	20.0511	19.8071	19.4281	19.1271
MIT 2	19.1620	19.3033	19.5448	19.8409	20.0242	20.0750	20.0798	20.0797	20.0511	19.8071	19.4281	19.1271 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5786	19.7025	19.9166	20.1797	20.3507	20.4011	20.4067	20.4062	20.3750	20.1486	19.8101	19.5473 (91)
Temperature adjustment	0.0000											
adjusted MIT	19.5786	19.7025	19.9166	20.1797	20.3507	20.4011	20.4067	20.4062	20.3750	20.1486	19.8101	19.5473 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9908	0.9743	0.9114	0.7537	0.5371	0.3749	0.4310	0.7199	0.9470	0.9904	0.9967 (94)
Useful gains	442.8064	494.7189	546.6991	581.0213	525.8851	373.5202	247.6225	259.9464	387.0146	446.3988	427.8538	422.4392 (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	1003.9847	971.9942	880.3565	737.6491	565.3677	378.0145	248.0547	260.9113	409.3576	624.0462	831.7280	1005.6417 (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	417.5167	320.7290	248.2412	112.7720	29.3751	0.0000	0.0000	0.0000	0.0000	132.1697	290.7894	433.9027 (98)
Space heating												1985.4958 (98)
Space heating per m2										(98) / (4) =		28.1751 (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

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 %)													209.6446 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													947.0768 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.5167	320.7290	248.2412	112.7720	29.3751	0.0000	0.0000	0.0000	0.0000	132.1697	290.7894	433.9027	(98)
Space heating efficiency (main heating system 1)	209.6446	209.6446	209.6446	209.6446	209.6446	0.0000	0.0000	0.0000	0.0000	209.6446	209.6446	209.6446	(210)
Space heating fuel (main heating system)	199.1545	152.9870	118.4104	53.7920	14.0118	0.0000	0.0000	0.0000	0.0000	63.0446	138.7059	206.9706	(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	182.9177	161.1163	168.9530	151.1022	147.8195	131.7149	126.1487	138.9059	138.8115	156.7015	166.1397	178.3977	(64)
Efficiency of water heater	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	(216)
Fuel for water heating, kWh/month	66.8559	58.8875	61.7518	55.2274	54.0276	48.1414	46.1070	50.7697	50.7352	57.2740	60.7236	65.2038	(219)
Water heating fuel used												675.7049	(219)
Annual totals kWh/year													
Space heating fuel - main system												947.0768	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												321.6528	(232)
Total delivered energy for all uses												1944.4345	(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	947.0768	0.5190	491.5329 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	675.7049	0.5190	350.6909 (264)
Space and water heating			842.2237 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	321.6528	0.5190	166.9378 (268)
Total CO2, kg/year			1009.1615 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.3200 (273)

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

DER		14.3200	ZC1
Total Floor Area	TFA	70.4700	
Assumed number of occupants	N	2.2575	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6827	ZC2
CO2 emissions from cooking, equation (L16)		2.4575	ZC3
Total CO2 emissions		33.4601	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		33.4601	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	70.4700 (1b)	x 2.6000 (2b)	= 183.2220 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.2220 (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 30.0000 / (5) = 0.1637 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4137 (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) =		0.3206 (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	0.4088	0.4008	0.3928	0.3527	0.3447	0.3046	0.3046	0.2966	0.3206	0.3447	0.3607	0.3768 (22b)
Effective ac	0.5836	0.5803	0.5771	0.5622	0.5594	0.5464	0.5464	0.5440	0.5514	0.5594	0.5651	0.5710 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.8100	1.3258	18.3087		(27)
External Wall 1	68.8200	13.8100	55.0100	0.1800	9.9018		(29a)
External Wall 2	18.7200	1.8900	16.8300	0.1800	3.0294		(29a)
External Roof 1	49.6700		49.6700	0.1300	6.4571		(30)
Total net area of external elements Aum(A, m ²)			137.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.5870		(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)							20.3951 (36)
Total fabric heat loss						(33) + (36) =	59.9821 (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	35.2844	35.0882	34.8959	33.9926	33.8236	33.0368	33.0368	32.8911	33.3398	33.8236	34.1655	34.5229 (38)
Heat transfer coeff	95.2665	95.0703	94.8780	93.9747	93.8057	93.0189	93.0189	92.8732	93.3220	93.8057	94.1476	94.5050 (39)
Average = Sum(39)m / 12 =												93.9739 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3519	1.3491	1.3464	1.3335	1.3311	1.3200	1.3200	1.3179	1.3243	1.3311	1.3360	1.3411 (40)
HLP (average)												1.3335 (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												2.2575 (42)
Average daily hot water use (litres/day)												87.8152 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5967	93.0841	89.5715	86.0589	82.5463	79.0337	79.0337	82.5463	86.0589	89.5715	93.0841	96.5967 (44)
Energy conte	143.2501	125.2875	129.2854	112.7142	108.1519	93.3269	86.4811	99.2383	100.4235	117.0339	127.7517	138.7301 (45)
Energy content (annual)										Total = Sum(45)m =		1381.6747 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4875	18.7931	19.3928	16.9071	16.2228	13.9990	12.9722	14.8857	15.0635	17.5551	19.1628	20.8095 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8102 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (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	191.6278	168.9834	177.6631	159.5313	156.5296	140.1440	134.8588	147.6160	147.2407	165.4116	174.5688	187.1078 (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	191.6278	168.9834	177.6631	159.5313	156.5296	140.1440	134.8588	147.6160	147.2407	165.4116	174.5688	187.1078 (64)
Heat gains from water heating, kWh/month	86.3328	76.6149	81.6896	74.9312	74.6627	68.4849	67.4571	71.6989	70.8445	77.6159	79.9311	84.8299 (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	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8515	15.8556	12.8946	9.7620	7.2972	6.1606	6.6568	8.6527	11.6137	14.7463	17.2111	18.3477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.3915	200.4502	195.2624	184.2181	170.2768	157.1738	148.4203	146.3616	151.5494	162.5937	176.5350	189.6380 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874 (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)	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992 (71)
Water heating gains (Table 5)	116.0387	114.0102	109.7978	104.0711	100.3531	95.1179	90.6682	96.3695	98.3952	104.3225	111.0155	114.0187 (72)
Total internal gains	392.1440	390.1782	377.8170	357.9135	337.7893	318.3146	305.6075	311.2461	321.4205	341.5246	364.6238	381.8665 (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	
Southwest	3.0500				36.7938		0.6300		0.7000		0.7700		34.2963 (79)	
Northwest	10.7600				11.2829		0.6300		0.7000		0.7700		37.1028 (81)	
Solar gains	71.3990	133.9430	216.0015	322.5050	411.3140	430.3688	405.7539	336.1305	252.3523	156.8617	87.7639	59.6504 (83)		
Total gains	463.5430	524.1212	593.8186	680.4185	749.1033	748.6834	711.3614	647.3766	573.7729	498.3864	452.3877	441.5170 (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	51.3690	51.4751	51.5794	52.0752	52.1690	52.6103	52.6103	52.6928	52.4394	52.1690	51.9796	51.7830
alpha	4.4246	4.4317	4.4386	4.4717	4.4779	4.5074	4.5074	4.5129	4.4960	4.4779	4.4653	4.4522
util living area	0.9970	0.9943	0.9862	0.9570	0.8738	0.7143	0.5541	0.6217	0.8619	0.9752	0.9943	0.9976 (86)
MIT	19.5490	19.7017	19.9834	20.3733	20.7190	20.9218	20.9805	20.9680	20.8070	20.3684	19.8929	19.5225 (87)
Th 2	19.8004	19.8026	19.8047	19.8147	19.8165	19.8252	19.8252	19.8268	19.8219	19.8165	19.8127	19.8088 (88)
util rest of house	0.9959	0.9923	0.9811	0.9399	0.8240	0.6134	0.4167	0.4813	0.7875	0.9622	0.9919	0.9967 (89)
MIT 2	17.8894	18.1135	18.5237	19.0853	19.5442	19.7745	19.8185	19.8141	19.6665	19.0890	18.4002	17.8564 (90)
Living area fraction									fLA = Living area / (4) =			0.3741 (91)
MIT	18.5102	18.7076	19.0697	19.5671	19.9837	20.2036	20.2531	20.2457	20.0931	19.5676	18.9586	18.4796 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5102	18.7076	19.0697	19.5671	19.9837	20.2036	20.2531	20.2457	20.0931	19.5676	18.9586	18.4796 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9942	0.9897	0.9767	0.9355	0.8321	0.6483	0.4686	0.5342	0.8074	0.9585	0.9894	0.9953 (94)
Useful gains	460.8767	518.7007	580.0100	636.5023	623.3266	485.4049	333.3458	345.8032	463.2848	477.7258	447.5889	439.4586 (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	1353.7560	1312.6908	1192.5872	1002.4362	777.0537	521.2424	339.8090	357.1663	559.2868	841.2095	1116.4569	1349.4964 (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	664.3022	533.5614	455.7574	263.4724	114.3730	0.0000	0.0000	0.0000	0.0000	270.4319	481.5850	677.0681 (98)
Space heating												3460.5513 (98)
Space heating per m2										(98) / (4) =		49.1067 (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													3701.1244 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	664.3022	533.5614	455.7574	263.4724	114.3730	0.0000	0.0000	0.0000	0.0000	270.4319	481.5850	677.0681	(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)	710.4836	570.6539	487.4411	281.7887	122.3240	0.0000	0.0000	0.0000	0.0000	289.2320	515.0641	724.1370	(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	191.6278	168.9834	177.6631	159.5313	156.5296	140.1440	134.8588	147.6160	147.2407	165.4116	174.5688	187.1078	(64)
Efficiency of water heater (217)m	87.8624	87.6724	87.2198	86.1438	83.9926	79.8000	79.8000	79.8000	79.8000	86.1176	87.3828	79.8000	(216)
Fuel for water heating, kWh/month	218.0998	192.7441	203.6959	185.1918	186.3612	175.6191	168.9960	184.9825	184.5121	192.0764	199.7749	212.7512	(219)
Water heating fuel used												2304.8049	(219)
Annual totals kWh/year													
Space heating fuel - main system												3701.1244	(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)												315.2633	(232)
Total delivered energy for all uses												6396.1926	(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	3701.1244	0.2160	799.4429 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2304.8049	0.2160	497.8379 (264)
Space and water heating			1297.2807 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	315.2633	0.5190	163.6216 (268)
Total CO2, kg/m2/year			1499.8274 (272)
Emissions per m2 for space and water heating			18.4090 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3219 (272b)
Emissions per m2 for pumps and fans			0.5524 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.4090 * 1.55) + 2.3219 + 0.5524, rounded to 2 d.p.			31.4100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122161			Issued on Date	01/11/2022
Assessment Reference	003 be clean	Prop Type Ref			
Property	Flat 3, 32, Norwich Road, Northwood, HA6 1NB				
SAP Rating	89 B	DER	13.66	TER	27.47
Environmental	90 B	% DER<TER	50.28		
CO ₂ Emissions (t/year)	0.79	DFEE	34.27	TFEE	52.56
General Requirements Compliance	Pass	% DFEE<TFEE	34.81		
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com			Assessor ID	L706-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 70 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
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 27.47 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.66 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 34.3 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	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.87 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 5.0 kW PUZ-WM50VHA

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 0.98 kWh/day
Permitted by DBSCG 2.03 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing North East: 1.20 m², No overhang
Windows facing South East: 6.43 m², No overhang
Windows facing South West: 6.17 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.80 W/m²K
Thermal bridging y-value 0.034 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	4.8700 (1b)	x 2.6000 (2b)	= 12.6620 (1b) - (3b)
First floor	65.5100 (1c)	x 2.5000 (2c)	= 163.7750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.4370 (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					1 * 10 = 10.0000 (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) =					10.0000 / (5) = 0.0567 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2067 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1912 (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	0.2438	0.2390	0.2342	0.2103	0.2055	0.1816	0.1816	0.1768	0.1912	0.2055	0.2151	0.2246 (22b)
Effective ac	0.5297	0.5286	0.5274	0.5221	0.5211	0.5165	0.5165	0.5156	0.5183	0.5211	0.5231	0.5252 (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
Opening Type 1 (Uw = 0.80)			13.8000	0.7752	10.6977		(27)
Opening Type 2			1.8900	1.4000	2.6460		(26)
External Wall 1	87.7500	13.8000	73.9500	0.1400	10.3530		(29a)
External Wall 2	3.9000	1.8900	2.0100	0.1321	0.2654		(29a)
External Roof 1	65.5100		65.5100	0.1400	9.1714		(30)
Total net area of external elements Aum(A, m ²)			157.1600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.1335		(33)
Party Wall 1			28.1800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3678 (36)
Total fabric heat loss						(33) + (36) =	38.5013 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.8418	30.7746	30.7088	30.3995	30.3417	30.0724	30.0724	30.0225	30.1761	30.3417	30.4587	30.5811 (38)
Heat transfer coeff	69.3431	69.2759	69.2101	68.9008	68.8430	68.5737	68.5737	68.5238	68.6774	68.8430	68.9600	69.0824 (39)
Average = Sum(39)m / 12 =												68.9006 (39)
HLP	0.9853	0.9843	0.9834	0.9790	0.9782	0.9743	0.9743	0.9736	0.9758	0.9782	0.9798	0.9816 (40)
HLP (average)												0.9790 (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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy content (annual)	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1380.8652 (45)
Water storage loss:	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (46)
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9800 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5292 (55)
Total storage loss	16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052 (56)
If cylinder contains dedicated solar storage	16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052 (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	182.8338	161.0429	168.8773	151.0361	147.7562	131.6602	126.0980	138.8478	138.7527	156.6330	166.0649	178.3164 (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	182.8338	161.0429	168.8773	151.0361	147.7562	131.6602	126.0980	138.8478	138.7527	156.6330	166.0649	178.3164 (64)
Heat gains from water heating, kWh/month	79.3368	70.2967	74.6963	68.1659	67.6735	61.7234	60.4722	64.7115	64.0817	70.6251	73.1630	77.8348 (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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1923	16.1583	13.1408	9.9484	7.4366	6.2783	6.7839	8.8179	11.8354	15.0278	17.5396	18.6979	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	106.6355	104.6082	100.3983	94.6749	90.9590	85.7270	81.2798	86.9778	89.0023	94.9262	101.6152	104.6167	(72)
Total internal gains	379.8399	377.8350	365.4253	345.4769	325.3226	305.8431	293.1572	298.8327	309.0571	329.2059	352.3335	369.5823	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast				1.2000	11.2829	0.5700	0.7000			0.7700			3.7438 (75)
Southeast				6.4300	36.7938	0.5700	0.7000			0.7700			65.4172 (77)
Southwest				6.1700	36.7938	0.5700	0.7000			0.7700			62.7721 (79)
Solar gains	131.9331	225.9743	312.4910	392.7279	444.9413	443.9465	427.0868	387.7934	340.2251	250.6404	158.2518	112.7607	(83)
Total gains	511.7730	603.8094	677.9162	738.2048	770.2639	749.7896	720.2440	686.6261	649.2822	579.8462	510.5853	482.3430	(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	70.4829	70.5512	70.6183	70.9353	70.9949	71.2737	71.2737	71.3256	71.1661	70.9949	70.8744	70.7489
alpha	5.6989	5.7034	5.7079	5.7290	5.7330	5.7516	5.7516	5.7550	5.7444	5.7330	5.7250	5.7166
util living area	0.9947	0.9859	0.9627	0.8979	0.7629	0.5739	0.4173	0.4562	0.6932	0.9251	0.9871	0.9961 (86)
Tweekday	19.1385	19.3313	19.5801	19.8350	19.9828	20.0300	20.0351	20.0354	20.0166	19.8299	19.4333	19.0939
Tweekend	20.5363	20.6223	20.7351	20.8552	20.9342	20.9637	20.9687	20.9682	20.9535	20.8494	20.6658	20.5153
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2843	20.4157	20.5911	20.7740	20.8985	20.9442	20.9516	20.9509	20.9274	20.7676	20.4782	20.2520 (87)
Th 2	20.0956	20.0964	20.0972	20.1009	20.1016	20.1048	20.1048	20.1054	20.1035	20.1016	20.1002	20.0987 (88)
util rest of house	0.9930	0.9817	0.9516	0.8696	0.7085	0.4986	0.3333	0.3690	0.6171	0.8976	0.9825	0.9949 (89)
Tweekday	19.1385	19.3313	19.5801	19.8350	19.9828	20.0300	20.0351	20.0354	20.0166	19.8299	19.4333	19.0939
Tweekend	19.1385	19.3313	19.5801	19.8350	19.9828	20.0300	20.0351	20.0354	20.0166	19.8299	19.4333	19.0939
MIT 2	19.1385	19.3313	19.5801	19.8350	19.9828	20.0300	20.0351	20.0354	20.0166	19.8299	19.4333	19.0939 (90)
Living area fraction	fLA = Living area / (4) =											0.4014 (91)
MIT	19.5984	19.7666	19.9859	20.2119	20.3503	20.3970	20.4030	20.4029	20.3822	20.2063	19.8527	19.5587 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5984	19.7666	19.9859	20.2119	20.3503	20.3970	20.4030	20.4029	20.3822	20.2063	19.8527	19.5587 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	507.5826	591.5828	644.0457	644.8127	557.9700	392.5965	260.3021	273.4511	416.6730	522.6142	500.8078	479.4250	(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	1060.8404	1029.8964	933.3616	779.3999	595.5143	397.5203	260.7851	274.2910	431.4450	661.3273	879.4277	1061.0165	(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	411.6238	294.5467	215.2510	96.9028	27.9329	0.0000	0.0000	0.0000	0.0000	103.2026	272.6063	432.7041	(98)
Space heating												1854.7702	(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) = 26.3537 (99)

8c. Space cooling requirement

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 %)													216.7052 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													855.8956 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	411.6238	294.5467	215.2510	96.9028	27.9329	0.0000	0.0000	0.0000	0.0000	103.2026	272.6063	432.7041	(98)
Space heating efficiency (main heating system 1)	216.7052	216.7052	216.7052	216.7052	216.7052	0.0000	0.0000	0.0000	0.0000	216.7052	216.7052	216.7052	(210)
Space heating fuel (main heating system)	189.9464	135.9205	99.3290	44.7164	12.8898	0.0000	0.0000	0.0000	0.0000	47.6235	125.7959	199.6741	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	182.8338	161.0429	168.8773	151.0361	147.7562	131.6602	126.0980	138.8478	138.7527	156.6330	166.0649	178.3164	(64)
Efficiency of water heater	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	(216)
Fuel for water heating, kWh/month	66.8252	58.8607	61.7242	55.2033	54.0044	48.1214	46.0885	50.7485	50.7137	57.2489	60.6962	65.1741	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													855.8956 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													321.2820 (232)
Total delivered energy for all uses													1852.5867 (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	855.8956	0.5190	444.2098	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	675.4091	0.5190	350.5373	(264)
Space and water heating			794.7471	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	321.2820	0.5190	166.7454	(268)
Total CO2, kg/year			961.4925	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.6600	(273)

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

DER			13.6600	ZC1
Total Floor Area		TFA	70.3800	
Assumed number of occupants		N	2.2553	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6864	ZC2
CO2 emissions from cooking, equation (L16)			2.4599	ZC3
Total CO2 emissions			32.8063	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			32.8063	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	4.8700 (1b)	x 2.6000 (2b)	= 12.6620 (1b) - (3b)
First floor	65.5100 (1c)	x 2.5000 (2c)	= 163.7750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.4370 (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																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000	/ (5) =	0.1700 (8)	
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4200 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =				0.9250 (20)			
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =				0.3885 (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	0.4954	0.4857	0.4759	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565	(22b)				
Effective ac	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			13.8000	1.3258	18.2955		(27)					
External Wall 1	87.7500	13.8000	73.9500	0.1800	13.3110		(29a)					
External Wall 2	3.9000	1.8900	2.0100	0.1800	0.3618		(29a)					
External Roof 1	65.5100		65.5100	0.1300	8.5163		(30)					
Total net area of external elements Aum(A, m2)			157.1600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.3746		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1980 (36)					
Total fabric heat loss						(33) + (36) =	51.5726 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.2561	Feb 35.9787	Mar 35.7068	Apr 34.4296	May 34.1907	Jun 33.0783	Jul 33.0783	Aug 32.8723	Sep 33.5067	Oct 34.1907	Nov 34.6741	Dec 35.1794 (38)
Heat transfer coeff	87.8287	87.5513	87.2794	86.0022	85.7632	84.6508	84.6508	84.4448	85.0793	85.7632	86.2466	86.7520 (39)
Average = Sum(39)m / 12 =												86.0010 (39)
HLP	Jan 1.2479	Feb 1.2440	Mar 1.2401	Apr 1.2220	May 1.2186	Jun 1.2028	Jul 1.2028	Aug 1.1998	Sep 1.2089	Oct 1.2186	Nov 1.2254	Dec 1.2326 (40)
HLP (average)												1.2220 (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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	Jan 96.5401	Feb 93.0296	Mar 89.5190	Apr 86.0085	May 82.4979	Jun 78.9874	Jul 78.9874	Aug 82.4979	Sep 86.0085	Oct 89.5190	Nov 93.0296	Dec 96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)										Total = Sum(45)m =		1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.8102 (55)
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (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	191.5439	168.9100	177.5874	159.4653	156.4663	140.0894	134.8081	147.5579	147.1818	165.3431	174.4940	187.0265 (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	191.5439	168.9100	177.5874	159.4653	156.4663	140.0894	134.8081	147.5579	147.1818	165.3431	174.4940	187.0265 (64)
Heat gains from water heating, kWh/month	86.3049	76.5905	81.6644	74.9092	74.6416	68.4667	67.4403	71.6796	70.8250	77.5932	79.9063	84.8029 (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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8315	15.8378	12.8802	9.7511	7.2891	6.1537	6.6493	8.6431	11.6007	14.7298	17.1918	18.3271	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	116.0012	113.9739	109.7640	104.0406	100.3247	95.0927	90.6455	96.3435	98.3680	104.2919	110.9809	113.9824	(72)
Total internal gains	391.8448	389.8803	377.5304	357.6453	337.5408	318.0842	305.3884	311.0236	321.1881	341.2736	364.3513	381.5772	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				1.2000	11.2829	0.6300	0.7000	0.7700	4.1379 (75)			
Southeast				6.4300	36.7938	0.6300	0.7000	0.7700	72.3033 (77)			
Southwest				6.1700	36.7938	0.6300	0.7000	0.7700	69.3796 (79)			

Solar gains	145.8207	249.7611	345.3848	434.0676	491.7772	490.6778	472.0433	428.6138	376.0383	277.0236	174.9099	124.6302 (83)
Total gains	537.6656	639.6414	722.9151	791.7130	829.3180	808.7620	777.4317	739.6373	697.2264	618.2971	539.2613	506.2074 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.6481	55.8244	55.9984	56.8300	56.9883	57.7372	57.7372	57.8780	57.4464	56.9883	56.6689	56.3388
alpha	4.7099	4.7216	4.7332	4.7887	4.7992	4.8491	4.8491	4.8585	4.8298	4.7992	4.7779	4.7559
util living area	0.9944	0.9868	0.9684	0.9187	0.8110	0.6348	0.4720	0.5140	0.7504	0.9400	0.9878	0.9957 (86)
MIT	19.7780	19.9788	20.2576	20.5874	20.8353	20.9625	20.9927	20.9891	20.9157	20.5904	20.1231	19.7466 (87)
Th 2	19.8819	19.8850	19.8880	19.9025	19.9052	19.9178	19.9178	19.9201	19.9129	19.9052	19.8997	19.8940 (88)
util rest of house	0.9925	0.9825	0.9580	0.8920	0.7534	0.5417	0.3596	0.3990	0.6639	0.9143	0.9830	0.9943 (89)
MIT 2	18.2787	18.5715	18.9729	19.4394	19.7529	19.8945	19.9153	19.9160	19.8517	19.4559	18.7934	18.2416 (90)
Living area fraction	18.8805	19.1364	19.4886	19.9002	20.1873	20.3232	20.3477	20.3467	20.2788	19.9113	19.3272	18.8457 (91)
MIT	18.8805	19.1364	19.4886	19.9002	20.1873	20.3232	20.3477	20.3467	20.2788	19.9113	19.3272	18.8457 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8805	19.1364	19.4886	19.9002	20.1873	20.3232	20.3477	20.3467	20.2788	19.9113	19.3272	18.8457 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	532.3935	625.9962	689.2175	706.1433	638.2060	467.4339	314.8037	329.4370	484.7284	565.4223	528.3410	502.3611	(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	1280.5861	1246.4146	1133.6360	946.0390	727.9017	484.4726	317.2493	333.2804	525.6886	798.5682	1054.5505	1270.5460	(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	556.6553	416.9212	330.6473	172.7249	66.7336	0.0000	0.0000	0.0000	0.0000	173.4605	378.8708	571.5296	(98)
Space heating													(98)
Space heating per m2													(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												2852.9874 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	556.6553	416.9212	330.6473	172.7249	66.7336	0.0000	0.0000	0.0000	0.0000	173.4605	378.8708	571.5296 (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)	595.3532	445.9050	353.6335	184.7325	71.3728	0.0000	0.0000	0.0000	0.0000	185.5192	405.2094	611.2616 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	191.5439	168.9100	177.5874	159.4653	156.4663	140.0894	134.8081	147.5579	147.1818	165.3431	174.4940	187.0265 (64)
Efficiency of water heater (217)m	87.4965	87.1315	86.4497	85.0271	82.7243	79.8000	79.8000	79.8000	79.8000	84.9417	86.8288	79.8000 (216)
Fuel for water heating, kWh/month	218.9160	193.8565	205.4229	187.5464	189.1419	175.5506	168.9325	184.9096	184.4384	194.6547	200.9634	87.6039 (217)
Water heating fuel used												213.4912 (219)
Annual totals kWh/year												2317.8240 (219)
Space heating fuel - main system												2852.9874 (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)												314.9105 (232)
Total delivered energy for all uses												5560.7219 (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	2852.9874	0.2160	616.2453 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2317.8240	0.2160	500.6500 (264)
Space and water heating			1116.8953 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	314.9105	0.5190	163.4385 (268)
Total CO2, kg/m2/year			1319.2588 (272)
Emissions per m2 for space and water heating			15.8695 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3222 (272b)
Emissions per m2 for pumps and fans			0.5531 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8695 * 1.55) + 2.3222 + 0.5531, rounded to 2 d.p.			27.4700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122162	Issued on Date	01/11/2022
Assessment Reference	004 - be clean	Prop Type Ref	
Property	Flat 4, 32, Norwich Road, Northwood, HA6 1NB		
SAP Rating	90 B	DER	17.04
Environmental	91 B	TER	32.44
CO ₂ Emissions (t/year)	0.52	% DER<TER	47.47
General Requirements Compliance	Pass	DFEE	29.17
		TFEE	50.67
		% DFEE<TFEE	42.43
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com		Assessor ID
Client	L706-0001		

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 38 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
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 32.44 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.04 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 29.2 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	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.80 (max. 2.00)	0.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 5.0 kW PUZ-WM50VHA

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 0.94 kWh/day
Permitted by DBSCG 1.89 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South East: 3.38 m², No overhang
Windows facing South: 3.65 m², No overhang
Windows facing South West: 0.92 m², No overhang
Windows facing North West: 1.89 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.80 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	37.5000 (1b)	x 2.6000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					1 * 10 = 10.0000 (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) =				10.0000 / (5) =	0.1026 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2526 (18)
Number of sides sheltered					4 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1768 (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	0.2254	0.2210	0.2166	0.1945	0.1901	0.1680	0.1680	0.1635	0.1768	0.1901	0.1989	0.2077 (22b)
Effective ac	0.5254	0.5244	0.5235	0.5189	0.5181	0.5141	0.5141	0.5134	0.5156	0.5181	0.5198	0.5216 (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
Opening Type 1 (Uw = 0.80)			9.8400	0.7752	7.6279		(27)
External Wall 1	37.4400	7.9500	29.4900	0.1400	4.1286		(29a)
External Wall 2	13.7800	1.8900	11.8900	0.1321	1.5701		(29a)
External Roof 1	17.4100		17.4100	0.1400	2.4374		(30)
Total net area of external elements Aum(A, m ²)			68.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.7640		(33)
Party Wall 1			20.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3678 (36)
Total fabric heat loss						(33) + (36) =	21.1318 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.9049	16.8732	16.8421	16.6959	16.6686	16.5413	16.5413	16.5177	16.5903	16.6686	16.7239	16.7817 (38)
Heat transfer coeff	38.0367	38.0050	37.9739	37.8277	37.8004	37.6731	37.6731	37.6495	37.7221	37.8004	37.8557	37.9135 (39)
Average = Sum(39)m / 12 =												37.8276 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0143	1.0135	1.0126	1.0087	1.0080	1.0046	1.0046	1.0040	1.0059	1.0080	1.0095	1.0110 (40)
HLP (average)												1.0087 (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												1.3416 (42)
Average daily hot water use (litres/day)												66.0628 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	72.6691	70.0266	67.3841	64.7415	62.0990	59.4565	59.4565	62.0990	64.7415	67.3841	70.0266	72.6691 (44)
Energy conte	107.7661	94.2530	97.2606	84.7942	81.3620	70.2092	65.0592	74.6563	75.5480	88.0439	96.1068	104.3658 (45)
Energy content (annual)												Total = Sum(45)m = 1039.4250 (45)
Distribution loss (46)m = 0.15 x (45)m	16.1649	14.1379	14.5891	12.7191	12.2043	10.5314	9.7589	11.1985	11.3322	13.2066	14.4160	15.6549 (46)
Water storage loss:												150.0000 (47)
Store volume												0.9400 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.5076 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total storage loss	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (56)
If cylinder contains dedicated solar storage	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (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	146.7641	129.4770	136.2586	122.5342	120.3600	107.9492	104.0572	113.6543	113.2880	127.0419	133.8468	143.3638 (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	146.7641	129.4770	136.2586	122.5342	120.3600	107.9492	104.0572	113.6543	113.2880	127.0419	133.8468	143.3638 (64)
Heat gains from water heating, kWh/month	67.0306	59.5183	63.5376	58.3861	58.2513	53.5366	52.8306	56.0216	55.3117	60.4730	62.1475	65.9000 (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	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.2792	9.1299	7.4249	5.6211	4.2019	3.5474	3.8331	4.9824	6.6874	8.4911	9.9104	10.5649 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080 (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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637 (71)	
Water heating gains (Table 5)	90.0949	88.5689	85.3999	81.0917	78.2947	74.3563	71.0088	75.2979	76.8218	81.2809	86.3160	88.5753 (72)	
Total internal gains	258.7993	257.3204	249.4314	236.9007	224.5820	212.3740	204.2247	208.4666	214.7106	227.3921	241.9490	252.4779 (73)	

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast				3.3800	36.7938		0.5700		0.7000		0.7700		34.3873 (77)
South				3.6500	46.7521		0.5700		0.7000		0.7700		47.1845 (78)
Southwest				0.9200	36.7938		0.5700		0.7000		0.7700		9.3599 (79)
Northwest				1.8900	11.2829		0.5700		0.7000		0.7700		5.8964 (81)
Solar gains	96.8281	163.7961	222.0187	273.0989	305.1723	302.9415	292.0563	267.9378	239.5770	180.3752	115.7480		83.0256 (83)
Total gains	355.6274	421.1165	471.4501	509.9996	529.7543	515.3155	496.2810	476.4044	454.2876	407.7673	357.6970		335.5034 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.4646	68.5217	68.5779	68.8428	68.8926	69.1254	69.1254	69.1686	69.0355	68.8926	68.7919	68.6870	
alpha	5.5643	5.5681	5.5719	5.5895	5.5928	5.6084	5.6084	5.6112	5.6024	5.5928	5.5861	5.5791	
util living area	0.9822	0.9574	0.9053	0.7989	0.6395	0.4643	0.3335	0.3627	0.5619	0.8324	0.9598	0.9866 (86)	
Tweekday	19.2879	19.4982	19.7216	19.9040	19.9846	20.0064	20.0084	20.0088	20.0009	19.9018	19.5740	19.2346	
Tweekend	20.6124	20.7086	20.8143	20.9059	20.9526	20.9664	20.9684	20.9682	20.9624	20.9016	20.7406	20.5874	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.4018	20.5492	20.7134	20.8530	20.9269	20.9484	20.9512	20.9510	20.9412	20.8482	20.5950	20.3631 (87)	
Th 2	20.0714	20.0721	20.0728	20.0761	20.0767	20.0795	20.0795	20.0800	20.0784	20.0767	20.0754	20.0742 (88)	
util rest of house	0.9771	0.9463	0.8829	0.7589	0.5837	0.3992	0.2640	0.2906	0.4914	0.7884	0.9473	0.9826 (89)	
Tweekday	19.2879	19.4982	19.7216	19.9040	19.9846	20.0064	20.0084	20.0088	20.0009	19.9018	19.5740	19.2346	
Tweekend	19.2879	19.4982	19.7216	19.9040	19.9846	20.0064	20.0084	20.0088	20.0009	19.9018	19.5740	19.2346	
MIT 2	19.2879	19.4982	19.7216	19.9040	19.9846	20.0064	20.0084	20.0088	20.0009	19.9018	19.5740	19.2346 (90)	
Living area fraction									fLA = Living area / (4) =			0.2907 (91)	
MIT	19.6117	19.8037	20.0099	20.1798	20.2585	20.2802	20.2824	20.2827	20.2743	20.1769	19.8708	19.5626 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6117	19.8037	20.0099	20.1798	20.2585	20.2802	20.2824	20.2827	20.2743	20.1769	19.8708	19.5626 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9740	0.9426	0.8813	0.7637	0.5950	0.4135	0.2794	0.3066	0.5067	0.7936	0.9440	0.9799 (94)	
Ext temp.	346.3652	396.9279	415.4661	389.4817	315.2063	213.0840	138.6493	146.0462	230.1848	323.6156	337.6493	328.7711 (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	582.4053	566.4134	513.0226	426.6910	323.5136	213.9921	138.7278	146.1801	232.9060	362.0096	483.4467	582.4520 (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	175.6138	113.8943	72.5820	26.7907	6.1806	0.0000	0.0000	0.0000	0.0000	28.5652	104.9742	188.7387 (98)	
Space heating per m2												717.3394 (98)	
										(98) / (4) =		19.1291 (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

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 %)												142.9238 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												501.9034 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	175.6138	113.8943	72.5820	26.7907	6.1806	0.0000	0.0000	0.0000	0.0000	28.5652	104.9742	188.7387 (98)
Space heating efficiency (main heating system 1)	142.9238	142.9238	142.9238	142.9238	142.9238	0.0000	0.0000	0.0000	0.0000	142.9238	142.9238	142.9238 (210)
Space heating fuel (main heating system)	122.8724	79.6888	50.7837	18.7447	4.3244	0.0000	0.0000	0.0000	0.0000	19.9863	73.4477	132.0555 (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	146.7641	129.4770	136.2586	122.5342	120.3600	107.9492	104.0572	113.6543	113.2880	127.0419	133.8468	143.3638 (64)
Efficiency of water heater (217)m	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000 (216)
Fuel for water heating, kWh/month	53.6419	47.3234	49.8021	44.7859	43.9912	39.4551	38.0326	41.5403	41.4064	46.4334	48.9206	52.3990 (219)
Water heating fuel used												547.7321 (219)
Annual totals kWh/year												
Space heating fuel - main system												501.9034 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												181.5337 (232)
Total delivered energy for all uses												1231.1693 (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	501.9034	0.5190	260.4879 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	547.7321	0.5190	284.2730 (264)
Space and water heating			544.7609 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	181.5337	0.5190	94.2160 (268)
Total CO2, kg/year			638.9768 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.0400 (273)

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

DER		17.0400 ZC1
Total Floor Area	TFA	37.5000
Assumed number of occupants	N	1.3416
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		18.2200 ZC2
CO2 emissions from cooking, equation (L16)		4.0320 ZC3
Total CO2 emissions		39.2920 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		39.2920 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	37.5000 (1b)	x 2.6000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (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					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) = 0.2051 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4551 (18)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3186 (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	0.4062	0.3982	0.3903	0.3504	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	0.3743 (22b)
	0.5825	0.5793	0.5762	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5701 (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 Opening Type (Uw = 1.40)			9.3800	1.3258	12.4356			(27)					
External Wall 1	37.4400	7.5800	29.8600	0.1800	5.3748			(29a)					
External Wall 2	13.7800	1.8000	11.9800	0.1800	2.1564			(29a)					
External Roof 1	17.4100		17.4100	0.1300	2.2633			(30)					
Total net area of external elements Aum(A, m2)			68.6300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			22.2301		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							250.0000	(35)					
Total fabric heat loss							(33) + (36) =	31.4281 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 18.7419	Feb 18.6389	Mar 18.5378	Apr 18.0633	May 17.9745	Jun 17.5612	Jul 17.5612	Aug 17.4846	Sep 17.7204	Oct 17.9745	Nov 18.1541	Dec 18.3419	(38)
Heat transfer coeff	50.1700	50.0670	49.9659	49.4914	49.4026	48.9893	48.9893	48.9127	49.1485	49.4026	49.5822	49.7700	(39)
Average = Sum(39)m / 12 =												49.4910	(39)
HLP	Jan 1.3379	Feb 1.3351	Mar 1.3324	Apr 1.3198	May 1.3174	Jun 1.3064	Jul 1.3064	Aug 1.3043	Sep 1.3106	Oct 1.3174	Nov 1.3222	Dec 1.3272	(40)
HLP (average)												1.3198	(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												1.3416 (42)
Average daily hot water use (litres/day)												66.0628 (43)
Daily hot water use	72.6691	70.0266	67.3841	64.7415	62.0990	59.4565	59.4565	62.0990	64.7415	67.3841	70.0266	72.6691 (44)
Energy conte	107.7661	94.2530	97.2606	84.7942	81.3620	70.2092	65.0592	74.6563	75.5480	88.0439	96.1068	104.3658 (45)
Energy content (annual)										Total = Sum(45)m =		1039.4250 (45)
Distribution loss (46)m = 0.15 x (45)m	16.1649	14.1379	14.5891	12.7191	12.2043	10.5314	9.7589	11.1985	11.3322	13.2066	14.4160	15.6549 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	154.3610	136.3387	143.8555	129.8860	127.9569	115.3011	111.6541	121.2513	120.6398	134.6388	141.1986	150.9607 (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	154.3610	136.3387	143.8555	129.8860	127.9569	115.3011	111.6541	121.2513	120.6398	134.6388	141.1986	150.9607 (64)
	73.1082	65.0077	69.6151	64.2675	64.3288	59.4180	58.9081	62.0992	61.1932	66.5505	68.0290	71.9775 (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	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.2792	9.1299	7.4249	5.6211	4.2019	3.5474	3.8331	4.9824	6.6874	8.4911	9.9104	10.5649	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	(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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	(71)
Water heating gains (Table 5)	98.2637	96.7376	93.5686	89.2605	86.4634	82.5251	79.1775	83.4666	84.9905	89.4496	94.4847	96.7440	(72)
Total internal gains	269.9680	268.4891	260.6001	248.0694	235.7507	223.5427	215.3935	219.6354	225.8793	238.5609	253.1177	263.6466	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast			3.2200		36.7938		0.6300		0.7000		0.7700		36.2078 (77)
South			3.4800		46.7521		0.6300		0.7000		0.7700		49.7224 (78)
Southwest			0.8800		36.7938		0.6300		0.7000		0.7700		9.8953 (79)
Northwest			1.8000		11.2829		0.6300		0.7000		0.7700		6.2068 (81)
Solar gains	102.0323	172.5973	233.9423	287.7555	321.5410	319.1864	307.7192	282.3138	252.4401	190.0656	121.9687		87.4882 (83)
Total gains	372.0003	441.0864	494.5424	535.8249	557.2916	542.7291	523.1127	501.9492	478.3194	428.6264	375.0863		351.1348 (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	51.9068	52.0137	52.1188	52.6186	52.7132	53.1579	53.1579	53.2411	52.9857	52.7132	52.5222	52.3240	
alpha	4.4605	4.4676	4.4746	4.5079	4.5142	4.5439	4.5439	4.5494	4.5324	4.5142	4.5015	4.4883	
util living area	0.9850	0.9682	0.9344	0.8608	0.7320	0.5565	0.4077	0.4417	0.6580	0.8842	0.9695	0.9881	(86)
MIT	19.8584	20.0817	20.3640	20.6657	20.8748	20.9720	20.9945	20.9921	20.9406	20.6724	20.2094	19.8132	(87)
Th 2	19.8113	19.8134	19.8155	19.8254	19.8272	19.8358	19.8358	19.8374	19.8325	19.8272	19.8235	19.8196	(88)
util rest of house	0.9802	0.9587	0.9152	0.8221	0.6656	0.4642	0.3021	0.3334	0.5658	0.8429	0.9586	0.9843	(89)
MIT 2	18.3445	18.6645	19.0604	19.4689	19.7184	19.8196	19.8341	19.8347	19.7929	19.4907	18.8586	18.2854	(90)
Living area fraction	18.7846	19.0764	19.4393	19.8168	20.0546	20.1545	20.1714	20.1711	20.1265	19.8342	19.2512	18.7295	(91)
MIT	18.7846	19.0764	19.4393	19.8168	20.0546	20.1545	20.1714	20.1711	20.1265	19.8342	19.2512	18.7295	(92)
Temperature adjustment	18.7846	19.0764	19.4393	19.8168	20.0546	20.1545	20.1714	20.1711	20.1265	19.8342	19.2512	18.7295	(93)
adjusted MIT	18.7846	19.0764	19.4393	19.8168	20.0546	20.1545	20.1714	20.1711	20.1265	19.8342	19.2512	18.7295	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9747	0.9512	0.9079	0.8218	0.6794	0.4903	0.3329	0.3650	0.5903	0.8432	0.9517	0.9795	(94)
Ext temp.	362.5970	419.5507	448.9910	440.3512	378.6220	266.0922	174.1543	183.2219	282.3706	361.4163	356.9826	343.9411	(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	726.6911	709.7699	646.5236	540.2861	412.7374	272.1133	174.9593	184.4541	296.1943	456.1916	602.4850	723.1308	(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	270.8860	195.0273	146.9643	71.9531	25.3818	0.0000	0.0000	0.0000	0.0000	70.5128	176.7617	282.1171	(98)
Space heating per m2												1239.6040	(98)
												33.0561	(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													1325.7797 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	270.8860	195.0273	146.9643	71.9531	25.3818	0.0000	0.0000	0.0000	0.0000	70.5128	176.7617	282.1171	(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)	289.7176	208.5853	157.1810	76.9552	27.1463	0.0000	0.0000	0.0000	0.0000	75.4147	189.0500	301.7295	(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	154.3610	136.3387	143.8555	129.8860	127.9569	115.3011	111.6541	121.2513	120.6398	134.6388	141.1986	150.9607	(64)
Efficiency of water heater (217)m	86.2996	85.7683	84.8709	83.3114	81.3929	79.8000	79.8000	79.8000	79.8000	83.1802	85.4141	86.4590	(216)
Fuel for water heating, kWh/month	178.8664	158.9616	169.4993	155.9042	157.2089	144.4876	139.9174	151.9439	151.1777	161.8639	165.3107	174.6038	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													1325.7797 (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)													181.5337 (232)
Total delivered energy for all uses													3492.0587 (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	1325.7797	0.2160	286.3684 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1909.7453	0.2160	412.5050 (264)
Space and water heating			698.8734 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	181.5337	0.5190	94.2160 (268)
Total CO2, kg/m2/year			832.0144 (272)
Emissions per m2 for space and water heating			18.6366 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5124 (272b)
Emissions per m2 for pumps and fans			1.0380 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.6366 * 1.55) + 2.5124 + 1.0380, rounded to 2 d.p.			32.4400 (273)

APPENDIX C - SAP CALCULATIONS FOR THE BE GREEN CASE

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122159	Issued on Date	02/11/2022
Assessment Reference	001 be green	Prop Type Ref	
Property	Flat 1, 32, Norwich Road, Northwood, HA6 1NB		
SAP Rating	104 A	DER	-2.38
Environmental	104 A	TER	24.46
CO ₂ Emissions (t/year)	-0.57	% DER<TER	109.73
General Requirements Compliance	Pass	DFEE	33.91
		TFEE	53.99
		% DFEE<TFEE	37.19
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com		Assessor ID
Client	L706-0001		

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 117 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
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.46 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) -2.38 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.85 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 5.0 kW PUZ-WM50VHA

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 0.98 kWh/day	
Permitted by DBSCG 2.03	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

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:	0.53	
Maximum	1.5	OK
MVHR efficiency:	95%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
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Based on:

Overshading:	Average
Windows facing South East:	3.24 m ² , No overhang
Windows facing South:	3.65 m ² , No overhang
Windows facing South West:	3.05 m ² , No overhang
Windows facing North West:	10.76 m ² , No overhang
Air change rate:	1.90 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Floor U-value	0.11 W/m ² K
Window U-value	0.80 W/m ² K
Thermal bridging y-value	0.017 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	3.17 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	116.8500 (1b)	x 2.6000 (2b)	= 303.8100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 303.8100 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test								Yes				
Measured/design AP50								3.0000				
Infiltration rate								0.1500	(18)			
Number of sides sheltered								3	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												80.7500 (23c)
Effective ac	0.2445	0.2416	0.2387	0.2241	0.2212	0.2067	0.2067	0.2038	0.2125	0.2212	0.2270	0.2328 (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						
Opening Type 1 (Uw = 0.80)			20.7000	0.7752	16.0465			(27)					
Opening Type 2			1.8900	1.4000	2.6460			(26)					
Heat Loss Floor 1			116.8500	0.1100	12.8535			(28a)					
External Wall 1	96.8200	20.7000	76.1200	0.1400	10.6568			(29a)					
External Wall 2	34.3200	1.8900	32.4300	0.1321	4.2824			(29a)					
Total net area of external elements Aum(A, m2)			247.9900					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		46.4852			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.2445 (36)					
Total fabric heat loss						(33) + (36) =		50.7297 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.5098	Feb 24.2184	Mar 23.9270	Apr 22.4702	May 22.1788	Jun 20.7219	Jul 20.7219	Aug 20.4306	Sep 21.3047	Oct 22.1788	Nov 22.7615	Dec 23.3443	(38)
Heat transfer coeff	75.2395	74.9481	74.6567	73.1999	72.9085	71.4516	71.4516	71.1603	72.0344	72.9085	73.4913	74.0740	(39)
Average = Sum(39)m / 12 =												73.1270	(39)
HLP	Jan 0.6439	Feb 0.6414	Mar 0.6389	Apr 0.6264	May 0.6239	Jun 0.6115	Jul 0.6115	Aug 0.6090	Sep 0.6165	Oct 0.6239	Nov 0.6289	Dec 0.6339	(40)
HLP (average)												0.6258	(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												2.8503 (42)
Average daily hot water use (litres/day)												101.8940 (43)
Daily hot water use	Jan 112.0835	Feb 108.0077	Mar 103.9319	Apr 99.8562	May 95.7804	Jun 91.7046	Jul 91.7046	Aug 95.7804	Sep 99.8562	Oct 103.9319	Nov 108.0077	Dec 112.0835 (44)
Energy conte	166.2165	145.3740	150.0130	130.7850	125.4913	108.2894	100.3461	115.1486	116.5238	135.7973	148.2334	160.9718 (45)
Energy content (annual)										Total = Sum(45)m =		1603.1902 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.9325	21.8061	22.5019	19.6177	18.8237	16.2434	15.0519	17.2723	17.4786	20.3696	22.2350	24.1458 (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												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9800 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5292 (55)
Total storage loss												
16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052	(56)
If cylinder contains dedicated solar storage												
16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052	(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												
205.8841	181.2028	189.6806	169.1730	165.1589	146.6774	140.0137	154.8162	154.9118	175.4649	186.6214	200.6394	(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 =												
Output from w/h												
205.8841	181.2028	189.6806	169.1730	165.1589	146.6774	140.0137	154.8162	154.9118	175.4649	186.6214	200.6394	(64)
Heat gains from water heating, kWh/month												
87.0011	76.9999	81.6134	74.1964	73.4599	66.7166	65.0991	70.0210	69.4546	76.8867	79.9980	85.2572	(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	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
26.3075	23.3661	19.0026	14.3862	10.7538	9.0788	9.8100	12.7514	17.1149	21.7313	25.3637	27.0386	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
281.0537	283.9702	276.6208	260.9748	241.2246	222.6622	210.2614	207.3449	214.6943	230.3402	250.0905	268.6529	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	(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)												
-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	(71)
Water heating gains (Table 5)												
116.9369	114.5832	109.6954	103.0506	98.7365	92.6620	87.4989	94.1142	96.4647	103.3423	111.1083	114.5930	(72)
Total internal gains												
490.0523	487.6736	471.0729	444.1657	416.4690	390.1572	373.3244	379.9647	394.0280	421.1680	452.3166	476.0387	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data			factor		W	
					W/m2	or Table 6b		Specific data	or Table 6c			
Southeast				3.2400	36.7938	0.5700		0.7000	0.7700		32.9630 (77)	
South				3.6500	46.7521	0.5700		0.7000	0.7700		47.1845 (78)	
Southwest				3.0500	36.7938	0.5700		0.7000	0.7700		31.0299 (79)	
Northwest				10.7600	11.2829	0.5700		0.7000	0.7700		33.5692 (81)	

Solar gains	144.7466	254.6108	370.6903	498.2334	594.6946	606.8003	578.1711	503.5046	414.3314	287.3277	174.8172	122.9507 (83)
Total gains	634.7989	742.2843	841.7633	942.3991	1011.1636	996.9575	951.4955	883.4693	808.3594	708.4957	627.1338	598.9894 (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	107.8501	108.2693	108.6919	110.8551	111.2982	113.5675	113.5675	114.0325	112.6487	111.2982	110.4156	109.5470
alpha	8.1900	8.2180	8.2461	8.3903	8.4199	8.5712	8.5712	8.6022	8.5099	8.4199	8.3610	8.3031
util living area												
0.9982	0.9928	0.9690	0.8638	0.6627	0.4584	0.3304	0.3705	0.6111	0.9216	0.9934	0.9988	(86)
Tweekday	19.7803	19.9300	20.1240	20.3064	20.3564	20.3729	20.3730	20.3754	20.3668	20.2840	20.0088	19.7649
Tweekend	20.7111	20.7768	20.8640	20.9481	20.9756	20.9793	20.9794	20.9795	20.9779	20.9337	20.8073	20.7008
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.5541	20.6548	20.7900	20.9189	20.9624	20.9682	20.9682	20.9683	20.9656	20.8976	20.6991	20.5383 (87)
Th 2	20.3907	20.3929	20.3951	20.4063	20.4085	20.4197	20.4197	20.4219	20.4152	20.4085	20.4040	20.3996 (88)
util rest of house												
0.9976	0.9907	0.9606	0.8370	0.6232	0.4170	0.2868	0.3239	0.5609	0.8980	0.9911	0.9984	(89)
Tweekday	19.7803	19.9300	20.1240	20.3064	20.3564	20.3729	20.3730	20.3754	20.3668	20.2840	20.0088	19.7649
Tweekend	19.7803	19.9300	20.1240	20.3064	20.3564	20.3729	20.3730	20.3754	20.3668	20.2840	20.0088	19.7649
MIT 2	19.7803	19.9300	20.1240	20.3064	20.3564	20.3729	20.3730	20.3754	20.3668	20.2840	20.0088	19.7649 (90)
Living area fraction												
MIT	20.1055	20.2346	20.4039	20.5639	20.6111	20.6231	20.6232	20.6246	fLA = Living area / (4) =	20.6184	20.5419	20.2989
Temperature adjustment												0.0000
adjusted MIT	20.1055	20.2346	20.4039	20.5639	20.6111	20.6231	20.6232	20.6246	20.6184	20.5419	20.2989	20.0899 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9973	0.9901	0.9608	0.8444	0.6369	0.4315	0.3021	0.3403	0.5785	0.9037	0.9906	0.9982 (94)
Ext temp.	633.0618	734.9180	808.7399	795.7829	644.0034	430.1775	287.4564	300.6065	467.6065	640.3012	621.2535	597.9091 (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	1189.2013	1149.2989	1038.0208	853.7927	649.6943	430.3601	287.4634	300.6251	469.5512	724.8468	970.0063	1177.0304 (97)
	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating kWh	413.7678	278.4640	170.5850	41.7670	4.2340	0.0000	0.0000	0.0000	0.0000	62.9019	251.1020	430.8662 (98)
Space heating												1653.6880 (98)
Space heating per m2											(98) / (4) =	14.1522 (99)

8c. Space cooling requirement

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 %)												224.8730 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												735.3876 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	413.7678	278.4640	170.5850	41.7670	4.2340	0.0000	0.0000	0.0000	0.0000	62.9019	251.1020	430.8662	(98)
Space heating efficiency (main heating system 1)	224.8730	224.8730	224.8730	224.8730	224.8730	0.0000	0.0000	0.0000	0.0000	224.8730	224.8730	224.8730	(210)
Space heating fuel (main heating system)	184.0007	123.8317	75.8584	18.5736	1.8829	0.0000	0.0000	0.0000	0.0000	27.9722	111.6639	191.6043	(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	205.8841	181.2028	189.6806	169.1730	165.1589	146.6774	140.0137	154.8162	154.9118	175.4649	186.6214	200.6394	(64)
Efficiency of water heater (217)m	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	(216)
Fuel for water heating, kWh/month	75.2500	66.2291	69.3277	61.8322	60.3651	53.6102	51.1746	56.5849	56.6198	64.1319	68.2096	73.3331	(219)
Water heating fuel used												756.6682	(219)
Annual totals kWh/year													
Space heating fuel - main system												735.3876	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)													245.5544 (230a)
Total electricity for the above, kWh/year													245.5544 (231)
Electricity for lighting (calculated in Appendix L)													464.5983 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 3.17 * 1080 * 1.00) =										-2737.6744		-2737.6744	(233)
Total delivered energy for all uses												-535.4659	(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	735.3876	0.5190	381.6662	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	756.6682	0.5190	392.7108	(264)
Space and water heating			774.3769	(265)
Pumps and fans	245.5544	0.5190	127.4428	(267)
Energy for lighting	464.5983	0.5190	241.1265	(268)
Energy saving/generation technologies				
PV Unit	-2737.6744	0.5190	-1420.8530	(269)
Total CO2, kg/year			-277.9068	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			-2.3800	(273)

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

DER			-2.3800	ZC1
Total Floor Area		TFA	116.8500	
Assumed number of occupants		N	2.8503	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			14.2530	ZC2
CO2 emissions from cooking, equation (L16)			1.6038	ZC3
Total CO2 emissions			13.4768	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			13.4768	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	116.8500 (1b)	x 2.6000 (2b)	= 303.8100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 303.8100 (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)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1317 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3817 (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) =				0.2958 (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	0.3771	0.3697	0.3623	0.3254	0.3180	0.2810	0.2810	0.2736	0.2958	0.3180	0.3328	0.3476 (22b)
Effective ac	0.5711	0.5684	0.5656	0.5529	0.5506	0.5395	0.5395	0.5374	0.5437	0.5506	0.5554	0.5604 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.7000	1.3258	27.4432		(27)
Heat Loss Floor 1			116.8500	0.1300	15.1905		(28a)
External Wall 1	96.8200	20.7000	76.1200	0.1800	13.7016		(29a)
External Wall 2	34.3200	1.8900	32.4300	0.1800	5.8374		(29a)
Total net area of external elements Aum(A, m ²)			247.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.0627		(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)							11.4414 (36)
Total fabric heat loss						(33) + (36) =	75.5041 (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	57.2583	56.9814	56.7100	55.4354	55.1970	54.0868	54.0868	53.8812	54.5144	55.1970	55.6794	56.1837 (38)
Heat transfer coeff	132.7623	132.4855	132.2141	130.9395	130.7010	129.5909	129.5909	129.3853	130.0185	130.7010	131.1835	131.6878 (39)
Average = Sum(39)m / 12 =												130.9384 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1362	1.1338	1.1315	1.1206	1.1185	1.1090	1.1090	1.1073	1.1127	1.1185	1.1227	1.1270 (40)
HLP (average)												1.1206 (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												2.8503 (42)
Average daily hot water use (litres/day)												101.8940 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.0835	108.0077	103.9319	99.8562	95.7804	91.7046	91.7046	95.7804	99.8562	103.9319	108.0077	112.0835 (44)
Energy conte	166.2165	145.3740	150.0130	130.7850	125.4913	108.2894	100.3461	115.1486	116.5238	135.7973	148.2334	160.9718 (45)
Energy content (annual)										Total = Sum(45)m =		1603.1902 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9325	21.8061	22.5019	19.6177	18.8237	16.2434	15.0519	17.2723	17.4786	20.3696	22.2350	24.1458 (46)
Water storage loss:												170.0000 (47)
Store volume												1.5003 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8102 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (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	214.5942	189.0700	198.3907	177.6021	173.8690	155.1066	148.7238	163.5263	163.3410	184.1750	195.0505	209.3495 (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	214.5942	189.0700	198.3907	177.6021	173.8690	155.1066	148.7238	163.5263	163.3410	184.1750	195.0505	209.3495 (64)
Heat gains from water heating, kWh/month	93.9692	83.2937	88.5815	80.9397	80.4280	73.4599	72.0672	76.9891	76.1979	83.8548	86.7413	92.2253 (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	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6579	22.7891	18.5333	14.0309	10.4883	8.8546	9.5678	12.4365	16.6923	21.1947	24.7373	26.3710 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0537	283.9702	276.6208	260.9748	241.2246	222.6622	210.2614	207.3449	214.6943	230.3402	250.0905	268.6529 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514 (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)	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110 (71)
Water heating gains (Table 5)	126.3026	123.9489	119.0611	112.4163	108.1022	102.0277	96.8646	103.4799	105.8304	112.7080	120.4740	123.9587 (72)
Total internal gains	501.7683	499.4623	482.9694	456.1761	428.5692	402.2987	385.4478	392.0155	405.9711	432.9971	464.0560	487.7367 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southeast				3.2400	36.7938	0.6300		0.7000	0.7700		36.4327 (77)	
South				3.6500	46.7521	0.6300		0.7000	0.7700		52.1513 (78)	
Southwest				3.0500	36.7938	0.6300		0.7000	0.7700		34.2963 (79)	
Northwest				10.7600	11.2829	0.6300		0.7000	0.7700		37.1028 (81)	
Solar gains	159.9831	281.4119	409.7104	550.6790	657.2940	670.6741	639.0313	556.5051	457.9452	317.5727	193.2191	135.8928 (83)
Total gains	661.7515	780.8742	892.6798	1006.8552	1085.8632	1072.9727	1024.4791	948.5206	863.9163	750.5698	657.2750	623.6296 (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	61.1211	61.2488	61.3746	61.9720	62.0851	62.6169	62.6169	62.7164	62.4110	62.0851	61.8568	61.6198	
alpha	5.0747	5.0833	5.0916	5.1315	5.1390	5.1745	5.1745	5.1811	5.1607	5.1390	5.1238	5.1080	
util living area	0.9985	0.9962	0.9890	0.9621	0.8804	0.7148	0.5443	0.6053	0.8531	0.9783	0.9966	0.9989 (86)	
MIT	19.7459	19.9076	20.1659	20.5025	20.7902	20.9495	20.9899	20.9830	20.8704	20.4947	20.0562	19.7172 (87)	
Th 2	19.9714	19.9733	19.9752	19.9841	19.9857	19.9935	19.9935	19.9949	19.9905	19.9857	19.9824	19.9789 (88)	
util rest of house	0.9980	0.9948	0.9850	0.9475	0.8360	0.6248	0.4262	0.4841	0.7834	0.9673	0.9951	0.9985 (89)	
MIT 2	18.2954	18.5327	18.9094	19.3955	19.7783	19.9596	19.9897	19.9878	19.8849	19.3929	18.7569	18.2586 (90)	
Living area fraction									fLA = Living area / (4) =			0.4203 (91)	
MIT	18.9050	19.1106	19.4375	19.8607	20.2036	20.3756	20.4100	20.4061	20.2991	19.8560	19.3029	18.8716 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9050	19.1106	19.4375	19.8607	20.2036	20.3756	20.4100	20.4061	20.2991	19.8560	19.3029	18.8716 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9972	0.9933	0.9822	0.9454	0.8467	0.6609	0.4762	0.5354	0.8073	0.9655	0.9938	0.9979 (94)	
Useful gains	659.8863	775.6363	876.8111	951.8563	919.3885	709.0982	487.8262	507.8066	697.4236	724.6795	653.2087	622.3186 (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	1938.9966	1882.6935	1710.5193	1435.1908	1111.4294	748.4689	493.7472	518.3254	805.9942	1209.7689	1600.8248	1932.0737 (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	951.6580	743.9425	620.2789	348.0008	142.8784	0.0000	0.0000	0.0000	0.0000	360.9065	682.2836	974.4578 (98)	
Space heating												4824.4065 (98)	
Space heating per m2												(98) / (4) =	41.2872 (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												5159.7931 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	951.6580	743.9425	620.2789	348.0008	142.8784	0.0000	0.0000	0.0000	0.0000	360.9065	682.2836	974.4578 (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)	1017.8161	795.6604	663.3999	372.1934	152.8112	0.0000	0.0000	0.0000	0.0000	385.9962	729.7151	1042.2008 (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	214.5942	189.0700	198.3907	177.6021	173.8690	155.1066	148.7238	163.5263	163.3410	184.1750	195.0505	209.3495 (64)
Efficiency of water heater (217)m	88.3209	88.1060	87.6519	86.5774	84.2957	79.8000	79.8000	79.8000	79.8000	86.5776	87.8803	79.8000 (216)
Fuel for water heating, kWh/month	242.9710	214.5938	226.3393	205.1368	206.2609	194.3691	186.3706	204.9202	204.6879	212.7283	221.9502	236.8107 (219)
Water heating fuel used												2557.1388 (219)
Annual totals kWh/year												
Space heating fuel - main system												5159.7931 (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)												453.1259 (232)
Total delivered energy for all uses												8245.0577 (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	5159.7931	0.2160	1114.5153 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2557.1388	0.2160	552.3420 (264)
Space and water heating			1666.8573 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	453.1259	0.5190	235.1723 (268)
Total CO2, kg/m2/year			1940.9546 (272)
Emissions per m2 for space and water heating			14.2649 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.0126 (272b)
Emissions per m2 for pumps and fans			0.3331 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.2649 * 1.55) + 2.0126 + 0.3331, rounded to 2 d.p.			24.4600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122160	Issued on Date	02/11/2022
Assessment Reference	002 be green	Prop Type Ref	
Property	Flat 2, 32, Norwich Road, Northwood, HA6 1NB		
SAP Rating	100 A	DER	2.17
Environmental	100 A	TER	31.41
CO ₂ Emissions (t/year)	-0.09	% DER<TER	93.09
General Requirements Compliance	Pass	DFEE	35.53
		TFEE	65.77
		% DFEE<TFEE	45.98
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com		Assessor ID
Client	L706-0001		

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 70 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
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 31.41 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 2.17 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 65.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 35.5 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	(no floor)		
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.87 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 5.0 kW PUZ-WM50VHA

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 0.98 kWh/day
Permitted by DBSCG 2.03 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing South West: 3.05 m², No overhang
Windows facing North West: 10.76 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.80 W/m²K
Thermal bridging y-value 0.029 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 1.91 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	70.4700 (1b)	x 2.6000 (2b)	= 183.2220 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.2220 (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					1 * 10 = 10.0000 (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 10.0000 / (5) = 0.0546 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2046 (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) =		0.1585 (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	0.2021	0.1982	0.1942	0.1744	0.1704	0.1506	0.1506	0.1467	0.1585	0.1704	0.1784	0.1863 (22b)
Effective ac	0.5204	0.5196	0.5189	0.5152	0.5145	0.5113	0.5113	0.5108	0.5126	0.5145	0.5159	0.5174 (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						
Opening Type 1 (Uw = 0.80)			13.8100	0.7752	10.7054			(27)					
Opening Type 2			1.8900	1.4000	2.6460			(26)					
External Wall 1	68.8200	13.8100	55.0100	0.1400	7.7014			(29a)					
External Wall 2	18.7200	1.8900	16.8300	0.1321	2.2224			(29a)					
External Roof 1	49.6700		49.6700	0.1400	6.9538			(30)					
Total net area of external elements Aum(A, m2)			137.2100					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	30.2290			(33)					
Party Wall 1			16.1200	0.0000	0.0000			(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.0160 (36)					
Total fabric heat loss						(33) + (36) =		34.2450 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 31.4670	Feb 31.4191	Mar 31.3720	Apr 31.1512	May 31.1098	Jun 30.9175	Jul 30.9175	Aug 30.8819	Sep 30.9916	Oct 31.1098	Nov 31.1934	Dec 31.2808	(38)
Heat transfer coeff	65.7120	65.6641	65.6170	65.3962	65.3549	65.1625	65.1625	65.1269	65.2366	65.3549	65.4384	65.5258	(39)
Average = Sum(39)m / 12 =												65.3960	(39)
HLP	Jan 0.9325	Feb 0.9318	Mar 0.9311	Apr 0.9280	May 0.9274	Jun 0.9247	Jul 0.9247	Aug 0.9242	Sep 0.9257	Oct 0.9274	Nov 0.9286	Dec 0.9298	(40)
HLP (average)												0.9280	(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												2.2575 (42)
Average daily hot water use (litres/day)												87.8152 (43)
Daily hot water use	Jan 96.5967	Feb 93.0841	Mar 89.5715	Apr 86.0589	May 82.5463	Jun 79.0337	Jul 79.0337	Aug 82.5463	Sep 86.0589	Oct 89.5715	Nov 93.0841	Dec 96.5967 (44)
Energy conte	143.2501	125.2875	129.2854	112.7142	108.1519	93.3269	86.4811	99.2383	100.4235	117.0339	127.7517	138.7301 (45)
Energy content (annual)										Total = Sum(45)m =		1381.6747 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.4875	18.7931	19.3928	16.9071	16.2228	13.9990	12.9722	14.8857	15.0635	17.5551	19.1628		20.8095 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9800 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Enter (49) or (54) in (55)												0.5292 (55)
Total storage loss	16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052 (56)
If cylinder contains dedicated solar storage	16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052 (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	182.9177	161.1163	168.9530	151.1022	147.8195	131.7149	126.1487	138.9059	138.8115	156.7015	166.1397	178.3977 (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	182.9177	161.1163	168.9530	151.1022	147.8195	131.7149	126.1487	138.9059	138.8115	156.7015	166.1397	178.3977 (64)
Heat gains from water heating, kWh/month	79.3647	70.3211	74.7215	68.1879	67.6946	61.7416	60.4890	64.7308	64.1012	70.6479	73.1878	77.8618 (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	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2133	16.1769	13.1559	9.9599	7.4451	6.2855	6.7917	8.8281	11.8491	15.0451	17.5599	18.7195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.3915	200.4502	195.2624	184.2181	170.2768	157.1738	148.4203	146.3616	151.5494	162.5937	176.5350	189.6380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	(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)	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	(71)
Water heating gains (Table 5)	106.6730	104.6445	100.4321	94.7054	90.9874	85.7522	81.3025	87.0038	89.0295	94.9568	101.6498	104.6530	(72)
Total internal gains	380.1401	378.1338	365.7127	345.7456	325.5715	306.0738	293.3767	299.0557	309.2902	329.4578	352.6069	369.8727	(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	
Southwest					3.0500	36.7938	0.5700	0.7000	0.7700		31.0299 (79)	
Northwest					10.7600	11.2829	0.5700	0.7000	0.7700		33.5692 (81)	
Solar gains	64.5991	121.1865	195.4300	291.7902	372.1413	389.3813	367.1107	304.1181	228.3188	141.9225	79.4054	53.9694 (83)
Total gains	444.7392	499.3204	561.1426	637.5359	697.7128	695.4551	660.4874	603.1738	537.6090	471.3803	432.0123	423.8421 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.4727	74.5271	74.5805	74.8324	74.8797	75.1007	75.1007	75.1418	75.0154	74.8797	74.7840	74.6843
alpha	5.9648	5.9685	5.9720	5.9888	5.9920	6.0067	6.0067	6.0095	6.0010	5.9920	5.9856	5.9790
util living area	0.9973	0.9940	0.9820	0.9316	0.7918	0.5882	0.4325	0.4929	0.7713	0.9629	0.9939	0.9980 (86)
Tweekday	19.1620	19.3033	19.5448	19.8409	20.0242	20.0750	20.0798	20.0797	20.0511	19.8071	19.4281	19.1271
Tweekend	20.5306	20.5931	20.7011	20.8377	20.9334	20.9654	20.9700	20.9692	20.9468	20.8186	20.6473	20.5143
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2755	20.3706	20.5387	20.7466	20.8972	20.9468	20.9537	20.9525	20.9170	20.7200	20.4492	20.2504 (87)
Th 2	20.1400	20.1406	20.1411	20.1438	20.1443	20.1466	20.1466	20.1470	20.1457	20.1443	20.1433	20.1422 (88)
util rest of house	0.9964	0.9920	0.9761	0.9103	0.7406	0.5148	0.3495	0.4035	0.6992	0.9469	0.9915	0.9973 (89)
Tweekday	19.1620	19.3033	19.5448	19.8409	20.0242	20.0750	20.0798	20.0797	20.0511	19.8071	19.4281	19.1271
Tweekend	19.1620	19.3033	19.5448	19.8409	20.0242	20.0750	20.0798	20.0797	20.0511	19.8071	19.4281	19.1271
MIT 2	19.1620	19.3033	19.5448	19.8409	20.0242	20.0750	20.0798	20.0797	20.0511	19.8071	19.4281	19.1271 (90)
Living area fraction	fLA = Living area / (4) =											0.3741 (91)
MIT	19.5786	19.7025	19.9166	20.1797	20.3507	20.4011	20.4067	20.4062	20.3750	20.1486	19.8101	19.5473 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5786	19.7025	19.9166	20.1797	20.3507	20.4011	20.4067	20.4062	20.3750	20.1486	19.8101	19.5473 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9908	0.9743	0.9114	0.7537	0.5371	0.3749	0.4310	0.7199	0.9470	0.9904	0.9967 (94)
Useful gains	442.8064	494.7189	546.6991	581.0213	525.8851	373.5202	247.6225	259.9464	387.0146	446.3988	427.8538	422.4392 (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	1003.9847	971.9942	880.3565	737.6491	565.3677	378.0145	248.0547	260.9113	409.3576	624.0462	831.7280	1005.6417 (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	417.5167	320.7290	248.2412	112.7720	29.3751	0.0000	0.0000	0.0000	0.0000	132.1697	290.7894	433.9027 (98)
Space heating												1985.4958 (98)
Space heating per m2										(98) / (4) =		28.1751 (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

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 %)													209.6446 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													947.0768 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.5167	320.7290	248.2412	112.7720	29.3751	0.0000	0.0000	0.0000	0.0000	132.1697	290.7894	433.9027	(98)
Space heating efficiency (main heating system 1)	209.6446	209.6446	209.6446	209.6446	209.6446	0.0000	0.0000	0.0000	0.0000	209.6446	209.6446	209.6446	(210)
Space heating fuel (main heating system)	199.1545	152.9870	118.4104	53.7920	14.0118	0.0000	0.0000	0.0000	0.0000	63.0446	138.7059	206.9706	(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	182.9177	161.1163	168.9530	151.1022	147.8195	131.7149	126.1487	138.9059	138.8115	156.7015	166.1397	178.3977	(64)
Efficiency of water heater	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	(216)
Fuel for water heating, kWh/month	66.8559	58.8875	61.7518	55.2274	54.0276	48.1414	46.1070	50.7697	50.7352	57.2740	60.7236	65.2038	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													947.0768 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year													0.0000 (231)
Electricity for lighting (calculated in Appendix L)													321.6528 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.91 * 1080 * 1.00) =													-1649.5136 (233)
Total delivered energy for all uses													294.9209 (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	947.0768	0.5190	491.5329 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	675.7049	0.5190	350.6909 (264)
Space and water heating			842.2237 (265)
Pumps and fans	0.0000	0.0000	0.0000 (267)
Energy for lighting	321.6528	0.5190	166.9378 (268)
Energy saving/generation technologies			
PV Unit	-1649.5136	0.5190	-856.0976 (269)
Total CO2, kg/year			153.0639 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			2.1700 (273)

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

DER			2.1700 ZC1
Total Floor Area		TFA	70.4700
Assumed number of occupants		N	2.2575
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6827 ZC2
CO2 emissions from cooking, equation (L16)			2.4575 ZC3
Total CO2 emissions			21.3101 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			21.3101 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	70.4700 (1b)	x 2.6000 (2b)	= 183.2220 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.2220 (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 30.0000 / (5) = 0.1637 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4137 (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) =		0.3206 (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	0.4088	0.4008	0.3928	0.3527	0.3447	0.3046	0.3046	0.2966	0.3206	0.3447	0.3607	0.3768 (22b)
Effective ac	0.5836	0.5803	0.5771	0.5622	0.5594	0.5464	0.5464	0.5440	0.5514	0.5594	0.5651	0.5710 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.8100	1.3258	18.3087		(27)
External Wall 1	68.8200	13.8100	55.0100	0.1800	9.9018		(29a)
External Wall 2	18.7200	1.8900	16.8300	0.1800	3.0294		(29a)
External Roof 1	49.6700		49.6700	0.1300	6.4571		(30)
Total net area of external elements Aum(A, m ²)			137.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.5870		(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)							20.3951 (36)
Total fabric heat loss						(33) + (36) =	59.9821 (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	35.2844	35.0882	34.8959	33.9926	33.8236	33.0368	33.0368	32.8911	33.3398	33.8236	34.1655	34.5229 (38)
Heat transfer coeff	95.2665	95.0703	94.8780	93.9747	93.8057	93.0189	93.0189	92.8732	93.3220	93.8057	94.1476	94.5050 (39)
Average = Sum(39)m / 12 =												93.9739 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3519	1.3491	1.3464	1.3335	1.3311	1.3200	1.3200	1.3179	1.3243	1.3311	1.3360	1.3411 (40)
HLP (average)												1.3335 (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												2.2575 (42)
Average daily hot water use (litres/day)												87.8152 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5967	93.0841	89.5715	86.0589	82.5463	79.0337	79.0337	82.5463	86.0589	89.5715	93.0841	96.5967 (44)
Energy conte	143.2501	125.2875	129.2854	112.7142	108.1519	93.3269	86.4811	99.2383	100.4235	117.0339	127.7517	138.7301 (45)
Energy content (annual)										Total = Sum(45)m =		1381.6747 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4875	18.7931	19.3928	16.9071	16.2228	13.9990	12.9722	14.8857	15.0635	17.5551	19.1628	20.8095 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8102 (55)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (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	191.6278	168.9834	177.6631	159.5313	156.5296	140.1440	134.8588	147.6160	147.2407	165.4116	174.5688	187.1078 (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	191.6278	168.9834	177.6631	159.5313	156.5296	140.1440	134.8588	147.6160	147.2407	165.4116	174.5688	187.1078 (64)
Heat gains from water heating, kWh/month	86.3328	76.6149	81.6896	74.9312	74.6627	68.4849	67.4571	71.6989	70.8445	77.6159	79.9311	84.8299 (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	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8515	15.8556	12.8946	9.7620	7.2972	6.1606	6.6568	8.6527	11.6137	14.7463	17.2111	18.3477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.3915	200.4502	195.2624	184.2181	170.2768	157.1738	148.4203	146.3616	151.5494	162.5937	176.5350	189.6380 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874 (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)	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992 (71)
Water heating gains (Table 5)	116.0387	114.0102	109.7978	104.0711	100.3531	95.1179	90.6682	96.3695	98.3952	104.3225	111.0155	114.0187 (72)
Total internal gains	392.1440	390.1782	377.8170	357.9135	337.7893	318.3146	305.6075	311.2461	321.4205	341.5246	364.6238	381.8665 (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
Southwest						3.0500	36.7938	0.6300	0.7000	0.7700			34.2963 (79)
Northwest						10.7600	11.2829	0.6300	0.7000	0.7700			37.1028 (81)
Solar gains	71.3990	133.9430	216.0015	322.5050	411.3140	430.3688	405.7539	336.1305	252.3523	156.8617	87.7639	59.6504 (83)	
Total gains	463.5430	524.1212	593.8186	680.4185	749.1033	748.6834	711.3614	647.3766	573.7729	498.3864	452.3877	441.5170 (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	51.3690	51.4751	51.5794	52.0752	52.1690	52.6103	52.6103	52.6928	52.4394	52.1690	51.9796	51.7830
alpha	4.4246	4.4317	4.4386	4.4717	4.4779	4.5074	4.5074	4.5129	4.4960	4.4779	4.4653	4.4522
util living area	0.9970	0.9943	0.9862	0.9570	0.8738	0.7143	0.5541	0.6217	0.8619	0.9752	0.9943	0.9976 (86)
MIT	19.5490	19.7017	19.9834	20.3733	20.7190	20.9218	20.9805	20.9680	20.8070	20.3684	19.8929	19.5225 (87)
Th 2	19.8004	19.8026	19.8047	19.8147	19.8165	19.8252	19.8252	19.8268	19.8219	19.8165	19.8127	19.8088 (88)
util rest of house	0.9959	0.9923	0.9811	0.9399	0.8240	0.6134	0.4167	0.4813	0.7875	0.9622	0.9919	0.9967 (89)
MIT 2	17.8894	18.1135	18.5237	19.0853	19.5442	19.7745	19.8185	19.8141	19.6665	19.0890	18.4002	17.8564 (90)
Living area fraction									fLA = Living area / (4) =			0.3741 (91)
MIT	18.5102	18.7076	19.0697	19.5671	19.9837	20.2036	20.2531	20.2457	20.0931	19.5676	18.9586	18.4796 (92)
Temperature adjustment												0.0000
adjusted MIT	18.5102	18.7076	19.0697	19.5671	19.9837	20.2036	20.2531	20.2457	20.0931	19.5676	18.9586	18.4796 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9942	0.9897	0.9767	0.9355	0.8321	0.6483	0.4686	0.5342	0.8074	0.9585	0.9894	0.9953 (94)
Useful gains	460.8767	518.7007	580.0100	636.5023	623.3266	485.4049	333.3458	345.8032	463.2848	477.7258	447.5889	439.4586 (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	1353.7560	1312.6908	1192.5872	1002.4362	777.0537	521.2424	339.8090	357.1663	559.2868	841.2095	1116.4569	1349.4964 (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	664.3022	533.5614	455.7574	263.4724	114.3730	0.0000	0.0000	0.0000	0.0000	270.4319	481.5850	677.0681 (98)
Space heating												3460.5513 (98)
Space heating per m2										(98) / (4) =		49.1067 (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													3701.1244 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	664.3022	533.5614	455.7574	263.4724	114.3730	0.0000	0.0000	0.0000	0.0000	270.4319	481.5850	677.0681	(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)	710.4836	570.6539	487.4411	281.7887	122.3240	0.0000	0.0000	0.0000	0.0000	289.2320	515.0641	724.1370	(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	191.6278	168.9834	177.6631	159.5313	156.5296	140.1440	134.8588	147.6160	147.2407	165.4116	174.5688	187.1078	(64)
Efficiency of water heater (217)m	87.8624	87.6724	87.2198	86.1438	83.9926	79.8000	79.8000	79.8000	79.8000	86.1176	87.3828	79.8000	(216)
Fuel for water heating, kWh/month	218.0998	192.7441	203.6959	185.1918	186.3612	175.6191	168.9960	184.9825	184.5121	192.0764	199.7749	212.7512	(219)
Water heating fuel used												2304.8049	(219)
Annual totals kWh/year													
Space heating fuel - main system												3701.1244	(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)												315.2633	(232)
Total delivered energy for all uses												6396.1926	(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	3701.1244	0.2160	799.4429 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2304.8049	0.2160	497.8379 (264)
Space and water heating			1297.2807 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	315.2633	0.5190	163.6216 (268)
Total CO2, kg/m2/year			1499.8274 (272)
Emissions per m2 for space and water heating			18.4090 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3219 (272b)
Emissions per m2 for pumps and fans			0.5524 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.4090 * 1.55) + 2.3219 + 0.5524, rounded to 2 d.p.			31.4100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122161			Issued on Date	02/11/2022
Assessment Reference	003 be green	Prop Type Ref			
Property	Flat 3, 32, Norwich Road, Northwood, HA6 1NB				
SAP Rating	100 A	DER	1.50	TER	27.47
Environmental	100 A	% DER<TER	94.54		
CO ₂ Emissions (t/year)	-0.12	DFEE	34.27	TFEE	52.56
General Requirements Compliance	Pass	% DFEE<TFEE	34.81		
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com			Assessor ID	L706-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 70 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.47 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 1.50 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)34.3 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	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.87 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 5.0 kW PUZ-WM50VHA

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 0.98 kWh/day	
Permitted by DBSCG 2.03	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
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Based on:

Overshading:	Average
Windows facing North East:	1.20 m ² , No overhang
Windows facing South East:	6.43 m ² , No overhang
Windows facing South West:	6.17 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.80 W/m ² K
Thermal bridging y-value	0.034 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	1.91 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	4.8700 (1b)	x 2.6000 (2b)	= 12.6620 (1b) - (3b)
First floor	65.5100 (1c)	x 2.5000 (2c)	= 163.7750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.4370 (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					1 * 10 = 10.0000 (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) =					10.0000 / (5) = 0.0567 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2067 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1912 (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	0.2438	0.2390	0.2342	0.2103	0.2055	0.1816	0.1816	0.1768	0.1912	0.2055	0.2151	0.2246 (22b)
Effective ac	0.5297	0.5286	0.5274	0.5221	0.5211	0.5165	0.5165	0.5156	0.5183	0.5211	0.5231	0.5252 (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
Opening Type 1 (Uw = 0.80)			13.8000	0.7752	10.6977		(27)
Opening Type 2			1.8900	1.4000	2.6460		(26)
External Wall 1	87.7500	13.8000	73.9500	0.1400	10.3530		(29a)
External Wall 2	3.9000	1.8900	2.0100	0.1321	0.2654		(29a)
External Roof 1	65.5100		65.5100	0.1400	9.1714		(30)
Total net area of external elements Aum(A, m ²)			157.1600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		33.1335		(33)
Party Wall 1			28.1800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3678 (36)
Total fabric heat loss						(33) + (36) =	38.5013 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	30.8418	30.7746	30.7088	30.3995	30.3417	30.0724	30.0724	30.0225	30.1761	30.3417	30.4587	30.5811 (38)
Heat transfer coeff	69.3431	69.2759	69.2101	68.9008	68.8430	68.5737	68.5737	68.5238	68.6774	68.8430	68.9600	69.0824 (39)
Average = Sum(39)m / 12 =												68.9006 (39)
HLP	0.9853	0.9843	0.9834	0.9790	0.9782	0.9743	0.9743	0.9736	0.9758	0.9782	0.9798	0.9816 (40)
HLP (average)												0.9790 (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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy content (annual)	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1380.8652 (45)
Water storage loss:	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (46)
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.9800 (48)

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Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.5292 (55)
Total storage loss	16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052 (56)
If cylinder contains dedicated solar storage	16.4052	14.8176	16.4052	15.8760	16.4052	15.8760	16.4052	16.4052	15.8760	16.4052	15.8760	16.4052 (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	182.8338	161.0429	168.8773	151.0361	147.7562	131.6602	126.0980	138.8478	138.7527	156.6330	166.0649	178.3164 (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	182.8338	161.0429	168.8773	151.0361	147.7562	131.6602	126.0980	138.8478	138.7527	156.6330	166.0649	178.3164 (64)
Heat gains from water heating, kWh/month	79.3368	70.2967	74.6963	68.1659	67.6735	61.7234	60.4722	64.7115	64.0817	70.6251	73.1630	77.8348 (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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1923	16.1583	13.1408	9.9484	7.4366	6.2783	6.7839	8.8179	11.8354	15.0278	17.5396	18.6979	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	106.6355	104.6082	100.3983	94.6749	90.9590	85.7270	81.2798	86.9778	89.0023	94.9262	101.6152	104.6167	(72)
Total internal gains	379.8399	377.8350	365.4253	345.4769	325.3226	305.8431	293.1572	298.8327	309.0571	329.2059	352.3335	369.5823	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				1.2000	11.2829	0.5700	0.7000	0.7700	3.7438 (75)			
Southeast				6.4300	36.7938	0.5700	0.7000	0.7700	65.4172 (77)			
Southwest				6.1700	36.7938	0.5700	0.7000	0.7700	62.7721 (79)			
Solar gains	131.9331	225.9743	312.4910	392.7279	444.9413	443.9465	427.0868	387.7934	340.2251	250.6404	158.2518	112.7607 (83)
Total gains	511.7730	603.8094	677.9162	738.2048	770.2639	749.7896	720.2440	686.6261	649.2822	579.8462	510.5853	482.3430 (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	70.4829	70.5512	70.6183	70.9353	70.9949	71.2737	71.2737	71.3256	71.1661	70.9949	70.8744	70.7489
alpha	5.6989	5.7034	5.7079	5.7290	5.7330	5.7516	5.7516	5.7550	5.7444	5.7330	5.7250	5.7166
util living area	0.9947	0.9859	0.9627	0.8979	0.7629	0.5739	0.4173	0.4562	0.6932	0.9251	0.9871	0.9961 (86)
Tweekday	19.1385	19.3313	19.5801	19.8350	19.9828	20.0300	20.0351	20.0354	20.0166	19.8299	19.4333	19.0939
Tweekend	20.5363	20.6223	20.7351	20.8552	20.9342	20.9637	20.9687	20.9682	20.9535	20.8494	20.6658	20.5153
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2843	20.4157	20.5911	20.7740	20.8985	20.9442	20.9516	20.9509	20.9274	20.7676	20.4782	20.2520 (87)
Th 2	20.0956	20.0964	20.0972	20.1009	20.1016	20.1048	20.1048	20.1054	20.1035	20.1016	20.1002	20.0987 (88)
util rest of house	0.9930	0.9817	0.9516	0.8696	0.7085	0.4986	0.3333	0.3690	0.6171	0.8976	0.9825	0.9949 (89)
Tweekday	19.1385	19.3313	19.5801	19.8350	19.9828	20.0300	20.0351	20.0354	20.0166	19.8299	19.4333	19.0939
Tweekend	19.1385	19.3313	19.5801	19.8350	19.9828	20.0300	20.0351	20.0354	20.0166	19.8299	19.4333	19.0939
MIT 2	19.1385	19.3313	19.5801	19.8350	19.9828	20.0300	20.0351	20.0354	20.0166	19.8299	19.4333	19.0939 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5984	19.7666	19.9859	20.2119	20.3503	20.3970	20.4030	20.4029	20.3822	20.2063	19.8527	19.5587 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5984	19.7666	19.9859	20.2119	20.3503	20.3970	20.4030	20.4029	20.3822	20.2063	19.8527	19.5587 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	507.5826	591.5828	644.0457	644.8127	557.9700	392.5965	260.3021	273.4511	416.6730	522.6142	500.8078	479.4250	(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	1060.8404	1029.8964	933.3616	779.3999	595.5143	397.5203	260.7851	274.2910	431.4450	661.3273	879.4277	1061.0165	(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	411.6238	294.5467	215.2510	96.9028	27.9329	0.0000	0.0000	0.0000	0.0000	103.2026	272.6063	432.7041	(98)
Space heating												1854.7702	(98)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2 (98) / (4) = 26.3537 (99)

8c. Space cooling requirement

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 %)													216.7052 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													855.8956 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	411.6238	294.5467	215.2510	96.9028	27.9329	0.0000	0.0000	0.0000	0.0000	103.2026	272.6063	432.7041	(98)
Space heating efficiency (main heating system 1)	216.7052	216.7052	216.7052	216.7052	216.7052	0.0000	0.0000	0.0000	0.0000	216.7052	216.7052	216.7052	(210)
Space heating fuel (main heating system)	189.9464	135.9205	99.3290	44.7164	12.8898	0.0000	0.0000	0.0000	0.0000	47.6235	125.7959	199.6741	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	182.8338	161.0429	168.8773	151.0361	147.7562	131.6602	126.0980	138.8478	138.7527	156.6330	166.0649	178.3164	(64)
Efficiency of water heater	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	(216)
Fuel for water heating, kWh/month	66.8252	58.8607	61.7242	55.2033	54.0044	48.1214	46.0885	50.7485	50.7137	57.2489	60.6962	65.1741	(219)
Water heating fuel used												675.4091	(219)
Annual totals kWh/year												855.8956	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												321.2820	(232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 1.91 * 1080 * 1.00) =												-1649.5136	(233)
Total delivered energy for all uses												203.0730	(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	855.8956	0.5190	444.2098	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	675.4091	0.5190	350.5373	(264)
Space and water heating			794.7471	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	321.2820	0.5190	166.7454	(268)
Energy saving/generation technologies				
PV Unit	-1649.5136	0.5190	-856.0976	(269)
Total CO2, kg/year			105.3949	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			1.5000	(273)

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

DER		1.5000	ZC1
Total Floor Area		70.3800	
Assumed number of occupants		2.2553	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		16.6864	ZC2
CO2 emissions from cooking, equation (L16)		2.4599	ZC3
Total CO2 emissions		20.6463	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		20.6463	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	4.8700 (1b)	x 2.6000 (2b)	= 12.6620 (1b) - (3b)
First floor	65.5100 (1c)	x 2.5000 (2c)	= 163.7750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.4370 (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																3 * 10 =	30.0000 (7a)
Number of passive vents																0 * 10 =	0.0000 (7b)
Number of flueless gas fires																0 * 40 =	0.0000 (7c)
										Air changes per hour							
Infiltration due to chimneys, flues and fans										= (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000	/ (5) =	0.1700 (8)
Pressure test										Yes							
Measured/design AP50										5.0000							
Infiltration rate										0.4200 (18)							
Number of sides sheltered										1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.3885 (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	0.4954	0.4857	0.4759	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565	(22b)				
Effective ac	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042	(25)				

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			13.8000	1.3258	18.2955		(27)					
External Wall 1	87.7500	13.8000	73.9500	0.1800	13.3110		(29a)					
External Wall 2	3.9000	1.8900	2.0100	0.1800	0.3618		(29a)					
External Roof 1	65.5100		65.5100	0.1300	8.5163		(30)					
Total net area of external elements Aum(A, m2)			157.1600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		42.3746		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1980 (36)					
Total fabric heat loss						(33) + (36) =	51.5726 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.2561	Feb 35.9787	Mar 35.7068	Apr 34.4296	May 34.1907	Jun 33.0783	Jul 33.0783	Aug 32.8723	Sep 33.5067	Oct 34.1907	Nov 34.6741	Dec 35.1794 (38)
Heat transfer coeff	87.8287	87.5513	87.2794	86.0022	85.7632	84.6508	84.6508	84.4448	85.0793	85.7632	86.2466	86.7520 (39)
Average = Sum(39)m / 12 =												86.0010 (39)
HLP	Jan 1.2479	Feb 1.2440	Mar 1.2401	Apr 1.2220	May 1.2186	Jun 1.2028	Jul 1.2028	Aug 1.1998	Sep 1.2089	Oct 1.2186	Nov 1.2254	Dec 1.2326 (40)
HLP (average)												1.2220 (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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	Jan 96.5401	Feb 93.0296	Mar 89.5190	Apr 86.0085	May 82.4979	Jun 78.9874	Jul 78.9874	Aug 82.4979	Sep 86.0085	Oct 89.5190	Nov 93.0296	Dec 96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)										Total = Sum(45)m =		1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.8102 (55)
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (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	191.5439	168.9100	177.5874	159.4653	156.4663	140.0894	134.8081	147.5579	147.1818	165.3431	174.4940	187.0265 (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	191.5439	168.9100	177.5874	159.4653	156.4663	140.0894	134.8081	147.5579	147.1818	165.3431	174.4940	187.0265 (64)
Heat gains from water heating, kWh/month	86.3049	76.5905	81.6644	74.9092	74.6416	68.4667	67.4403	71.6796	70.8250	77.5932	79.9063	84.8029 (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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8315	15.8378	12.8802	9.7511	7.2891	6.1537	6.6493	8.6431	11.6007	14.7298	17.1918	18.3271	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	116.0012	113.9739	109.7640	104.0406	100.3247	95.0927	90.6455	96.3435	98.3680	104.2919	110.9809	113.9824	(72)
Total internal gains	391.8448	389.8803	377.5304	357.6453	337.5408	318.0842	305.3884	311.0236	321.1881	341.2736	364.3513	381.5772	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				1.2000	11.2829	0.6300	0.7000	0.7700	4.1379 (75)			
Southeast				6.4300	36.7938	0.6300	0.7000	0.7700	72.3033 (77)			
Southwest				6.1700	36.7938	0.6300	0.7000	0.7700	69.3796 (79)			
Solar gains	145.8207	249.7611	345.3848	434.0676	491.7772	490.6778	472.0433	428.6138	376.0383	277.0236	174.9099	124.6302 (83)
Total gains	537.6656	639.6414	722.9151	791.7130	829.3180	808.7620	777.4317	739.6373	697.2264	618.2971	539.2613	506.2074 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.6481	55.8244	55.9984	56.8300	56.9883	57.7372	57.7372	57.8780	57.4464	56.9883	56.6689	56.3388
alpha	4.7099	4.7216	4.7332	4.7887	4.7992	4.8491	4.8491	4.8585	4.8298	4.7992	4.7779	4.7559
util living area	0.9944	0.9868	0.9684	0.9187	0.8110	0.6348	0.4720	0.5140	0.7504	0.9400	0.9878	0.9957 (86)
MIT	19.7780	19.9788	20.2576	20.5874	20.8353	20.9625	20.9927	20.9891	20.9157	20.5904	20.1231	19.7466 (87)
Th 2	19.8819	19.8850	19.8880	19.9025	19.9052	19.9178	19.9178	19.9201	19.9129	19.9052	19.8997	19.8940 (88)
util rest of house	0.9925	0.9825	0.9580	0.8920	0.7534	0.5417	0.3596	0.3990	0.6639	0.9143	0.9830	0.9943 (89)
MIT 2	18.2787	18.5715	18.9729	19.4394	19.7529	19.8945	19.9153	19.9160	19.8517	19.4559	18.7934	18.2416 (90)
Living area fraction	18.8805	19.1364	19.4886	19.9002	20.1873	20.3232	20.3477	20.3467	20.2788	19.9113	19.3272	18.8457 (91)
MIT	18.8805	19.1364	19.4886	19.9002	20.1873	20.3232	20.3477	20.3467	20.2788	19.9113	19.3272	18.8457 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8805	19.1364	19.4886	19.9002	20.1873	20.3232	20.3477	20.3467	20.2788	19.9113	19.3272	18.8457 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	532.3935	625.9962	689.2175	706.1433	638.2060	467.4339	314.8037	329.4370	484.7284	565.4223	528.3410	502.3611	(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	1280.5861	1246.4146	1133.6360	946.0390	727.9017	484.4726	317.2493	333.2804	525.6886	798.5682	1054.5505	1270.5460	(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	556.6553	416.9212	330.6473	172.7249	66.7336	0.0000	0.0000	0.0000	0.0000	173.4605	378.8708	571.5296	(98)
Space heating													(98)
Space heating per m2													(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												2852.9874 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	556.6553	416.9212	330.6473	172.7249	66.7336	0.0000	0.0000	0.0000	0.0000	173.4605	378.8708	571.5296 (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)	595.3532	445.9050	353.6335	184.7325	71.3728	0.0000	0.0000	0.0000	0.0000	185.5192	405.2094	611.2616 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	191.5439	168.9100	177.5874	159.4653	156.4663	140.0894	134.8081	147.5579	147.1818	165.3431	174.4940	187.0265 (64)
Efficiency of water heater (217)m	87.4965	87.1315	86.4497	85.0271	82.7243	79.8000	79.8000	79.8000	79.8000	84.9417	86.8288	79.8000 (216)
Fuel for water heating, kWh/month	218.9160	193.8565	205.4229	187.5464	189.1419	175.5506	168.9325	184.9096	184.4384	194.6547	200.9634	87.6039 (217)
Water heating fuel used												213.4912 (219)
Annual totals kWh/year												2317.8240 (219)
Space heating fuel - main system												2852.9874 (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)												314.9105 (232)
Total delivered energy for all uses												5560.7219 (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	2852.9874	0.2160	616.2453 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2317.8240	0.2160	500.6500 (264)
Space and water heating			1116.8953 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	314.9105	0.5190	163.4385 (268)
Total CO2, kg/m2/year			1319.2588 (272)
Emissions per m2 for space and water heating			15.8695 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3222 (272b)
Emissions per m2 for pumps and fans			0.5531 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8695 * 1.55) + 2.3222 + 0.5531, rounded to 2 d.p.			27.4700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122162			Issued on Date	01/11/2022	
Assessment Reference	004 be green		Prop Type Ref			
Property	Flat 4, 32, Norwich Road, Northwood, HA6 1NB					
SAP Rating	98 A	DER	4.97	TER	32.44	
Environmental	98 A	% DER<TER	84.68			
CO ₂ Emissions (t/year)	0.04	DFEE	29.17	TFEE	50.67	
General Requirements Compliance	Pass	% DFEE<TFEE	42.43			
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com			Assessor ID	L706-0001	
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 38 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 32.44 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 4.97 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)29.2 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	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.80 (max. 2.00)	0.80 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 5.0 kW PUZ-WM50VHA

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 0.94 kWh/day	
Permitted by DBSCG 1.89	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
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Based on:

Overshading:	Average
Windows facing South East:	3.38 m ² , No overhang
Windows facing South:	3.65 m ² , No overhang
Windows facing South West:	0.92 m ² , No overhang
Windows facing North West:	1.89 m ² , No overhang
Air change rate:	4.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.80 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	1.01 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	37.5000 (1b)	x 2.6000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (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					1 * 10 = 10.0000 (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) =				10.0000 / (5) =	0.1026 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2526 (18)
Number of sides sheltered					4 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1768 (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	0.2254	0.2210	0.2166	0.1945	0.1901	0.1680	0.1680	0.1635	0.1768	0.1901	0.1989	0.2077 (22b)
Effective ac	0.5254	0.5244	0.5235	0.5189	0.5181	0.5141	0.5141	0.5134	0.5156	0.5181	0.5198	0.5216 (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
Opening Type 1 (Uw = 0.80)			9.8400	0.7752	7.6279		(27)
External Wall 1	37.4400	7.9500	29.4900	0.1400	4.1286		(29a)
External Wall 2	13.7800	1.8900	11.8900	0.1321	1.5701		(29a)
External Roof 1	17.4100		17.4100	0.1400	2.4374		(30)
Total net area of external elements Aum(A, m ²)			68.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		15.7640		(33)
Party Wall 1			20.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3678 (36)
Total fabric heat loss						(33) + (36) =	21.1318 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.9049	16.8732	16.8421	16.6959	16.6686	16.5413	16.5413	16.5177	16.5903	16.6686	16.7239	16.7817 (38)
Heat transfer coeff	38.0367	38.0050	37.9739	37.8277	37.8004	37.6731	37.6731	37.6495	37.7221	37.8004	37.8557	37.9135 (39)
Average = Sum(39)m / 12 =												37.8276 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0143	1.0135	1.0126	1.0087	1.0080	1.0046	1.0046	1.0040	1.0059	1.0080	1.0095	1.0110 (40)
HLP (average)												1.0087 (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												1.3416 (42)
Average daily hot water use (litres/day)												66.0628 (43)
Daily hot water use	72.6691	70.0266	67.3841	64.7415	62.0990	59.4565	59.4565	62.0990	64.7415	67.3841	70.0266	72.6691 (44)
Energy conte	107.7661	94.2530	97.2606	84.7942	81.3620	70.2092	65.0592	74.6563	75.5480	88.0439	96.1068	104.3658 (45)
Energy content (annual)												Total = Sum(45)m = 1039.4250 (45)
Distribution loss (46)m = 0.15 x (45)m	16.1649	14.1379	14.5891	12.7191	12.2043	10.5314	9.7589	11.1985	11.3322	13.2066	14.4160	15.6549 (46)
Water storage loss:												150.0000 (47)
Store volume												0.9400 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.5076 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Total storage loss	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (56)
If cylinder contains dedicated solar storage	15.7356	14.2128	15.7356	15.2280	15.7356	15.2280	15.7356	15.7356	15.2280	15.7356	15.2280	15.7356 (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	146.7641	129.4770	136.2586	122.5342	120.3600	107.9492	104.0572	113.6543	113.2880	127.0419	133.8468	143.3638 (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	146.7641	129.4770	136.2586	122.5342	120.3600	107.9492	104.0572	113.6543	113.2880	127.0419	133.8468	143.3638 (64)
Heat gains from water heating, kWh/month	67.0306	59.5183	63.5376	58.3861	58.2513	53.5366	52.8306	56.0216	55.3117	60.4730	62.1475	65.9000 (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	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.2792	9.1299	7.4249	5.6211	4.2019	3.5474	3.8331	4.9824	6.6874	8.4911	9.9104	10.5649 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080 (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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637 (71)	
Water heating gains (Table 5)	90.0949	88.5689	85.3999	81.0917	78.2947	74.3563	71.0088	75.2979	76.8218	81.2809	86.3160	88.5753 (72)	
Total internal gains	258.7993	257.3204	249.4314	236.9007	224.5820	212.3740	204.2247	208.4666	214.7106	227.3921	241.9490	252.4779 (73)	

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast				3.3800	36.7938		0.5700		0.7000		0.7700		34.3873 (77)
South				3.6500	46.7521		0.5700		0.7000		0.7700		47.1845 (78)
Southwest				0.9200	36.7938		0.5700		0.7000		0.7700		9.3599 (79)
Northwest				1.8900	11.2829		0.5700		0.7000		0.7700		5.8964 (81)
Solar gains	96.8281	163.7961	222.0187	273.0989	305.1723	302.9415	292.0563	267.9378	239.5770	180.3752	115.7480		83.0256 (83)
Total gains	355.6274	421.1165	471.4501	509.9996	529.7543	515.3155	496.2810	476.4044	454.2876	407.7673	357.6970		335.5034 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.4646	68.5217	68.5779	68.8428	68.8926	69.1254	69.1254	69.1686	69.0355	68.8926	68.7919	68.6870	
alpha	5.5643	5.5681	5.5719	5.5895	5.5928	5.6084	5.6084	5.6112	5.6024	5.5928	5.5861	5.5791	
util living area	0.9822	0.9574	0.9053	0.7989	0.6395	0.4643	0.3335	0.3627	0.5619	0.8324	0.9598	0.9866 (86)	
Tweekday	19.2879	19.4982	19.7216	19.9040	19.9846	20.0064	20.0084	20.0088	20.0009	19.9018	19.5740	19.2346	
Tweekend	20.6124	20.7086	20.8143	20.9059	20.9526	20.9664	20.9684	20.9682	20.9624	20.9016	20.7406	20.5874	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.4018	20.5492	20.7134	20.8530	20.9269	20.9484	20.9512	20.9510	20.9412	20.8482	20.5950	20.3631 (87)	
Th 2	20.0714	20.0721	20.0728	20.0761	20.0767	20.0795	20.0795	20.0800	20.0784	20.0767	20.0754	20.0742 (88)	
util rest of house	0.9771	0.9463	0.8829	0.7589	0.5837	0.3992	0.2640	0.2906	0.4914	0.7884	0.9473	0.9826 (89)	
Tweekday	19.2879	19.4982	19.7216	19.9040	19.9846	20.0064	20.0084	20.0088	20.0009	19.9018	19.5740	19.2346	
Tweekend	19.2879	19.4982	19.7216	19.9040	19.9846	20.0064	20.0084	20.0088	20.0009	19.9018	19.5740	19.2346	
MIT 2	19.2879	19.4982	19.7216	19.9040	19.9846	20.0064	20.0084	20.0088	20.0009	19.9018	19.5740	19.2346 (90)	
Living area fraction									fLA = Living area / (4) =			0.2907 (91)	
MIT	19.6117	19.8037	20.0099	20.1798	20.2585	20.2802	20.2824	20.2827	20.2743	20.1769	19.8708	19.5626 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.6117	19.8037	20.0099	20.1798	20.2585	20.2802	20.2824	20.2827	20.2743	20.1769	19.8708	19.5626 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9740	0.9426	0.8813	0.7637	0.5950	0.4135	0.2794	0.3066	0.5067	0.7936	0.9440	0.9799 (94)	
Ext temp.	346.3652	396.9279	415.4661	389.4817	315.2063	213.0840	138.6493	146.0462	230.1848	323.6156	337.6493	328.7711 (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	582.4053	566.4134	513.0226	426.6910	323.5136	213.9921	138.7278	146.1801	232.9060	362.0096	483.4467	582.4520 (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	175.6138	113.8943	72.5820	26.7907	6.1806	0.0000	0.0000	0.0000	0.0000	28.5652	104.9742	188.7387 (98)	
Space heating per m2												717.3394 (98)	
										(98) / (4) =		19.1291 (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

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 %)																142.9238 (206)
Efficiency of secondary/supplementary heating system, %																100.0000 (208)
Space heating requirement																501.9034 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Space heating requirement	175.6138	113.8943	72.5820	26.7907	6.1806	0.0000	0.0000	0.0000	0.0000	28.5652	104.9742	188.7387	(98)			
Space heating efficiency (main heating system 1)	142.9238	142.9238	142.9238	142.9238	142.9238	0.0000	0.0000	0.0000	0.0000	142.9238	142.9238	142.9238	(210)			
Space heating fuel (main heating system)	122.8724	79.6888	50.7837	18.7447	4.3244	0.0000	0.0000	0.0000	0.0000	19.9863	73.4477	132.0555	(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	146.7641	129.4770	136.2586	122.5342	120.3600	107.9492	104.0572	113.6543	113.2880	127.0419	133.8468	143.3638	(64)			
Efficiency of water heater (217)m	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	273.6000	(216)			
Fuel for water heating, kWh/month	53.6419	47.3234	49.8021	44.7859	43.9912	39.4551	38.0326	41.5403	41.4064	46.4334	48.9206	52.3990	(219)			
Water heating fuel used												547.7321	(219)			
Annual totals kWh/year																
Space heating fuel - main system												501.9034	(211)			
Space heating fuel - secondary												0.0000	(215)			
Electricity for pumps and fans:																
Total electricity for the above, kWh/year												0.0000	(231)			
Electricity for lighting (calculated in Appendix L)												181.5337	(232)			
Energy saving/generation technologies (Appendices M ,N and Q)																
PV Unit 0 (0.80 * 1.01 * 1080 * 1.00) =										-872.2559		-872.2559	(233)			
Total delivered energy for all uses												358.9134	(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	501.9034	0.5190	260.4879	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	547.7321	0.5190	284.2730	(264)
Space and water heating			544.7609	(265)
Pumps and fans	0.0000	0.0000	0.0000	(267)
Energy for lighting	181.5337	0.5190	94.2160	(268)
Energy saving/generation technologies				
PV Unit	-872.2559	0.5190	-452.7008	(269)
Total CO2, kg/year			186.2760	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			4.9700	(273)

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

DER		4.9700	ZC1
Total Floor Area		37.5000	
Assumed number of occupants		1.3416	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		18.2200	ZC2
CO2 emissions from cooking, equation (L16)		4.0320	ZC3
Total CO2 emissions		27.2220	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		27.2220	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	37.5000 (1b)	x 2.6000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (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					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) = 0.2051 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4551 (18)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3186 (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	0.4062	0.3982	0.3903	0.3504	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	0.3743 (22b)
	0.5825	0.5793	0.5762	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5701 (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 Opening Type (Uw = 1.40)			9.3800	1.3258	12.4356			(27)					
External Wall 1	37.4400	7.5800	29.8600	0.1800	5.3748			(29a)					
External Wall 2	13.7800	1.8000	11.9800	0.1800	2.1564			(29a)					
External Roof 1	17.4100		17.4100	0.1300	2.2633			(30)					
Total net area of external elements Aum(A, m2)			68.6300					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			22.2301		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							250.0000	(35)					
Total fabric heat loss							(33) + (36) =	31.4281 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 18.7419	Feb 18.6389	Mar 18.5378	Apr 18.0633	May 17.9745	Jun 17.5612	Jul 17.5612	Aug 17.4846	Sep 17.7204	Oct 17.9745	Nov 18.1541	Dec 18.3419	(38)
Heat transfer coeff	50.1700	50.0670	49.9659	49.4914	49.4026	48.9893	48.9893	48.9127	49.1485	49.4026	49.5822	49.7700	(39)
Average = Sum(39)m / 12 =												49.4910	(39)
HLP	Jan 1.3379	Feb 1.3351	Mar 1.3324	Apr 1.3198	May 1.3174	Jun 1.3064	Jul 1.3064	Aug 1.3043	Sep 1.3106	Oct 1.3174	Nov 1.3222	Dec 1.3272	(40)
HLP (average)												1.3198	(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												1.3416 (42)
Average daily hot water use (litres/day)												66.0628 (43)
Daily hot water use	72.6691	70.0266	67.3841	64.7415	62.0990	59.4565	59.4565	62.0990	64.7415	67.3841	70.0266	72.6691 (44)
Energy conte	107.7661	94.2530	97.2606	84.7942	81.3620	70.2092	65.0592	74.6563	75.5480	88.0439	96.1068	104.3658 (45)
Energy content (annual)										Total = Sum(45)m =		1039.4250 (45)
Distribution loss (46)m = 0.15 x (45)m	16.1649	14.1379	14.5891	12.7191	12.2043	10.5314	9.7589	11.1985	11.3322	13.2066	14.4160	15.6549 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (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	154.3610	136.3387	143.8555	129.8860	127.9569	115.3011	111.6541	121.2513	120.6398	134.6388	141.1986	150.9607 (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	154.3610	136.3387	143.8555	129.8860	127.9569	115.3011	111.6541	121.2513	120.6398	134.6388	141.1986	150.9607 (64)
	73.1082	65.0077	69.6151	64.2675	64.3288	59.4180	58.9081	62.0992	61.1932	66.5505	68.0290	71.9775 (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	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.2792	9.1299	7.4249	5.6211	4.2019	3.5474	3.8331	4.9824	6.6874	8.4911	9.9104	10.5649	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	(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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	(71)
Water heating gains (Table 5)	98.2637	96.7376	93.5686	89.2605	86.4634	82.5251	79.1775	83.4666	84.9905	89.4496	94.4847	96.7440	(72)
Total internal gains	269.9680	268.4891	260.6001	248.0694	235.7507	223.5427	215.3935	219.6354	225.8793	238.5609	253.1177	263.6466	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access		Gains
						Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
Southeast				3.2200	36.7938		0.6300		0.7000		0.7700	36.2078 (77)
South				3.4800	46.7521		0.6300		0.7000		0.7700	49.7224 (78)
Southwest				0.8800	36.7938		0.6300		0.7000		0.7700	9.8953 (79)
Northwest				1.8000	11.2829		0.6300		0.7000		0.7700	6.2068 (81)
Solar gains	102.0323	172.5973	233.9423	287.7555	321.5410	319.1864	307.7192	282.3138	252.4401	190.0656	121.9687	87.4882 (83)
Total gains	372.0003	441.0864	494.5424	535.8249	557.2916	542.7291	523.1127	501.9492	478.3194	428.6264	375.0863	351.1348 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.9068	52.0137	52.1188	52.6186	52.7132	53.1579	53.1579	53.2411	52.9857	52.7132	52.5222	52.3240	
alpha	4.4605	4.4676	4.4746	4.5079	4.5142	4.5439	4.5439	4.5494	4.5324	4.5142	4.5015	4.4883	
util living area	0.9850	0.9682	0.9344	0.8608	0.7320	0.5565	0.4077	0.4417	0.6580	0.8842	0.9695	0.9881	(86)
MIT	19.8584	20.0817	20.3640	20.6657	20.8748	20.9720	20.9945	20.9921	20.9406	20.6724	20.2094	19.8132	(87)
Th 2	19.8113	19.8134	19.8155	19.8254	19.8272	19.8358	19.8358	19.8374	19.8325	19.8272	19.8235	19.8196	(88)
util rest of house	0.9802	0.9587	0.9152	0.8221	0.6656	0.4642	0.3021	0.3334	0.5658	0.8429	0.9586	0.9843	(89)
MIT 2	18.3445	18.6645	19.0604	19.4689	19.7184	19.8196	19.8341	19.8347	19.7929	19.4907	18.8586	18.2854	(90)
Living area fraction	18.7846	19.0764	19.4393	19.8168	20.0546	20.1545	20.1714	20.1711	20.1265	19.8342	19.2512	18.7295	(92)
Temperature adjustment	18.7846	19.0764	19.4393	19.8168	20.0546	20.1545	20.1714	20.1711	20.1265	19.8342	19.2512	18.7295	(93)
adjusted MIT	18.7846	19.0764	19.4393	19.8168	20.0546	20.1545	20.1714	20.1711	20.1265	19.8342	19.2512	18.7295	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9747	0.9512	0.9079	0.8218	0.6794	0.4903	0.3329	0.3650	0.5903	0.8432	0.9517	0.9795	(94)
Ext temp.	362.5970	419.5507	448.9910	440.3512	378.6220	266.0922	174.1543	183.2219	282.3706	361.4163	356.9826	343.9411	(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	726.6911	709.7699	646.5236	540.2861	412.7374	272.1133	174.9593	184.4541	296.1943	456.1916	602.4850	723.1308	(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	270.8860	195.0273	146.9643	71.9531	25.3818	0.0000	0.0000	0.0000	0.0000	70.5128	176.7617	282.1171	(98)
												1239.6040	(98)
												33.0561	(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													1325.7797 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	270.8860	195.0273	146.9643	71.9531	25.3818	0.0000	0.0000	0.0000	0.0000	70.5128	176.7617	282.1171	(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)	289.7176	208.5853	157.1810	76.9552	27.1463	0.0000	0.0000	0.0000	0.0000	75.4147	189.0500	301.7295	(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	154.3610	136.3387	143.8555	129.8860	127.9569	115.3011	111.6541	121.2513	120.6398	134.6388	141.1986	150.9607	(64)
Efficiency of water heater (217)m	86.2996	85.7683	84.8709	83.3114	81.3929	79.8000	79.8000	79.8000	79.8000	83.1802	85.4141	86.4590	(216)
Fuel for water heating, kWh/month	178.8664	158.9616	169.4993	155.9042	157.2089	144.4876	139.9174	151.9439	151.1777	161.8639	165.3107	174.6038	(219)
Water heating fuel used												1909.7453	(219)
Annual totals kWh/year													
Space heating fuel - main system												1325.7797	(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)												181.5337	(232)
Total delivered energy for all uses												3492.0587	(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	1325.7797	0.2160	286.3684 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1909.7453	0.2160	412.5050 (264)
Space and water heating			698.8734 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	181.5337	0.5190	94.2160 (268)
Total CO2, kg/m2/year			832.0144 (272)
Emissions per m2 for space and water heating			18.6366 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5124 (272b)
Emissions per m2 for pumps and fans			1.0380 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.6366 * 1.55) + 2.5124 + 1.0380, rounded to 2 d.p.			32.4400 (273)

APPENDIX D UNREGULATED LOADS ASSESSMENTS

CODE FOR SUSTAINABLE HOMES

Calculation Type: New Build (As Designed)

Property Reference	122159	Issued on Date	02/11/2022
Assessment Reference	001 be green	Prop Type Ref	
Property	Flat 1, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	104 A	DER	-2.38	TER	24.46
Environmental	104 A	% DER<TER	109.73		
CO ₂ Emissions (t/year)	-0.57	DFEE	33.91	TFEE	53.99
General Requirements Compliance	Pass	% DFEE<TFEE	37.19		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
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ENE 1 - Dwelling Emission Rate calculation

Total floor area	116.85	m ²	
DER	-2.38	kgCO ₂ /yr/m ²	
TER	24.46	kgCO ₂ /yr/m ²	
CO ₂ emissions offset from additional allowable electricity generation	0.00	kgCO ₂ /yr/m ²	(ZC7)
Residual CO ₂ emissions offset from biofuel CHP	0.00	kgCO ₂ /yr/m ²	(ZC5)
Total CO ₂ emissions offset from SAP Section 16 allowances	0.00	kgCO ₂ /yr/m ²	
DER accounting for SAP Section 16 allowances	-2.38	kgCO ₂ /yr/m ²	
Reduction DER/TER	109.73	%	
CfSH ENE1 credits achieved	9.0		
CfSH ENE1 level achieved	5		

ENE 2 – Fabric Energy Efficiency calculation

Dwelling type	Flat, Detached
Fabric energy efficiency (F.E.E.)	33.91 kWh/m ² /yr
CfSH ENE2 credits achieved	8.3
CfSH ENE1 and 2 overall level achieved	5

ENE 7 – Low and Zero Carbon Technologies calculation

Standard case CO₂ emissions

Total floor area	116.85	m ²	
DER	12.51	kgCO ₂ /yr/m ²	
CO ₂ emissions from electrical appliances	14.25	kgCO ₂ /yr/m ²	(ZC2)
CO ₂ emissions from cooking	1.60	kgCO ₂ /yr/m ²	(ZC3)
Standard case total CO ₂ emissions	28.37	kgCO ₂ /yr/m ²	(ZC4)
Net Standard case CO ₂ emissions	28.37	kgCO ₂ /yr/m ²	(ZC8)

Actual case CO₂ emissions

DER	0.22	kgCO ₂ /yr/m ²	
CO ₂ emissions from electrical appliances	14.25	kgCO ₂ /yr/m ²	(ZC2)
CO ₂ emissions from cooking	1.60	kgCO ₂ /yr/m ²	(ZC3)
Actual case total CO ₂ emissions	16.08	kgCO ₂ /yr/m ²	(ZC4)
CO ₂ emissions from Biomass	0.00	kgCO ₂ /yr/m ²	(ZC5)
CO ₂ reduction from additional allowable electricity generation	0.00	kgCO ₂ /yr/m ²	(ZC7)
Net Actual case CO ₂ emissions	16.08	kgCO ₂ /yr/m ²	(ZC8)
Improvement in net actual/net standard case CO ₂ emissions	43	%	

CODE FOR SUSTAINABLE HOMES

Calculation Type: New Build (As Designed)

ENE7 credits achieved

2

CODE FOR SUSTAINABLE HOMES

Calculation Type: New Build (As Designed)

Property Reference	122160	Issued on Date	02/11/2022
Assessment Reference	002 be green	Prop Type Ref	
Property	Flat 2, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	100 A	DER	2.17	TER	31.41
Environmental	100 A	% DER<TER	93.09		
CO ₂ Emissions (t/year)	-0.09	DFEE	35.53	TFEE	65.77
General Requirements Compliance	Pass	% DFEE<TFEE	45.98		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
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ENE 1 - Dwelling Emission Rate calculation

Total floor area	70.47	m ²	
DER	2.17	kgCO ₂ /yr/m ²	
TER	31.41	kgCO ₂ /yr/m ²	
CO ₂ emissions offset from additional allowable electricity generation	0.00	kgCO ₂ /yr/m ²	(ZC7)
Residual CO ₂ emissions offset from biofuel CHP	0.00	kgCO ₂ /yr/m ²	(ZC5)
Total CO ₂ emissions offset from SAP Section 16 allowances	0.00	kgCO ₂ /yr/m ²	
DER accounting for SAP Section 16 allowances	2.17	kgCO ₂ /yr/m ²	
Reduction DER/TER	93.09	%	
CfSH ENE1 credits achieved	8.5		
CfSH ENE1 level achieved	4		

ENE 2 – Fabric Energy Efficiency calculation

Dwelling type	Flat, Mid-Terrace
Fabric energy efficiency (F.E.E.)	35.53 kWh/m ² /yr
CfSH ENE2 credits achieved	7.8
CfSH ENE1 and 2 overall level achieved	4

ENE 7 – Low and Zero Carbon Technologies calculation

Standard case CO₂ emissions

Total floor area	70.47	m ²	
DER	18.22	kgCO ₂ /yr/m ²	
CO ₂ emissions from electrical appliances	16.68	kgCO ₂ /yr/m ²	(ZC2)
CO ₂ emissions from cooking	2.46	kgCO ₂ /yr/m ²	(ZC3)
Standard case total CO ₂ emissions	37.36	kgCO ₂ /yr/m ²	(ZC4)
Net Standard case CO ₂ emissions	37.36	kgCO ₂ /yr/m ²	(ZC8)

Actual case CO₂ emissions

DER	6.05	kgCO ₂ /yr/m ²	
CO ₂ emissions from electrical appliances	16.68	kgCO ₂ /yr/m ²	(ZC2)
CO ₂ emissions from cooking	2.46	kgCO ₂ /yr/m ²	(ZC3)
Actual case total CO ₂ emissions	25.19	kgCO ₂ /yr/m ²	(ZC4)
CO ₂ emissions from Biomass	0.00	kgCO ₂ /yr/m ²	(ZC5)
CO ₂ reduction from additional allowable electricity generation	0.00	kgCO ₂ /yr/m ²	(ZC7)
Net Actual case CO ₂ emissions	25.19	kgCO ₂ /yr/m ²	(ZC8)
Improvement in net actual/net standard case CO ₂ emissions	33	%	

CODE FOR SUSTAINABLE HOMES

Calculation Type: New Build (As Designed)

ENE7 credits achieved

2

CODE FOR SUSTAINABLE HOMES

Calculation Type: New Build (As Designed)

Property Reference	122161	Issued on Date	02/11/2022
Assessment Reference	003 be green	Prop Type Ref	
Property	Flat 3, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	100 A	DER	1.50	TER	27.47
Environmental	100 A	% DER<TER	94.54		
CO ₂ Emissions (t/year)	-0.12	DFEE	34.27	TFEE	52.56
General Requirements Compliance	Pass	% DFEE<TFEE	34.81		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
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ENE 1 - Dwelling Emission Rate calculation

Total floor area	70.38	m ²	
DER	1.50	kgCO ₂ /yr/m ²	
TER	27.47	kgCO ₂ /yr/m ²	
CO ₂ emissions offset from additional allowable electricity generation	0.00	kgCO ₂ /yr/m ²	(ZC7)
Residual CO ₂ emissions offset from biofuel CHP	0.00	kgCO ₂ /yr/m ²	(ZC5)
Total CO ₂ emissions offset from SAP Section 16 allowances	0.00	kgCO ₂ /yr/m ²	
DER accounting for SAP Section 16 allowances	1.50	kgCO ₂ /yr/m ²	
Reduction DER/TER	94.54	%	
CfSH ENE1 credits achieved	8.6		
CfSH ENE1 level achieved	4		

ENE 2 – Fabric Energy Efficiency calculation

Dwelling type	Flat, Mid-Terrace
Fabric energy efficiency (F.E.E.)	34.27 kWh/m ² /yr
CfSH ENE2 credits achieved	8.2
CfSH ENE1 and 2 overall level achieved	4

ENE 7 – Low and Zero Carbon Technologies calculation

Standard case CO₂ emissions

Total floor area	70.38	m ²	
DER	17.79	kgCO ₂ /yr/m ²	
CO ₂ emissions from electrical appliances	16.69	kgCO ₂ /yr/m ²	(ZC2)
CO ₂ emissions from cooking	2.46	kgCO ₂ /yr/m ²	(ZC3)
Standard case total CO ₂ emissions	36.94	kgCO ₂ /yr/m ²	(ZC4)
Net Standard case CO ₂ emissions	36.94	kgCO ₂ /yr/m ²	(ZC8)

Actual case CO₂ emissions

DER	5.43	kgCO ₂ /yr/m ²	
CO ₂ emissions from electrical appliances	16.69	kgCO ₂ /yr/m ²	(ZC2)
CO ₂ emissions from cooking	2.46	kgCO ₂ /yr/m ²	(ZC3)
Actual case total CO ₂ emissions	24.58	kgCO ₂ /yr/m ²	(ZC4)
CO ₂ emissions from Biomass	0.00	kgCO ₂ /yr/m ²	(ZC5)
CO ₂ reduction from additional allowable electricity generation	0.00	kgCO ₂ /yr/m ²	(ZC7)
Net Actual case CO ₂ emissions	24.58	kgCO ₂ /yr/m ²	(ZC8)
Improvement in net actual/net standard case CO ₂ emissions	33	%	

CODE FOR SUSTAINABLE HOMES

Calculation Type: New Build (As Designed)

ENE7 credits achieved

2

CODE FOR SUSTAINABLE HOMES

Calculation Type: New Build (As Designed)

Property Reference	122162	Issued on Date	01/11/2022
Assessment Reference	004 be green	Prop Type Ref	
Property	Flat 4, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	98 A	DER	4.97	TER	32.44
Environmental	98 A	% DER<TER	84.68		
CO ₂ Emissions (t/year)	0.04	DFEE	29.17	TFEE	50.67
General Requirements Compliance	Pass	% DFEE<TFEE	42.43		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
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ENE 1 - Dwelling Emission Rate calculation

Total floor area	37.5	m ²	
DER	4.97	kgCO ₂ /yr/m ²	
TER	32.44	kgCO ₂ /yr/m ²	
CO ₂ emissions offset from additional allowable electricity generation	0.00	kgCO ₂ /yr/m ²	(ZC7)
Residual CO ₂ emissions offset from biofuel CHP	0.00	kgCO ₂ /yr/m ²	(ZC5)
Total CO ₂ emissions offset from SAP Section 16 allowances	0.00	kgCO ₂ /yr/m ²	
DER accounting for SAP Section 16 allowances	4.97	kgCO ₂ /yr/m ²	
Reduction DER/TER	84.68	%	
CfSH ENE1 credits achieved	8.0		
CfSH ENE1 level achieved	4		

ENE 2 – Fabric Energy Efficiency calculation

Dwelling type	Flat, End-Terrace
Fabric energy efficiency (F.E.E.)	29.17 kWh/m ² /yr
CfSH ENE2 credits achieved	9.0
CfSH ENE1 and 2 overall level achieved	4

ENE 7 – Low and Zero Carbon Technologies calculation

Standard case CO₂ emissions

Total floor area	37.5	m ²	
DER	21.25	kgCO ₂ /yr/m ²	
CO ₂ emissions from electrical appliances	18.22	kgCO ₂ /yr/m ²	(ZC2)
CO ₂ emissions from cooking	4.03	kgCO ₂ /yr/m ²	(ZC3)
Standard case total CO ₂ emissions	43.50	kgCO ₂ /yr/m ²	(ZC4)
Net Standard case CO ₂ emissions	43.50	kgCO ₂ /yr/m ²	(ZC8)

Actual case CO₂ emissions

DER	11.27	kgCO ₂ /yr/m ²	
CO ₂ emissions from electrical appliances	18.22	kgCO ₂ /yr/m ²	(ZC2)
CO ₂ emissions from cooking	4.03	kgCO ₂ /yr/m ²	(ZC3)
Actual case total CO ₂ emissions	33.52	kgCO ₂ /yr/m ²	(ZC4)
CO ₂ emissions from Biomass	0.00	kgCO ₂ /yr/m ²	(ZC5)
CO ₂ reduction from additional allowable electricity generation	0.00	kgCO ₂ /yr/m ²	(ZC7)
Net Actual case CO ₂ emissions	33.52	kgCO ₂ /yr/m ²	(ZC8)
Improvement in net actual/net standard case CO ₂ emissions	23	%	

CODE FOR SUSTAINABLE HOMES

Calculation Type: New Build (As Designed)

ENE7 credits achieved

2

APPENDIX E – FABRIC ENERGY EFFICIENCY STANDARD ASSESSMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122159	Issued on Date	02/11/2022
Assessment Reference	001 - be lean	Prop Type Ref	
Property	Flat 1, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	88 B	DER	11.55	TER	16.95
Environmental	90 B	% DER<TER	31.84		
CO ₂ Emissions (t/year)	1.12	DFEE	33.90	TFEE	53.99
General Requirements Compliance	Pass	% DFEE<TFEE	37.20		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
Client			

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	116.8500 (1b)	x 2.6000 (2b)	= 303.8100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8500		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 303.8100 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1317 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2817 (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) = 0.2183 (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	0.2783	0.2729	0.2674	0.2401	0.2347	0.2074	0.2074	0.2019	0.2183	0.2347	0.2456	0.2565 (22b)
Effective ac	0.5387	0.5372	0.5358	0.5288	0.5275	0.5215	0.5215	0.5204	0.5238	0.5275	0.5302	0.5329 (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
Opening Type 1 (Uw = 0.80)			20.7000	0.7752	16.0465		(27)
Opening Type 2			1.8900	1.4000	2.6460		(26)
Heat Loss Floor 1			116.8500	0.1100	12.8535		(28a)
External Wall 1	96.8200	20.7000	76.1200	0.1400	10.6568		(29a)
External Wall 2	34.3200	1.8900	32.4300	0.1321	4.2824		(29a)
Total net area of external elements Aum(A, m ²)			247.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.4852		(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)							4.2289 (36)
Total fabric heat loss						(33) + (36) =	50.7141 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	54.0116	53.8608	53.7130	53.0189	52.8890	52.2844	52.2844
Heat transfer coeff	104.7257	104.5749	104.4272	103.7330	103.6031	102.9985	102.9985
Average = Sum(39)m / 12 =							103.7323 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8962	0.8950	0.8937	0.8877	0.8866	0.8815	0.8815	0.8805	0.8835	0.8866	0.8889	0.8912	(40)
Days in month												0.8877	(40)
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.8503	(42)
Average daily hot water use (litres/day)													101.8940	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	112.0835	108.0077	103.9319	99.8562	95.7804	91.7046	91.7046	95.7804	99.8562	103.9319	108.0077	112.0835	(44)	
Energy conte	166.2165	145.3740	150.0130	130.7850	125.4913	108.2894	100.3461	115.1486	116.5238	135.7973	148.2334	160.9718	(45)	
Energy content (annual)														
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)	
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)	
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)	
Heat gains from water heating, kWh/month	35.3210	30.8920	31.8778	27.7918	26.6669	23.0115	21.3235	24.4691	24.7613	28.8569	31.4996	34.2065	(65)	

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

Metabolic gains (Table 5), Watts														
(66)m	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.3075	23.3661	19.0026	14.3862	10.7538	9.0788	9.8100	12.7514	17.1149	21.7313	25.3637	27.0386	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0537	283.9702	276.6208	260.9748	241.2246	222.6622	210.2614	207.3449	214.6943	230.3402	250.0905	268.6529	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	(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)	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	(71)	
Water heating gains (Table 5)	47.4745	45.9702	42.8464	38.5997	35.8426	31.9604	28.6607	32.8885	34.3907	38.7862	43.7494	45.9765	(72)	
Total internal gains	420.5898	419.0606	404.2239	379.7149	353.5752	329.4556	314.4862	318.7390	331.9540	356.6119	384.9577	407.4222	(73)	

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	3.2400	36.7938	0.5700	0.7000	0.7700	32.9630	(77)
South	3.6500	46.7521	0.5700	0.7000	0.7700	47.1845	(78)
Southwest	3.0500	36.7938	0.5700	0.7000	0.7700	31.0299	(79)
Northwest	10.7600	11.2829	0.5700	0.7000	0.7700	33.5692	(81)
Solar gains	144.7466	254.6108	370.6903	498.2334	594.6946	606.8003	578.1711
Total gains	565.3364	673.6713	774.9143	877.9483	948.2698	936.2559	892.6573

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	77.4841	77.5959	77.7057	78.2257	78.3238	78.7835	78.7835	78.8693	78.6058	78.3238	78.1256	77.9196		
alpha	6.1656	6.1731	6.1804	6.2150	6.2216	6.2522	6.2522	6.2580	6.2404	6.2216	6.2084	6.1946		
util living area	0.9994	0.9979	0.9922	0.9647	0.8683	0.6789	0.5041	0.5677	0.8410	0.9832	0.9983	0.9996	(86)	
MIT	20.0023	20.1475	20.3716	20.6555	20.8817	20.9801	20.9973	20.9945	20.9285	20.6249	20.2532	19.9714	(87)	
Th 2	20.1707	20.1718	20.1729	20.1779	20.1789	20.1833	20.1833	20.1841	20.1816	20.1789	20.1770	20.1750	(88)	
util rest of house	0.9991	0.9972	0.9894	0.9521	0.8265	0.6026	0.4125	0.4712	0.7776	0.9751	0.9976	0.9994	(89)	
MIT 2	19.2461	19.3919	19.6155	19.8960	20.0989	20.1741	20.1826	20.1825	20.1415	19.8712	19.5020	19.2188	(90)	
Living area fraction									fLA = Living area / (4) =			0.4203	(91)	
MIT	19.5639	19.7095	19.9333	20.2152	20.4279	20.5128	20.5250	20.5238	20.4722	20.1879	19.8177	19.5351	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.5639	19.7095	19.9333	20.2152	20.4279	20.5128	20.5250	20.5238	20.4722	20.1879	19.8177	19.5351	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9989	0.9967	0.9884	0.9527	0.8402	0.6343	0.4511	0.5120	0.8021	0.9752	0.9972	0.9993	(94)

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Calculation Type: New Build (As Designed)

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Useful gains	564.7342	671.4330	765.9324	836.4380	796.7592	593.8770	402.6973	420.9864	598.5723	627.9717	558.2097	529.9892 (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												
Month fracti	1598.5251	1548.6989	1402.7981	1173.7575	904.2389	609.0134	404.2650	424.2816	657.8160	993.3396	1320.9397	1597.0079 (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	769.1405	589.5227	473.8280	242.8701	79.9649	0.0000	0.0000	0.0000	0.0000	271.8338	549.1656	793.8619 (98)
Space heating per m2										(98) / (4) =		32.2652 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	968.1856	762.1887	781.9375	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9378	0.9734	0.9587	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	907.9300	741.8976	749.6110	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	216.1899	307.1626	241.8710	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												765.2235 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	54.0475	76.7906	60.4677	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												191.3059 (107)
Space cooling per m2												1.6372 (108)
Energy for space heating												32.2652 (99)
Energy for space cooling												1.6372 (108)
Total												33.9024 (109)
Dwelling Fabric Energy Efficiency (DFEE)												33.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	116.8500 (1b)	x 2.6000 (2b)	= 303.8100 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.8500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 303.8100 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1317 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3817 (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) =		0.2958 (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	0.3771	0.3697	0.3623	0.3254	0.3180	0.2810	0.2810	0.2736	0.2958	0.3180	0.3328	0.3476 (22b)
Effective ac	0.5711	0.5684	0.5656	0.5529	0.5506	0.5395	0.5395	0.5374	0.5437	0.5506	0.5554	0.5604 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.7000	1.3258	27.4432		(27)
Heat Loss Floor 1			116.8500	0.1300	15.1905		(28a)
External Wall 1	96.8200	20.7000	76.1200	0.1800	13.7016		(29a)
External Wall 2	34.3200	1.8900	32.4300	0.1800	5.8374		(29a)
Total net area of external elements Aum(A, m ²)			247.9900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		64.0627		(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)							11.4414 (36)
Total fabric heat loss						(33) + (36) =	75.5041 (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	57.2583	56.9814	56.7100	55.4354	55.1970	54.0868	54.0868	53.8812	54.5144	55.1970	55.6794	56.1837 (38)
Heat transfer coeff	132.7623	132.4855	132.2141	130.9395	130.7010	129.5909	129.5909	129.3853	130.0185	130.7010	131.1835	131.6878 (39)
Average = Sum(39)m / 12 =												130.9384 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1362	1.1338	1.1315	1.1206	1.1185	1.1090	1.1090	1.1073	1.1127	1.1185	1.1227	1.1270 (40)
HLP (average)												1.1206 (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												2.8503 (42)
Average daily hot water use (litres/day)												101.8940 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.0835	108.0077	103.9319	99.8562	95.7804	91.7046	91.7046	95.7804	99.8562	103.9319	108.0077	112.0835 (44)
Energy conte	166.2165	145.3740	150.0130	130.7850	125.4913	108.2894	100.3461	115.1486	116.5238	135.7973	148.2334	160.9718 (45)
Energy content (annual)										Total = Sum(45)m =		1603.1902 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss												
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	35.3210	30.8920	31.8778	27.7918	26.6669	23.0115	21.3235	24.4691	24.7613	28.8569	31.4996	34.2065 (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	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	142.5138	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6579	22.7891	18.5333	14.0309	10.4883	8.8546	9.5678	12.4365	16.6923	21.1947	24.7373	26.3710	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	281.0537	283.9702	276.6208	260.9748	241.2246	222.6622	210.2614	207.3449	214.6943	230.3402	250.0905	268.6529	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	37.2514	(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)	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	-114.0110	(71)
Water heating gains (Table 5)	47.4745	45.9702	42.8464	38.5997	35.8426	31.9604	28.6607	32.8885	34.3907	38.7862	43.7494	45.9765	(72)
Total internal gains	419.9402	418.4836	403.7547	379.3596	353.3096	329.2314	314.2439	318.4241	331.5314	356.0753	384.3314	406.7545	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Southeast				3.2400	36.7938	0.6300	0.7000	0.7700	36.4327 (77)				
South				3.6500	46.7521	0.6300	0.7000	0.7700	52.1513 (78)				
Southwest				3.0500	36.7938	0.6300	0.7000	0.7700	34.2963 (79)				
Northwest				10.7600	11.2829	0.6300	0.7000	0.7700	37.1028 (81)				
Solar gains	159.9831	281.4119	409.7104	550.6790	657.2940	670.6741	639.0313	556.5051	457.9452	317.5727	193.2191	135.8928	(83)
Total gains	579.9233	699.8955	813.4651	930.0386	1010.6037	999.9055	953.2752	874.9292	789.4766	673.6480	577.5504	542.6473	(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	61.1211	61.2488	61.3746	61.9720	62.0851	62.6169	62.6169	62.7164	62.4110	62.0851	61.8568	61.6198	
alpha	5.0747	5.0833	5.0916	5.1315	5.1390	5.1745	5.1745	5.1811	5.1607	5.1390	5.1238	5.1080	
util living area	0.9992	0.9977	0.9926	0.9721	0.9037	0.7510	0.5806	0.6477	0.8862	0.9861	0.9981	0.9994	(86)
MIT	19.6804	19.8434	20.1051	20.4503	20.7557	20.9364	20.9864	20.9769	20.8402	20.4382	19.9927	19.6521	(87)
Th 2	19.9714	19.9733	19.9752	19.9841	19.9857	19.9935	19.9935	19.9949	19.9905	19.9857	19.9824	19.9789	(88)
util rest of house	0.9989	0.9968	0.9899	0.9608	0.8646	0.6620	0.4567	0.5220	0.8247	0.9787	0.9973	0.9992	(89)
MIT 2	18.7617	18.9259	19.1878	19.5334	19.8166	19.9635	19.9899	19.9881	19.8976	19.5271	19.0826	18.7394	(90)
Living area fraction									fLA = Living area / (4) =			0.4203	(91)
MIT	19.1478	19.3115	19.5733	19.9187	20.2113	20.3724	20.4087	20.4037	20.2937	19.9100	19.4651	19.1230	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1478	19.3115	19.5733	19.9187	20.2113	20.3724	20.4087	20.4037	20.2937	19.9100	19.4651	19.1230	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	579.0996	697.1904	804.0915	892.7928	883.7662	697.6790	485.5445	503.4644	667.8008	658.8520	575.6743	542.0983	(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	(95)
Heat loss rate W	1971.2332	1909.3205	1728.4804	1442.7890	1112.4373	748.0489	493.5789	518.0163	805.3005	1216.8266	1622.0960	1965.1769	(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	(98)
Space heating kWh	1035.7474	814.5514	687.7454	395.9973	170.1312	0.0000	0.0000	0.0000	0.0000	415.1331	753.4236	1058.7705	(98)
Space heating												5331.4999	(98)
Space heating per m2												45.6269	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1218.1543	958.9726	983.3283	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8588	0.9216	0.8922	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1046.0937	883.7638	877.2854	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1282.2909	1225.2801	1135.8678	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	170.0620	254.0881	192.3853	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												616.5354	(104)

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Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.5155	63.5220	48.0963	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												154.1339 (107)
Space cooling per m2												1.3191 (108)
Energy for space heating												45.6269 (99)
Energy for space cooling												1.3191 (108)
Total												46.9459 (109)
Target Fabric Energy Efficiency (TFEE)												54.0 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122160	Issued on Date	02/11/2022
Assessment Reference	002 - be lean	Prop Type Ref	
Property	Flat 2, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	85 B	DER	16.54	TER	21.61
Environmental	88 B	% DER<TER	23.46		
CO ₂ Emissions (t/year)	0.97	DFEE	35.53	TFEE	65.77
General Requirements Compliance	Pass	% DFEE<TFEE	45.98		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
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Client	
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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.4700 (1b)	x 2.6000 (2b)	= 183.2220 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4700		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.2220 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				30.0000 / (5) =	0.1637 (8)
Pressure test				Yes	
Measured/design AP50				3.0000	
Infiltration rate				0.3137	(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) =		0.2431 (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	0.3100	0.3039	0.2979	0.2675	0.2614	0.2310	0.2310	0.2249	0.2431	0.2614	0.2735	0.2857 (22b)
Effective ac	0.5481	0.5462	0.5444	0.5358	0.5342	0.5267	0.5267	0.5253	0.5296	0.5342	0.5374	0.5408 (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
Opening Type 1 (Uw = 0.80)			13.8100	0.7752	10.7054		(27)
Opening Type 2			1.8900	1.4000	2.6460		(26)
External Wall 1	68.8200	13.8100	55.0100	0.1400	7.7014		(29a)
External Wall 2	18.7200	1.8900	16.8300	0.1321	2.2224		(29a)
External Roof 1	49.6700		49.6700	0.1400	6.9538		(30)
Total net area of external elements Aum(A, m ²)			137.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.2290		(33)
Party Wall 1			16.1200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.0160 (36)
Total fabric heat loss						(33) + (36) =	34.2450 (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	33.1371	33.0243	32.9137	32.3942	32.2971	31.8447	31.8447	31.7609	32.0189	32.2971	32.4937	32.6992 (38)
Heat transfer coeff	67.3821	67.2693	67.1587	66.6392	66.5421	66.0897	66.0897	66.0059	66.2639	66.5421	66.7387	66.9442 (39)
Average = Sum(39)m / 12 =												66.6388 (39)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9562	0.9546	0.9530	0.9456	0.9443	0.9378	0.9378	0.9367	0.9403	0.9443	0.9471	0.9500 (40)
Days in month												0.9456 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2575 (42)
Average daily hot water use (litres/day)												87.8152 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5967	93.0841	89.5715	86.0589	82.5463	79.0337	79.0337	82.5463	86.0589	89.5715	93.0841	96.5967 (44)
Energy content (annual)	143.2501	125.2875	129.2854	112.7142	108.1519	93.3269	86.4811	99.2383	100.4235	117.0339	127.7517	138.7301 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	30.4406	26.6236	27.4732	23.9518	22.9823	19.8320	18.3772	21.0881	21.3400	24.8697	27.1472	29.4801 (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	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2133	16.1769	13.1559	9.9599	7.4451	6.2855	6.7917	8.8281	11.8491	15.0451	17.5599	18.7195 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.3915	200.4502	195.2624	184.2181	170.2768	157.1738	148.4203	146.3616	151.5494	162.5937	176.5350	189.6380 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874 (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)	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992 (71)
Water heating gains (Table 5)	40.9148	39.6184	36.9263	33.2663	30.8902	27.5444	24.7006	28.3443	29.6389	33.4270	37.7045	39.6238 (72)
Total internal gains	314.3819	313.1078	302.2068	284.3066	265.4743	247.8660	236.7748	240.3962	249.8996	267.9280	288.6616	304.8435 (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		
Southwest	3.0500				36.7938		0.5700		0.7000		0.7700		31.0299
Northwest	10.7600				11.2829		0.5700		0.7000		0.7700		33.5692 (79)
Solar gains	64.5991	121.1865	195.4300	291.7902	372.1413	389.3813	367.1107	304.1181	228.3188	141.9225	79.4054	53.9694	(83)
Total gains	378.9810	434.2943	497.6368	576.0968	637.6156	637.2473	603.8855	544.5143	478.2184	409.8505	368.0671	358.8130	(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	72.6269	72.7487	72.8685	73.4365	73.5437	74.0471	74.0471	74.1411	73.8524	73.5437	73.3271	73.1019
alpha	5.8418	5.8499	5.8579	5.8958	5.9029	5.9365	5.9365	5.9427	5.9235	5.9029	5.8885	5.8735
util living area	0.9988	0.9971	0.9903	0.9564	0.8420	0.6430	0.4783	0.5498	0.8357	0.9810	0.9974	0.9992 (86)
MIT	19.9684	20.1018	20.3351	20.6465	20.8865	20.9816	20.9973	20.9941	20.9202	20.5985	20.2243	19.9403 (87)
Th 2	20.1200	20.1214	20.1227	20.1289	20.1300	20.1355	20.1355	20.1365	20.1334	20.1300	20.1277	20.1252 (88)
util rest of house	0.9985	0.9962	0.9869	0.9410	0.7952	0.5648	0.3861	0.4507	0.7692	0.9717	0.9963	0.9989 (89)
MIT 2	19.1701	19.3042	19.5369	19.8435	20.0554	20.1273	20.1347	20.1348	20.0891	19.8034	19.4320	19.1464 (90)
Living area fraction												0.3741 (91)
MIT	19.4687	19.6026	19.8355	20.1439	20.3663	20.4468	20.4574	20.4562	20.4000	20.1008	19.7283	19.4434 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4687	19.6026	19.8355	20.1439	20.3663	20.4468	20.4574	20.4562	20.4000	20.1008	19.7283	19.4434 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9981	0.9954	0.9855	0.9414	0.8089	0.5937	0.4207	0.4880	0.7916	0.9713	0.9957	0.9986 (94)
	378.2552	432.3114	490.4340	542.3090	515.7687	378.3599	254.0496	265.7162	378.5616	398.1000	366.4842	358.3108 (95)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	1022.1005	989.0314	895.5946	749.2839	576.6715	386.4163	254.9326	267.7336	417.4625	632.2048	842.7985	1020.4574 (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	479.0209	374.1159	301.4395	149.0219	45.3117	0.0000	0.0000	0.0000	0.0000	174.1740	342.9463	492.6371 (98)
Space heating												2358.6673 (98)
Space heating per m2											(98) / (4) =	33.4705 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	621.2428	489.0635	501.6447	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9477	0.9768	0.9615	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	588.7559	477.7350	482.3368	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	828.9190	788.2451	720.2794	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh						1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	172.9174	231.0195	177.0293	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												580.9662 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	43.2293	57.7549	44.2573	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												145.2415 (107)
Space cooling per m2												2.0610 (108)
Energy for space heating												33.4705 (99)
Energy for space cooling												2.0610 (108)
Total												35.5316 (109)
Dwelling Fabric Energy Efficiency (DFEE)												35.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.4700 (1b)	x 2.6000 (2b)	= 183.2220 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.4700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.2220 (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 30.0000 / (5) = 0.1637 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4137 (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) =		0.3206 (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	0.4088	0.4008	0.3928	0.3527	0.3447	0.3046	0.3046	0.2966	0.3206	0.3447	0.3607	0.3768 (22b)
Effective ac	0.5836	0.5803	0.5771	0.5622	0.5594	0.5464	0.5464	0.5440	0.5514	0.5594	0.5651	0.5710 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.8100	1.3258	18.3087		(27)
External Wall 1	68.8200	13.8100	55.0100	0.1800	9.9018		(29a)
External Wall 2	18.7200	1.8900	16.8300	0.1800	3.0294		(29a)
External Roof 1	49.6700		49.6700	0.1300	6.4571		(30)
Total net area of external elements Aum(A, m ²)			137.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.5870		(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)							20.3951 (36)
Total fabric heat loss						(33) + (36) =	59.9821 (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	35.2844	35.0882	34.8959	33.9926	33.8236	33.0368	33.0368	32.8911	33.3398	33.8236	34.1655	34.5229 (38)
Heat transfer coeff	95.2665	95.0703	94.8780	93.9747	93.8057	93.0189	93.0189	92.8732	93.3220	93.8057	94.1476	94.5050 (39)
Average = Sum(39)m / 12 =												93.9739 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3519	1.3491	1.3464	1.3335	1.3311	1.3200	1.3200	1.3179	1.3243	1.3311	1.3360	1.3411 (40)
HLP (average)												1.3335 (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												2.2575 (42)
Average daily hot water use (litres/day)												87.8152 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5967	93.0841	89.5715	86.0589	82.5463	79.0337	79.0337	82.5463	86.0589	89.5715	93.0841	96.5967 (44)
Energy conte	143.2501	125.2875	129.2854	112.7142	108.1519	93.3269	86.4811	99.2383	100.4235	117.0339	127.7517	138.7301 (45)
Energy content (annual)										Total = Sum(45)m =		1381.6747 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss												
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.4406	26.6236	27.4732	23.9518	22.9823	19.8320	18.3772	21.0881	21.3400	24.8697	27.1472	29.4801 (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	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	112.8741	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8515	15.8556	12.8946	9.7620	7.2972	6.1606	6.6568	8.6527	11.6137	14.7463	17.2111	18.3477	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.3915	200.4502	195.2624	184.2181	170.2768	157.1738	148.4203	146.3616	151.5494	162.5937	176.5350	189.6380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	34.2874	(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)	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	-90.2992	(71)
Water heating gains (Table 5)	40.9148	39.6184	36.9263	33.2663	30.8902	27.5444	24.7006	28.3443	29.6389	33.4270	37.7045	39.6238	(72)
Total internal gains	314.0201	312.7864	301.9455	284.1087	265.3264	247.7411	236.6399	240.2208	249.6642	267.6292	288.3128	304.4717	(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	
Southwest				3.0500	36.7938	0.6300	0.7000		0.7700		34.2963 (79)	
Northwest				10.7600	11.2829	0.6300	0.7000		0.7700		37.1028 (81)	
Solar gains	71.3990	133.9430	216.0015	322.5050	411.3140	430.3688	405.7539	336.1305	252.3523	156.8617	87.7639	59.6504 (83)
Total gains	385.4191	446.7294	517.9470	606.6137	676.6404	678.1099	642.3938	576.3514	502.0166	424.4909	376.0767	364.1221 (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)													21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.3690	51.4751	51.5794	52.0752	52.1690	52.6103	52.6103	52.6928	52.4394	52.1690	51.9796	51.7830	
alpha	4.4246	4.4317	4.4386	4.4717	4.4779	4.5074	4.5074	4.5129	4.4960	4.4779	4.4653	4.4522	
util living area	0.9986	0.9970	0.9918	0.9710	0.9043	0.7615	0.6041	0.6798	0.9035	0.9863	0.9973	0.9989	(86)
MIT	19.4496	19.6043	19.8908	20.2932	20.6639	20.8979	20.9725	20.9542	20.7541	20.2815	19.7966	19.4237	(87)
Th 2	19.8004	19.8026	19.8047	19.8147	19.8165	19.8252	19.8252	19.8268	19.8219	19.8165	19.8127	19.8088	(88)
util rest of house	0.9981	0.9959	0.9886	0.9586	0.8622	0.6629	0.4588	0.5346	0.8424	0.9785	0.9961	0.9985	(89)
MIT 2	18.3967	18.5526	18.8393	19.2418	19.5869	19.7780	19.8184	19.8137	19.6784	19.2370	18.7528	18.3773	(90)
Living area fraction									fLA = Living area / (4) =			0.3741	(91)
MIT	18.7906	18.9460	19.2326	19.6351	19.9897	20.1969	20.2501	20.2403	20.0807	19.6277	19.1432	18.7687	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7906	18.9460	19.2326	19.6351	19.9897	20.1969	20.2501	20.2403	20.0807	19.6277	19.1432	18.7687	(93)

8. Space heating requirement

Utilisation	0.9974	0.9948	0.9866	0.9563	0.8694	0.6971	0.5140	0.5897	0.8586	0.9768	0.9951	0.9980	(94)
Useful gains	384.4362	444.4023	510.9815	580.1007	588.2565	472.7034	330.2142	339.8847	431.0094	414.6590	374.2520	363.4036	(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	1380.4670	1335.3596	1208.0483	1008.8288	777.6249	520.6197	339.5318	356.6621	558.1351	846.8492	1133.8412	1376.8146	(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	741.0470	598.7233	518.6177	308.6842	140.8901	0.0000	0.0000	0.0000	0.0000	321.5495	546.9042	753.9778	(98)
Space heating												3930.3937	(98)
Space heating per m2										(98) / (4) =		55.7740	(99)

8c. Space cooling requirement

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

Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	874.3777	688.3399	705.8364	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8194	0.8870	0.8462	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	716.4842	610.5501	597.2464	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	876.5143	833.0752	757.2581	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	115.2217	165.5587	119.0487	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												399.8291	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	28.8054	41.3897	29.7622	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												99.9573 (107)
Space cooling per m2												1.4184 (108)
Energy for space heating												55.7740 (99)
Energy for space cooling												1.4184 (108)
Total												57.1924 (109)
Target Fabric Energy Efficiency (TFEE)												65.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122161	Issued on Date	02/11/2022
Assessment Reference	003 - be lean	Prop Type Ref	
Property	Flat 3, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	85 B	DER	16.07	TER	19.02
Environmental	88 B	% DER<TER	15.51		
CO ₂ Emissions (t/year)	0.95	DFEE	34.27	TFEE	52.56
General Requirements Compliance	Pass	% DFEE<TFEE	34.81		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
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Client	
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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	4.8700 (1b)	x 2.6000 (2b)	= 12.6620 (1b) - (3b)
First floor	65.5100 (1c)	x 2.5000 (2c)	= 163.7750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.4370 (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							3 * 10 =	30.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						30.0000 / (5) =	0.1700	(8)			
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.3200	(18)				
Number of sides sheltered							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.2960	(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	0.3774	0.3700	0.3626	0.3256	0.3182	0.2812	0.2812	0.2738	0.2960	0.3182	0.3330	0.3478 (22b)
Effective ac	0.5712	0.5685	0.5658	0.5530	0.5506	0.5395	0.5395	0.5375	0.5438	0.5506	0.5555	0.5605 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings	NetArea	U-value	A x U		K-value	A x K			
	m2		m2	m2	W/m2K	W/K		kJ/m2K	kJ/K			
Opening Type 1 (Uw = 0.80)				13.8000	0.7752	10.6977			(27)			
Opening Type 2				1.8900	1.4000	2.6460			(26)			
External Wall 1	87.7500		13.8000	73.9500	0.1400	10.3530			(29a)			
External Wall 2	3.9000		1.8900	2.0100	0.1321	0.2654			(29a)			
External Roof 1	65.5100			65.5100	0.1400	9.1714			(30)			
Total net area of external elements Aum(A, m2)				157.1600					(31)			
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =		33.1335			(33)			
Party Wall 1				28.1800	0.0000	0.0000			(32)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									5.3678 (36)			
Total fabric heat loss									(33) + (36) = 38.5013 (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
	33.2594	33.0984	32.9405	32.1991	32.0603	31.4146	31.4146	31.2950	31.6633	32.0603	32.3410	32.6344 (38)
Heat transfer coeff	71.7607	71.5997	71.4418	70.7004	70.5616	69.9159	69.9159	69.7963	70.1646	70.5616	70.8423	71.1357 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Average = Sum(39)m / 12 =												70.6997 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0196	1.0173	1.0151	1.0046	1.0026	0.9934	0.9934	0.9917	0.9969	1.0026	1.0066	1.0107 (40)
Days in month												1.0045 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy content (annual)	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1380.8652 (45)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.4228	26.6080	27.4571	23.9377	22.9688	19.8203	18.3665	21.0758	21.3275	24.8551	27.1313	29.4629 (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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1923	16.1583	13.1408	9.9484	7.4366	6.2783	6.7839	8.8179	11.8354	15.0278	17.5396	18.6979 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766 (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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126 (71)
Water heating gains (Table 5)	40.8909	39.5952	36.9047	33.2468	30.8721	27.5283	24.6861	28.3277	29.6215	33.4075	37.6824	39.6006 (72)
Total internal gains	314.0953	312.8220	301.9316	284.0489	265.2356	247.6444	236.5635	240.1826	249.6763	267.6872	288.4007	304.5663 (73)

6. Solar gains

[Jan]													
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
Northeast				1.2000	11.2829		0.5700	0.7000		0.7700	3.7438 (75)		
Southeast				6.4300	36.7938		0.5700	0.7000		0.7700	65.4172 (77)		
Southwest				6.1700	36.7938		0.5700	0.7000		0.7700	62.7721 (79)		
Solar gains	131.9331	225.9743	312.4910	392.7279	444.9413	443.9465	427.0868	387.7934	340.2251	250.6404	158.2518	112.7607	(83)
Total gains	446.0283	538.7964	614.4226	676.7767	710.1769	691.5909	663.6503	627.9760	589.9014	518.3275	446.6525	417.3270	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.1083	68.2615	68.4123	69.1298	69.2657	69.9055	69.9055	70.0252	69.6576	69.2657	68.9913	68.7068
alpha	5.5406	5.5508	5.5608	5.6087	5.6177	5.6604	5.6604	5.6683	5.6438	5.6177	5.5994	5.5805
util living area	0.9974	0.9921	0.9770	0.9287	0.8134	0.6264	0.4603	0.5056	0.7547	0.9537	0.9934	0.9982 (86)
MIT	19.9700	20.1546	20.4040	20.6889	20.8923	20.9805	20.9971	20.9951	20.9466	20.6716	20.2587	19.9341 (87)
Th 2	20.0670	20.0689	20.0708	20.0795	20.0812	20.0888	20.0888	20.0903	20.0859	20.0812	20.0779	20.0744 (88)
util rest of house	0.9965	0.9896	0.9695	0.9061	0.7618	0.5459	0.3667	0.4086	0.6783	0.9341	0.9909	0.9976 (89)
MIT 2	19.1280	19.3129	19.5593	19.8367	20.0121	20.0803	20.0881	20.0889	20.0586	19.8277	19.4246	19.0983 (90)
Living area fraction	19.4660	19.6507	19.8984	20.1788	20.3654	20.4416	20.4529	20.4527	20.4150	20.1665	19.7594	19.4338 (92)
MIT	19.4660	19.6507	19.8984	20.1788	20.3654	20.4416	20.4529	20.4527	20.4150	20.1665	19.7594	19.4338 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4660	19.6507	19.8984	20.1788	20.3654	20.4416	20.4529	20.4527	20.4150	20.1665	19.7594	19.4338 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Utilisation	0.9958	0.9882	0.9678	0.9089	0.7789	0.5779	0.4044	0.4477	0.7074	0.9363	0.9898	0.9970 (94)
Useful gains	444.1437	532.4238	594.6451	615.1199	553.1220	399.6770	268.4076	281.1610	417.3118	485.2913	442.0829	416.0754 (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	1088.3205	1056.1481	957.2055	797.4152	611.4450	408.4220	269.3823	282.8607	443.0915	675.0246	896.8197	1083.6649 (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	479.2676	351.9427	269.7450	131.2526	43.3923	0.0000	0.0000	0.0000	0.0000	141.1616	327.4105	496.6866 (98)
Space heating												2240.8589 (98)
Space heating per m2												(98) / (4) = 31.8394 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	657.2091	517.3774	530.4517	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9463	0.9765	0.9680	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	621.9483	505.2353	513.4779	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	892.3564	858.0209	817.7508	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	194.6938	262.4725	226.3791	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												683.5454 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												
Intermittency factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	48.6735	65.6181	56.5948	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												170.8864 (107)
Space cooling per m2												2.4281 (108)
Energy for space heating												31.8394 (99)
Energy for space cooling												2.4281 (108)
Total												34.2675 (109)
Dwelling Fabric Energy Efficiency (DFEE)												34.3 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	4.8700 (1b)	x 2.6000 (2b)	= 12.6620 (1b) - (3b)
First floor	65.5100 (1c)	x 2.5000 (2c)	= 163.7750 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.4370 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1700 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4200 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3885 (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	0.4954	0.4857	0.4759	0.4274	0.4177	0.3691	0.3691	0.3594	0.3885	0.4177	0.4371	0.4565 (22b)
Effective ac	0.6227	0.6179	0.6133	0.5913	0.5872	0.5681	0.5681	0.5646	0.5755	0.5872	0.5955	0.6042 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.8000	1.3258	18.2955		(27)
External Wall 1	87.7500	13.8000	73.9500	0.1800	13.3110		(29a)
External Wall 2	3.9000	1.8900	2.0100	0.1800	0.3618		(29a)
External Roof 1	65.5100		65.5100	0.1300	8.5163		(30)
Total net area of external elements Aum(A, m ²)			157.1600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.3746		(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)							9.1980 (36)
Total fabric heat loss						(33) + (36) =	51.5726 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.2561	35.9787	35.7068	34.4296	34.1907	33.0783	33.0783	32.8723	33.5067	34.1907	34.6741	35.1794 (38)
Heat transfer coeff	87.8287	87.5513	87.2794	86.0022	85.7632	84.6508	84.6508	84.4448	85.0793	85.7632	86.2466	86.7520 (39)
Average = Sum(39)m / 12 =												86.0010 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2479	1.2440	1.2401	1.2220	1.2186	1.2028	1.2028	1.1998	1.2089	1.2186	1.2254	1.2326 (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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)										Total = Sum(45)m =		1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
	30.4228	26.6080	27.4571	23.9377	22.9688	19.8203	18.3665	21.0758	21.3275	24.8551	27.1313	29.4629 (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
	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	17.8315	15.8378	12.8802	9.7511	7.2891	6.1537	6.6493	8.6431	11.6007	14.7298	17.1918	18.3271 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766 (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)												
	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126 (71)
Water heating gains (Table 5)												
	40.8909	39.5952	36.9047	33.2468	30.8721	27.5283	24.6861	28.3277	29.6215	33.4075	37.6824	39.6006 (72)
Total internal gains	313.7345	312.5016	301.6710	283.8516	265.0881	247.5198	236.4290	240.0077	249.4416	267.3891	288.0528	304.1955 (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			
Northeast			1.2000	11.2829		0.6300	0.7000		0.7700		4.1379 (75)	
Southeast			6.4300	36.7938		0.6300	0.7000		0.7700		72.3033 (77)	
Southwest			6.1700	36.7938		0.6300	0.7000		0.7700		69.3796 (79)	

Solar gains	145.8207	249.7611	345.3848	434.0676	491.7772	490.6778	472.0433	428.6138	376.0383	277.0236	174.9099	124.6302 (83)
Total gains	459.5552	562.2627	647.0558	717.9192	756.8653	738.1976	708.4723	668.6215	625.4799	544.4127	462.9628	428.8257 (84)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.6481	55.8244	55.9984	56.8300	56.9883	57.7372	57.7372	57.8780	57.4464	56.9883	56.6689	56.3388
alpha	4.7099	4.7216	4.7332	4.7887	4.7992	4.8491	4.8491	4.8585	4.8298	4.7992	4.7779	4.7559
util living area	0.9971	0.9921	0.9791	0.9407	0.8485	0.6818	0.5144	0.5628	0.8012	0.9613	0.9935	0.9979 (86)
MIT	19.6778	19.8825	20.1703	20.5188	20.7952	20.9492	20.9894	20.9839	20.8866	20.5142	20.0274	19.6466 (87)
Th 2	19.8819	19.8880	19.8880	19.9025	19.9052	19.9178	19.9178	19.9201	19.9129	19.9052	19.8997	19.8940 (88)
util rest of house	0.9961	0.9895	0.9718	0.9194	0.7961	0.5869	0.3937	0.4397	0.7193	0.9431	0.9908	0.9972 (89)
MIT 2	18.6878	18.8936	19.1795	19.5255	19.7719	19.8955	19.9153	19.9158	19.8540	19.5301	19.0504	18.6663 (90)
Living area fraction									fLA = Living area / (4) =			0.4014 (91)
MIT	19.0852	19.2906	19.5772	19.9242	20.1826	20.3184	20.3464	20.3446	20.2684	19.9251	19.4425	19.0598 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0852	19.2906	19.5772	19.9242	20.1826	20.3184	20.3464	20.3446	20.2684	19.9251	19.4425	19.0598 (93)

8. Space heating requirement												

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9951	0.9876	0.9693	0.9199	0.8108	0.6239	0.4426	0.4896	0.7487	0.9435	0.9893	0.9964 (94)
Useful gains	457.3214	555.2950	627.1968	660.4047	613.6570	460.5416	313.5503	327.3404	468.3024	513.6603	458.0252	427.2980 (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	1298.5631	1259.9136	1141.3707	948.1074	727.4965	484.0681	317.1372	333.0985	524.8066	799.7517	1064.5019	1289.1153 (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	625.8838	473.5037	382.5453	207.1460	84.6966	0.0000	0.0000	0.0000	0.0000	212.8520	436.6632	641.1920 (98)
Space heating												3064.4826 (98)
Space heating per m2										(98) / (4) =		43.5420 (99)

8c. Space cooling requirement												

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	795.7177	626.4160	641.7806	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8923	0.9426	0.9267	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	710.0560	590.4771	594.7616	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	946.6660	910.2311	865.0258	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	170.3592	237.8970	201.0765	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												609.3328 (104)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Cooled fraction											FC = cooled area / (4) =	1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	42.5898	59.4742	50.2691	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												152.3332 (107)
Space cooling per m2												2.1644 (108)
Energy for space heating												43.5420 (99)
Energy for space cooling												2.1644 (108)
Total												45.7064 (109)
Target Fabric Energy Efficiency (TFEE)												52.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122162	Issued on Date	02/11/2022
Assessment Reference	004 - be lean	Prop Type Ref	
Property	Flat 4, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	84 B	DER	17.30	TER	20.33
Environmental	91 B	% DER<TER	14.90		
CO ₂ Emissions (t/year)	0.56	DFEE	27.24	TFEE	42.09
General Requirements Compliance	Pass	% DFEE<TFEE	35.29		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
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Client	
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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	37.5000 (1b)	x 2.6000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)				20.0000 / (5) =	0.2051 (8)
Pressure test				Yes	
Measured/design AP50				3.0000	
Infiltration rate				0.3551	(18)
Number of sides sheltered				4	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.2486 (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	0.3170	0.3107	0.3045	0.2734	0.2672	0.2362	0.2362	0.2299	0.2486	0.2672	0.2797	0.2921 (22b)
	0.5502	0.5483	0.5464	0.5374	0.5357	0.5279	0.5279	0.5264	0.5309	0.5357	0.5391	0.5427 (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
Opening Type 1 (Uw = 0.80)			7.9500	0.7752	6.1628		(27)
Opening Type 2			1.8900	1.4000	2.6460		(26)
External Wall 1	37.4400	7.9500	29.4900	0.1400	4.1286		(29a)
External Wall 2	13.7800	1.8900	11.8900	0.1321	1.5701		(29a)
External Roof 1	17.4100		17.4100	0.1400	2.4374		(30)
Total net area of external elements Aum(A, m ²)			68.6300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.9449		(33)
Party Wall 1			20.9800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.4208 (36)
Total fabric heat loss						(33) + (36) =	19.3657 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	17.7036	17.6409	17.5794	17.2904	17.2364	16.9847	16.9847
Heat transfer coeff	37.0693	37.0065	36.9450	36.6561	36.6020	36.3504	36.3504
Average = Sum(39)m / 12 =						36.3038	36.4473
						36.6020	36.7114
						36.8257	36.8257 (39)
						36.6558	36.6558 (39)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9885	0.9868	0.9852	0.9775	0.9761	0.9693	0.9693	0.9681	0.9719	0.9761	0.9790	0.9820	(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													1.3416 (42)
Average daily hot water use (litres/day)													66.0628 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	72.6691	70.0266	67.3841	64.7415	62.0990	59.4565	59.4565	62.0990	64.7415	67.3841	70.0266	72.6691	(44)
Energy content	107.7661	94.2530	97.2606	84.7942	81.3620	70.2092	65.0592	74.6563	75.5480	88.0439	96.1068	104.3658	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month	22.9003	20.0288	20.6679	18.0188	17.2894	14.9195	13.8251	15.8645	16.0539	18.7093	20.4227	22.1777	(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	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.4505	9.2820	7.5486	5.7148	4.2719	3.6065	3.8970	5.0654	6.7988	8.6326	10.0755	10.7409	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	(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)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	(71)
Water heating gains (Table 5)	30.7800	29.8047	27.7794	25.0261	23.2385	20.7215	18.5821	21.3232	22.2971	25.1469	28.3649	29.8088	(72)
Total internal gains	199.6556	198.7083	191.9346	180.9287	169.5957	158.7982	151.8619	154.5750	160.2973	171.3997	184.1629	193.8874	(73)

6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast				3.3800	36.7938	0.5700		0.7000		0.7700		34.3873 (77)
South				3.6500	46.7521	0.5700		0.7000		0.7700		47.1845 (78)
Southwest				0.9200	36.7938	0.5700		0.7000		0.7700		9.3599 (79)
Solar gains	90.9317	151.7937	200.3943	237.5853	257.4351	252.0485	244.4470	229.9831	213.2272	165.7073	108.3288	78.2102 (83)
Total gains	290.5872	350.5020	392.3288	418.5139	427.0308	410.8467	396.3088	384.5580	373.5246	337.1070	292.4917	272.0976 (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	
alpha	70.2513	70.3704	70.4876	71.0432	71.1481	71.6407	71.6407	71.7326	71.4501	71.1481	70.9362	70.7160	
util living area	5.6834	5.6914	5.6992	5.7362	5.7432	5.7760	5.7760	5.7822	5.7633	5.7432	5.7291	5.7144	
	0.9927	0.9793	0.9482	0.8751	0.7410	0.5569	0.4023	0.4323	0.6491	0.8982	0.9820	0.9949	(86)
MIT	20.1470	20.3481	20.5774	20.8001	20.9380	20.9900	20.9987	20.9980	20.9766	20.7986	20.4234	20.1010	(87)
Th 2	20.0929	20.0943	20.0957	20.1021	20.1033	20.1090	20.1090	20.1100	20.1068	20.1033	20.1009	20.0983	(88)
util rest of house	0.9905	0.9733	0.9338	0.8433	0.6859	0.4834	0.3215	0.3497	0.5747	0.8647	0.9757	0.9932	(89)
MIT 2	19.3250	19.5235	19.7447	19.9530	20.0654	20.1047	20.1086	20.1095	20.0957	19.9576	19.6048	19.2840	(90)
Living area fraction	19.5639	19.7632	19.9867	20.1992	20.3190	20.3621	20.3673	20.3677	20.3518	20.2021	19.8428	19.5215	(91)
MIT	19.5639	19.7632	19.9867	20.1992	20.3190	20.3621	20.3673	20.3677	20.3518	20.2021	19.8428	19.5215	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5639	19.7632	19.9867	20.1992	20.3190	20.3621	20.3673	20.3677	20.3518	20.2021	19.8428	19.5215	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9888	0.9706	0.9318	0.8471	0.6998	0.5047	0.3451	0.3738	0.5957	0.8689	0.9734	0.9919	(94)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Useful gains	287.3470	340.2135	365.5748	354.5173	298.8328	207.3348	136.7508	143.7357	222.5239	292.8968	284.7250	269.8988	(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													
Month fracti	565.8232	550.0355	498.2680	414.1855	315.4737	209.4530	136.9445	144.0443	227.8600	351.4551	467.8045	564.2250	(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	207.1863	141.0004	98.7237	42.9611	12.3808	0.0000	0.0000	0.0000	0.0000	43.5673	131.8173	218.9787	(98)
Space heating per m2													
										(98) / (4) =		23.9097	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W													
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	341.6937	268.9929	275.9089	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9708	0.9885	0.9855	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	331.7139	265.9098	271.8999	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	531.9007	514.0094	500.9800	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh						1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling													
Cooled fraction						144.1345	184.5861	170.4356	0.0000	0.0000	0.0000	0.0000	(104)
Intermittency factor (Table 10b)													499.1562 (104)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	1.0000 (105)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	36.0336	46.1465	42.6089	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling													124.7890 (107)
Space cooling per m2													3.3277 (108)
Energy for space heating													23.9097 (99)
Energy for space cooling													3.3277 (108)
Total													27.2375 (109)
Dwelling Fabric Energy Efficiency (DFEE)													27.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	37.5000 (1b)	x 2.6000 (2b)	= 97.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	37.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.2051 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4551 (18)
Number of sides sheltered					4 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7000 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3186 (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	0.4062	0.3982	0.3903	0.3504	0.3425	0.3027	0.3027	0.2947	0.3186	0.3425	0.3584	0.3743 (22b)
	0.5825	0.5793	0.5762	0.5614	0.5586	0.5458	0.5458	0.5434	0.5507	0.5586	0.5642	0.5701 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			7.4900	1.3258	9.9299		(27)
External Wall 1	37.4400	7.4900	29.9500	0.1800	5.3910		(29a)
External Wall 2	13.7800	1.8900	11.8900	0.1800	2.1402		(29a)
External Roof 1	17.4100		17.4100	0.1300	2.2633		(30)
Total net area of external elements Aum(A, m ²)			68.6300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 21.6144		(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)							3.8090 (36)
Total fabric heat loss							(33) + (36) = 25.4234 (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	18.7419	18.6389	18.5378	18.0633	17.9745	17.5612	17.5612	17.4846	17.7204	17.9745	18.1541	18.3419 (38)
Heat transfer coeff	44.1654	44.0623	43.9613	43.4867	43.3979	42.9846	42.9846	42.9081	43.1438	43.3979	43.5775	43.7653 (39)
Average = Sum(39)m / 12 =												43.4863 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1777	1.1750	1.1723	1.1596	1.1573	1.1463	1.1463	1.1442	1.1505	1.1573	1.1621	1.1671 (40)
HLP (average)												1.1596 (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												1.3416 (42)
Average daily hot water use (litres/day)												66.0628 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	72.6691	70.0266	67.3841	64.7415	62.0990	59.4565	59.4565	62.0990	64.7415	67.3841	70.0266	72.6691 (44)
Energy conte	107.7661	94.2530	97.2606	84.7942	81.3620	70.2092	65.0592	74.6563	75.5480	88.0439	96.1068	104.3658 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	22.9003	20.0288	20.6679	18.0188	17.2894	14.9195	13.8251	15.8645	16.0539	18.7093	20.4227	22.1777 (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
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796	67.0796 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	10.3530	9.1955	7.4783	5.6615	4.2321	3.5729	3.8606	5.0182	6.7354	8.5521	9.9816	10.6408 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	115.3012	116.4977	113.4827	107.0640	98.9615	91.3463	86.2589	85.0625	88.0775	94.4962	102.5987	110.2139 (68)
Pumps, fans	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080	29.7080 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637	-53.6637 (71)
Total internal gains	30.7800	29.8047	27.7794	25.0261	23.2385	20.7215	18.5821	21.3232	22.2971	25.1469	28.3649	29.8088 (72)
	199.5581	198.6218	191.8642	180.8754	169.5559	158.7646	151.8255	154.5278	160.2340	171.3192	184.0690	193.7873 (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	
Southeast		3.1800	36.7938	0.6300	0.7000	0.7700	35.7581 (77)
South		3.4400	46.7521	0.6300	0.7000	0.7700	49.1509 (78)
Southwest		0.8700	36.7938	0.6300	0.7000	0.7700	9.7829 (79)

Solar gains	94.6918	158.0695	208.6770	247.4016	268.0684	262.4581	254.5431	239.4840	222.0391	172.5577	112.8081	81.4444 (83)
Total gains	294.2499	356.6912	400.5412	428.2770	437.6243	421.2227	406.3687	394.0118	382.2731	343.8769	296.8771	275.2317 (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
alpha	58.9640	59.1019	59.2378	59.8842	60.0067	60.5837	60.5837	60.6918	60.3602	60.0067	59.7594	59.5030
util living area	4.9309	4.9401	4.9492	4.9923	5.0004	5.0389	5.0389	5.0461	5.0240	5.0004	4.9840	4.9669
	0.9935	0.9831	0.9602	0.9061	0.7979	0.6244	0.4601	0.4932	0.7157	0.9240	0.9852	0.9952 (86)
MIT	19.8906	20.1056	20.3694	20.6547	20.8639	20.9697	20.9946	20.9923	20.9397	20.6659	20.2172	19.8482 (87)
Th 2	19.9378	19.9401	19.9422	19.9524	19.9543	19.9632	19.9632	19.9649	19.9598	19.9543	19.9505	19.9464 (88)
util rest of house	0.9914	0.9778	0.9478	0.8773	0.7405	0.5351	0.3545	0.3862	0.6308	0.8942	0.9797	0.9937 (89)
MIT 2	18.9438	19.1574	19.4152	19.6901	19.8689	19.9504	19.9620	19.9629	19.9305	19.7081	19.2779	18.9087 (90)
Living area fraction	19.2190	19.4330	19.6925	19.9705	20.1581	20.2467	20.2621	20.2621	fLA = Living area / (4) =			0.2907 (91)
MIT	19.2190	19.4330	19.6925	19.9705	20.1581	20.2467	20.2621	20.2621	20.2238	19.9865	19.5509	19.1818 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2190	19.4330	19.6925	19.9705	20.1581	20.2467	20.2621	20.2621	20.2238	19.9865	19.5509	19.1818 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9895	0.9746	0.9443	0.8778	0.7526	0.5605	0.3854	0.4175	0.6537	0.8953	0.9770	0.9922 (94)
Ext temp.	291.1661	347.6363	378.2352	375.9496	329.3727	236.0858	156.6007	164.4955	249.9058	307.8804	290.0345	273.0775 (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	658.9020	640.3579	579.9606	481.4179	367.0643	242.7191	157.4140	165.7162	264.2060	407.3542	542.5800	655.6817 (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	273.5955	196.7090	150.0837	75.9372	28.0425	0.0000	0.0000	0.0000	0.0000	74.0085	181.8328	284.6575 (98)
Space heating per m2										(98) / (4) =		1264.8666 (98)
												33.7298 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	404.0552	318.0860	326.1012	0.0000	0.0000	0.0000	0.0000 (100)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.9311	0.9670	0.9601	0.0000	0.0000	0.0000	0.0000 (101)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	376.2041	307.5914	313.0933	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	543.9837	525.7193	511.9670	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	120.8013	162.2871	147.9620	0.0000	0.0000	0.0000	0.0000 (104)
												431.0504 (104)
												fC = cooled area / (4) =
												1.0000 (105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	30.2003	40.5718	36.9905	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling											107.7626 (107)
Space cooling per m2											2.8737 (108)
Energy for space heating											33.7298 (99)
Energy for space cooling											2.8737 (108)
Total											36.6034 (109)
Target Fabric Energy Efficiency (TFEE)											42.1 (109)

APPENDIX F- OVERHEATING ASSESMENTS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122159	Issued on Date	02/11/2022
Assessment Reference	001 be green	Prop Type Ref	
Property	Flat 1, 32, Norwich Road, Northwood, HA6 1NB		

SAP Rating	104 A	DER	-2.38	TER	24.46
Environmental	104 A	% DER<TER	109.73		
CO ₂ Emissions (t/year)	-0.57	DFEE	33.91	TFEE	53.99
General Requirements Compliance	Pass	% DFEE<TFEE	37.19		

Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com	Assessor ID	L706-0001
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Client	
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SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	Detached Flat
Number of storeys	1
Cross ventilation possible	No
SAP Region	Thames Valley
Front of dwelling faces	North East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	1.90 (Calculated rate)

Overheating Calculation

Summer ventilation heat loss coefficient	190.49 (P1)
Transmission heat loss coefficient	50.73 (37)
Summer heat loss coefficient	241.22 (P2)

Overhangs Orientation	Ratio	Z_overhangs	Overhang type
South East	0.000	1.000	None
South	0.000	1.000	None
South West	0.000	1.000	None
North West	0.000	1.000	None

Solar shading Orientation	Z blinds	Solar access	Z overhangs	Z summer
South East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South East	3.2400	119.9223	0.5700	0.7000	0.9000	125.5750
South	3.6500	112.2060	0.5700	0.7000	0.9000	132.3631
South West	3.0500	119.9223	0.5700	0.7000	0.9000	118.2110
North West	10.7600	98.8453	0.5700	0.7000	0.9000	343.7368
total:						719.8859

	Jun	Jul	Aug	
Solar gains	764	720	639	(P3)
Internal gains	560	538	547	
Total summer gains	1324	1258	1187	(P5)
Summer gain/loss ratio	5.49	5.21	4.92	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	21.74	23.36	22.97	(P7)
Likelihood of high internal temperature	Slight	Medium	Medium	
Assessment of likelihood of high internal temperature:	Medium			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122160	Issued on Date	02/11/2022
Assessment Reference	002 be green	Prop Type Ref	
Property	Flat 2, 32, Norwich Road, Northwood, HA6 1NB		
SAP Rating	100 A	DER	2.17
Environmental	100 A	TER	31.41
CO ₂ Emissions (t/year)	-0.09	% DER<TER	93.09
General Requirements Compliance	Pass	DFEE	35.53
		TFEE	65.77
		% DFEE<TFEE	45.98
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com		Assessor ID
			L706-0001
Client			

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	No
SAP Region	Thames Valley
Front of dwelling faces	South East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	241.85 (P1)
Transmission heat loss coefficient	34.25 (37)
Summer heat loss coefficient	276.10 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
South West	0.000	1.000	None
North West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
South West	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South West	3.0500	119.9223	0.5700	0.7000	0.9000	118.2110
North West	10.7600	98.8453	0.5700	0.7000	0.9000	343.7368
total:						461.9478

Solar gains	Jun 495	Jul 462	Aug 391	(P3)
Internal gains	432	416	423	
Total summer gains	927	878	815	(P5)
Summer gain/loss ratio	3.36	3.18	2.95	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.61	21.33	21.00	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature:

Slight

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122161	Issued on Date	02/11/2022
Assessment Reference	003 be green	Prop Type Ref	
Property	Flat 3, 32, Norwich Road, Northwood, HA6 1NB		
SAP Rating	100 A	DER	1.50
Environmental	100 A	TER	27.47
CO ₂ Emissions (t/year)	-0.12	% DER<TER	94.54
General Requirements Compliance	Pass	DFEE	34.27
		TFEE	52.56
		% DFEE<TFEE	34.81
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com		Assessor ID
			L706-0001
Client			

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	2
Cross ventilation possible	No
SAP Region	Thames Valley
Front of dwelling faces	North East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	5.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	291.12 (P1)
Transmission heat loss coefficient	38.50 (37)
Summer heat loss coefficient	329.62 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
North East	0.000	1.000	None
South East	0.000	1.000	None
South West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
North East	1.000	0.90	1.000	0.900 (P8)
South East	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Shading	Gains W
North East	1.2000	98.8453	0.5700	0.7000	0.9000	38.3350
South East	6.4300	119.9223	0.5700	0.7000	0.9000	249.2120
South West	6.1700	119.9223	0.5700	0.7000	0.9000	239.1350
total:						526.6820

Solar gains	554	527	487	(P3)
Internal gains	432	415	423	
Total summer gains	986	942	910	(P5)
Summer gain/loss ratio	2.99	2.86	2.76	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.24	21.01	20.81	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122162	Issued on Date	01/11/2022
Assessment Reference	004 be green	Prop Type Ref	
Property	Flat 4, 32, Norwich Road, Northwood, HA6 1NB		
SAP Rating	98 A	DER	4.97
Environmental	98 A	TER	32.44
CO ₂ Emissions (t/year)	0.04	% DER<TER	84.68
General Requirements Compliance	Pass	DFEE	29.17
		TFEE	50.67
		% DFEE<TFEE	42.43
Assessor Details	Mrs. Nicola Battista, Monitor Energy Consultancy, Tel: 01752 337 541, nicbattista@gmail.com		Assessor ID
			L706-0001
Client			

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

SAP 2012 OVERHEATING ASSESSMENT FOR New Build (As Designed) 9.92

Overheating Calculation Input Data

Dwelling type	EndTerrace Flat
Number of storeys	1
Cross ventilation possible	No
SAP Region	Thames Valley
Front of dwelling faces	North East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	4.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	128.70 (P1)
Transmission heat loss coefficient	21.13 (37)
Summer heat loss coefficient	149.83 (P2)

Overhangs	Ratio	Z_overhangs	Overhang type
Orientation			
South East	0.000	1.000	None
South	0.000	1.000	None
South West	0.000	1.000	None
North West	0.000	1.000	None

Solar shading	Z blinds	Solar access	Z overhangs	Z summer
Orientation				
South East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)
South West	1.000	0.90	1.000	0.900 (P8)
North West	1.000	0.90	1.000	0.900 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South East	3.3800	119.9223	0.5700	0.7000	0.9000	131.0010
South	3.6500	112.2060	0.5700	0.7000	0.9000	132.3631
South West	0.9200	119.9223	0.5700	0.7000	0.9000	35.6571
North West	1.8900	98.8453	0.5700	0.7000	0.9000	60.3776
total:						359.3988

	Jun	Jul	Aug	
Solar gains	377	359	335	(P3)
Internal gains	291	281	286	
Total summer gains	668	640	621	(P5)
Summer gain/loss ratio	4.46	4.27	4.15	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.71	22.42	22.20	(P7)
Likelihood of high internal temperature	Slight	Medium	Medium	

Assessment of likelihood of high internal temperature: **Medium**

