

Energy Calculations Ltd

SAP ♦ CODE ♦ SBEM ♦ DESIGN

01754-761035



SAP Report Submission for Building Regulations Compliance

Client:

Project: Flat 3, Adj: 81, Goldington Avenue
BEDFORD, MK40 3DB

Contact: Matthew Carter
Energy Calculations Limited
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Report Issue Date: 10/04/2018

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

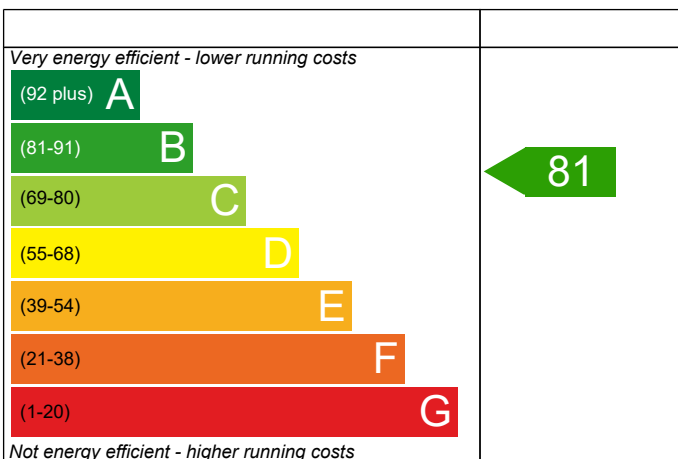
Flat 3, Adj: 81, Goldington Avenue,
BEDFORD,
MK40 3DB

Dwelling type: Flat, Semi-Detached
Date of assessment: 10/04/2018
Produced by: Energy Calculations Limited
Total floor area: 35.1 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

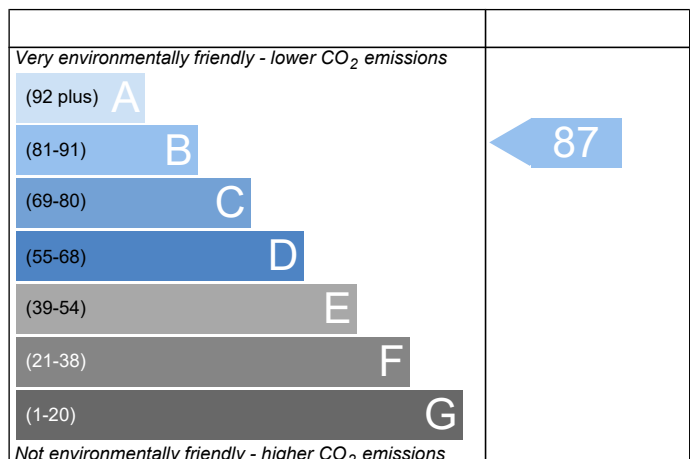
Energy Efficiency Rating



England EU Directive 2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England EU Directive 2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

THERMAL BRIDGING

Calculation Type: New Build (As Designed)

Property Reference	005395		Issued on Date	10/04/2018	
Survey Reference	001	Prop Type Ref			
Property	Flat 3, Adj: 81, Goldington Avenue, BEDFORD, MK40 3DB				
SAP Rating	81 B	DER	24.27	TER	24.27
Environmental	87 B	% DER<TER	0.01		
CO ₂ Emissions (t/year)	0.73	DFEE	56.16	TFEE	59.39
General Requirements Compliance	Pass	% DFEE<TFEE	5.44		
Surveyor	Matthew Carter, Tel: 01754 761035			Surveyor ID	7869-0001
Client					

	Junction detail	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Table K1 - Approved	0.300	6.96	2.09	
External wall	E3 Sill	Table K1 - Approved	0.040	5.16	0.21	
External wall	E4 Jamb	Table K1 - Approved	0.050	17.10	0.86	
External wall	E7 Party floor between dwellings (in blocks of flats)	Table K1 - Approved	0.070	25.05	1.75	
External wall	E10 Eaves (insulation at ceiling level)	Table K1 - Approved	0.060	4.68	0.28	
External wall	E16 Corner (normal)	Table K1 - Approved	0.090	11.60	1.04	
External wall	E17 Corner (inverted – internal area greater than external area)	Table K1 - Approved	-0.090	11.60	-1.04	
External wall	E18 Party wall between dwellings	Table K1 - Approved	0.060	11.60	0.70	

Total: **5.88** W/mK:
Y-Value: **0.076** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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Property Reference	005395	Issued on Date	10/04/2018
Survey Reference	001	Prop Type Ref	
Property	Flat 3, Adj: 81, Goldington Avenue, BEDFORD, MK40 3DB		
SAP Rating	81 B	DER	24.27
Environmental	87 B	% DER<TER	0.01
CO ₂ Emissions (t/year)	0.73	DFEE	56.16
General Requirements Compliance	Pass	% DFEE<TFEE	5.44
Surveyor	Matthew Carter, Tel: 01754 761035	Surveyor ID	7869-0001
Client			

SAP2012 - 9.92 input data (DesignData) -

SAP2012 Input Data (Flat) 10/04/2018

FullRefNo: 001

Regs Region: England
SAP Region: Thames Valley
Postcode: MK40 3DB
DwellingOrientation: West
Property Type: Flat, Semi-Detached
Storeys: 1
Date Built: 2017
Sheltered Sides: 2
Sunlight Shade: Average or unknown
Measurements
Perimeter, Floor Area, Storey Height
1st Storey: 25.05, 35.1, 2.9
Living Area: 17.84 m2, fraction: 50.8%
Thermal Mass: Precise calculation
External Walls
Nett Area, Gross Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
Main wall 47.54, 55.54, 110, CavityWallPlasterOnDabsDenseLightweight, Cavity, 0, 0.18, Calculate
Wall to Stairs 15.25, 17.11, 70, CavityWallDensePlasterAChlock, Cavity, 0.82, 0.18637749915283, Gross
Party Walls
Area, Kappa, Element, Construction, Type, ShelterFactor, UValueFinal
Party Wall 1 16.04, 180, PartyWallDensePlaster, FilledWithEdge, 0, 0
Internal Walls
Area, Kappa
Internal Wall 1 29, 9
External Roofs
Nett Area, Gross Area, Kappa, Construction, Element, UValueFinal
Plane 4.47, 4.47, 9, Plasterboard, insulated at ceiling level, 0.09
Party Ceilings
Area, Kappa, Construction, Element
Party Ceilings 1 30.63, 30, Timber I-joists, carpeted
Heat Loss Floors
Area, Kappa, Construction, Element, Type, ShelterFactor, UValueFinal
Party Floors
Area, Kappa, Construction, Element
Party Floor 1 35.1, 30

Description
Door to Hall Data Source, Type, Glazing, Glazing Gap, Argon Filled, Solar Trans, Frame Type, Frame Factor, U Value
SAP table, Door to Corridor, , , , , , 1.40
Windows
Manufacturer, Window, Double Low-E Soft 0.05, , , 0.63, , 0.7,
Roof lights
Manufacturer, Window, Double Low-E Soft 0.05, , , 0.63, , 0.7,
Openings
Opening Type, Location, Orientation, Pitch, Curtain Type, Overhang Ratio, Wide Overhang, Width, Height, Count, Area, Curtain Closed
Door to Stairs Door to Corridor, Wall to Stairs, South, , , , 0, 0, 0, 1.86,
Front Windows Window, Main wall, West, , None, 0, , 0, 0, 0, 2.84,
Side Windows Window, Main wall, South, , None, 0, , 0, 0, 0, 2.43,
Side Windows Window, Main wall, North, , None, 0, , 0, 0, 0, 0.81,
Rear Windows Window, Main wall, East, , None, 0, , 0, 0, 0, 1.92,
Conservatory: None
Draught Proofing: 100
Draught Lobby: Yes
Thermal Bridges
Bridging: Calculate Bridges
Y 0.076
List of Bridges
Junction with, Bridge Type, Source Type, Imported, Length, Psi, Adjusted, Result, Reference
0. External wall, E1 Steel lintel with perforated steel base plate, , No, 0, 0, 0, 0.00,
1. External wall, E2 Other lintels (including other steel lintels), Table K1 - Approved, No, 6.96, 0.3, 0.3, 2.09,
2. External wall, E3 Sill, Table K1 - Approved, No, 5.16, 0.04, 0.04, 0.21,
3. External wall, E4 Jamb, Table K1 - Approved, No, 17.1, 0.05, 0.05, 0.86,
4. External wall, E5 Ground floor (normal), , No, 0, 0.16, 0.16, 0.00,
5. External wall, E19 Ground floor (inverted), , No, 0, 0, 0, 0.00,
6. External wall, E20 Exposed floor (normal), , No, 0, 0, 0, 0.00,
7. External wall, E21 Exposed floor (inverted), , No, 0, 0, 0, 0.00,
8. External wall, E22 Basement floor, , No, 0, 0, 0, 0.00,
9. External wall, E6 Intermediate floor within a dwelling, , No, 0, 0, 0, 0.00,
10. External wall, E7 Party floor between dwellings (in blocks of flats), Table K1 - Approved, No, 25.05, 0.07, 0.07, 1.75,
11. External wall, E8 Balcony within a dwelling, wall insulation continuous, , No, 0, 0, 0, 0.00,
12. External wall, E9 Balcony between dwellings, wall insulation continuous, , No, 0, 0, 0, 0.00,
13. External wall, E23 Balcony within or between dwellings, balcony support penetrates wall insulation, , No, 0, 0, 0, 0.00,
14. External wall, E10 Eaves (insulation at ceiling level), Table K1 - Approved, No, 4.68, 0.06, 0.06, 0.28,
15. External wall, E24 Eaves (insulation at ceiling level - inverted), , No, 0, 0, 0, 0.00,
16. External wall, E11 Eaves (insulation at rafter level), , No, 0, 0.04, 0.04, 0.00,
17. External wall, E12 Gable (insulation at ceiling level), , No, 0, 0.24, 0.24, 0.00,
18. External wall, E13 Gable (insulation at rafter level), , No, 0, 0.04, 0.04, 0.00,
19. External wall, E14 Flat roof, , No, 0, 0, 0, 0.00,
20. External wall, E15 Flat roof with parapet, , No, 0, 0, 0, 0.00,
21. External wall, E16 Corner (normal), Table K1 - Approved, No, 11.6, 0.09, 0.09, 1.04,
22. External wall, E17 Corner (inverted - internal area greater than external area), Table K1 - Approved, No, 11.6, -0.09, -0.09, -1.04,
23. External wall, E18 Party wall between dwellings, Table K1 - Approved, No, 11.6, 0.06, 0.06, 0.70,
24. External wall, E25 Staggered party wall between dwellings, , No, 0, 0, 0, 0.00,
25. Party wall, P1 Party wall - Ground floor, , No, 0, 0.16, 0.16, 0.00,
26. Party wall, P6 Party wall - Ground floor (inverted), , No, 0, 0, 0, 0.00,
27. Party wall, P2 Party wall - Intermediate floor within a dwelling, , No, 0, 0, 0, 0.00,
28. Party wall, P3 Party wall - Intermediate floor between dwellings (in blocks of flats), , No, 0, 0, 0, 0.00,
29. Party wall, P7 Party Wall - Exposed floor (normal), , No, 0, 0, 0, 0.00,
30. Party wall, P8 Party Wall - Exposed floor (inverted), , No, 0, 0, 0, 0.00,

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

SAP2012 - 9.92 input data (DesignData) -

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31. Party wall, P4 Party wall - Roof (insulation at ceiling level), , No, 0, 0, 0, 0.00,
32. Party wall, P5 Party wall - Roof (insulation at rafter level), , No, 0, 0, 0, 0.00,
33. External roof, R1 Head of roof window, , No, 0, 0.08, 0.08, 0.00,
34. External roof, R2 Sill of roof window, , No, 0, 0.06, 0.06, 0.00,
35. External roof, R3 Jamb of roof window, , No, 0, 0.08, 0.08, 0.00,
36. External roof, R4 Ridge (vaulted ceiling), , No, 0, 0, 0, 0.00,
37. External roof, R5 Ridge (inverted), , No, 0, 0, 0, 0.00,
38. External roof, R6 Flat ceiling, , No, 0, 0, 0, 0.00,
39. External roof, R7 Flat ceiling (inverted), , No, 0, 0, 0, 0.00,
40. External roof, R8 Roof to wall (rafter), , No, 0, 0, 0, 0.00,
41. External roof, R9 Roof to wall (flat ceiling), , No, 0, 0, 0, 0.00,
Pressure Test: True
Designed q50: 5
AsBuilt q50: 15
Property Tested: False
Mechanical Ventilation None
Chimneys MHS: 0
Chimneys SHS: 0
Chimneys Other: 0
Chimneys Total: 0
Open Flues MHS: 0
Open Flues SHS: 0
Open Flues Other: 0
Open Flues Total: 0
Intermittent Fans: 2
Passive Vents: 0
Flueless Gas Fires: 0
Cooling System None
Light Fittings: 9
LEL Fittings: 9
Percentage of LEL Fittings: 100
External Lights Fitted: No
External LELs Fitted: No
Electricity Tariff: Standard
Main Heating 1
Description
Percentage 100
Sedbuk ID 17038
Fuel Type Mains gas
MHS Mains gas BGW Post 98 Combi condens. with auto ign.
SAP Code 104
Boiler Efficiency Type Split Efficiencies
Efficiency Winter 90.2
Efficiency Summer 87.3
Controls by PCDF 0
MHS Controls CBI Time and temperature zone control
Boiler Interlock Yes
Compensator 0
Delayed Start Stat Yes
Ctrl SAP Code 2110
Flue Type Balanced
Fan Assisted Flue Yes
Pumped Pump in heated space
Heat Pump Age 2013 or later
Heat Emitter Radiators
Flow Temperature Normal (> 45°C)
Combi boiler type Standard Combi
Combi keep hot type Gas/Oil, time clock
Main Heating 2 None
Heating Systems Interaction Each system heats separate parts of dwelling
Smoke Control Area Unknown
Community Heating None
Secondary Heating None
Water Heating
Type MainHeating1
WHS HWP From main heating 1
Low Water Usage Yes
SAP Code 901
Showers in Property Non-electric only
Hot Water Cylinder None
Flue Gas Heat Recovery System None
Waste Water Heat Recovery none
PV Unit None
Wind Turbine None
Terrain Type: Urban
Small Scale Hydro None
Special Features None

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 35 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) 24.27 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 24.27 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)56.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

SAP2012 - 9.92 input data (DesignData) -

External wall	0.18 (max. 0.30)	0.19 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.09 (max. 0.20)	0.09 (max. 0.35)	OK
Openings	1.40 (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:	5.00 (design value)		
Maximum	10.0		OK

4 Heating efficiency			
Main heating system:	Boiler system with radiators or underfloor - Mains gas		
Data from database			
Ideal Vogue c32			
Combi boiler			
Efficiency: 89.3% SEDBUK2009			
Minimum: 88.0%	OK		
Secondary heating system:	None		

5 Cylinder insulation			
Hot water storage	No cylinder		

6 Controls			
Space heating controls:	Time and temperature zone control		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):	Not significant		OK
Based on:			
Overshading:	Average		
Windows facing North:	0.81 m ² , No overhang		
Windows facing East:	1.92 m ² , No overhang		
Windows facing South:	2.43 m ² , No overhang		
Windows facing West:	2.84 m ² , No overhang		
Air change rate:	6.00 ach		
Blinds/curtains:	None		

10 Key features			
Party wall U-value	0.00 W/m ² K		
Roof U-value	0.09 W/m ² K		

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	35.1000 (1b)	2.9000 (2b)	101.7900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	101.7900 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1965 (8)
Pressure test				Yes	
Measured/design q50					5.0000
Infiltration rate					0.4465 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3795 (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	0.4839	0.4744	0.4649	0.4175	0.4080	0.3605	0.3605	0.3510	0.3795	0.4080	0.4269	0.4459 (22b)
Effective ac	0.6171	0.6125	0.6081	0.5871	0.5832	0.5650	0.5650	0.5616	0.5720	0.5832	0.5911	0.5994 (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
Door to Hall			1.8600	1.4000	2.6040		(26)
Windows (Uw = 1.40)			8.0000	1.3258	10.6061		(27)
Main wall	55.5400	8.0000	47.5400	0.1800	8.5572	110.0000	5229.4000 (29a)
Wall to Stairs	17.1100	1.8600	15.2500	0.1864	2.8423	70.0000	1067.5000 (29a)
Plane	4.4700		4.4700	0.0900	0.4023	9.0000	40.2300 (30)
Total net area of external elements Aum, m ²			77.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.0118		(33)
Party Wall 1			16.0400	0.0000	0.0000	180.0000	2887.2000 (32)
Party Floor 1			35.1000			30.0000	1053.0000 (32d)
Party Ceilings 1			30.6300			30.0000	918.9000 (32b)
Internal Wall 1			29.0000			9.0000	261.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11457.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							326.4168 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8797 (36)
Total fabric heat loss						(33) + (36) =	30.8915 (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
(38)m	20.7277	20.5750	20.4254	19.7223	19.5908	18.9785	18.9785	18.8651	19.2144	19.5908	19.8569	20.1351 (38)
Heat transfer coeff	51.6193	51.4666	51.3169	50.6139	50.4823	49.8700	49.8700	49.7566	50.1059	50.4823	50.7484	51.0266 (39)
Average = Sum(39)m / 12 =												50.6132 (39)
HLP	1.4706	1.4663	1.4620	1.4420	1.4382	1.4208	1.4208	1.4176	1.4275	1.4382	1.4458	1.4537 (40)
HLP (average)												1.4420 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.2831 (42)
Average daily hot water use (litres/day)												64.6727 (43)
Daily hot water use	71.1400	68.5531	65.9662	63.3793	60.7924	58.2055	58.2055	60.7924	63.3793	65.9662	68.5531	71.1400 (44)
Energy conte	105.4986	92.2697	95.2141	83.0099	79.6500	68.7319	63.6902	73.0855	73.9583	86.1913	94.0845	102.1697 (45)
Energy content (annual)										Total = Sum(45)m =		1017.5538 (45)
Distribution loss (46)m = 0.15 x (45)m	15.8248	13.8405	14.2821	12.4515	11.9475	10.3098	9.5535	10.9628	11.0937	12.9287	14.1127	15.3255 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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)
Combi loss	24.3404	21.9514	24.2498	23.4071	24.1434	23.3138	24.0594	24.1138	23.3647	24.2058	23.4951	24.3229	(61)
Total heat required for water heating calculated for each month	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(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	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(64)
Heat gains from water heating, kWh/month	41.1634	36.1675	37.7211	33.4526	32.5195	28.6818	27.1918	30.3294	30.4323	34.7101	37.1569	40.0522	(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	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	9.7563	8.6655	7.0472	5.3352	3.9881	3.3670	3.6381	4.7290	6.3472	8.0592	9.4063	10.0275	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4362	110.5719	107.7102	101.6180	93.9277	86.6999	81.8712	80.7356	83.5973	89.6895	97.3798	104.6076	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	(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)	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	(71)
Water heating gains (Table 5)	55.3271	53.8207	50.7005	46.4619	43.7090	39.8359	36.5482	40.7653	42.2671	46.6533	51.6068	53.8336	(72)
Total internal gains	219.7656	218.3040	210.7038	198.6610	186.8707	175.1486	167.3035	171.4758	177.4575	189.6480	203.6388	213.7146	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
North	0.8100	10.6334	0.6300	0.7000	0.7700	2.6323 (74)							
East	1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (76)							
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)							
West	2.8400	19.6403	0.6300	0.7000	0.7700	17.0466 (80)							
Solar gains	65.9232	117.7837	173.0249	229.8360	268.3214	270.3107	259.0363	230.2917	192.9932	133.6388	80.0269	55.6910	(83)
Total gains	285.6889	336.0877	383.7287	428.4970	455.1921	445.4593	426.3398	401.7675	370.4507	323.2867	283.6658	269.4056	(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	61.6546	61.8375	62.0179	62.8793	63.0431	63.8172	63.8172	63.9626	63.5168	63.0431	62.7126	62.3707	
alpha	5.1103	5.1225	5.1345	5.1920	5.2029	5.2545	5.2545	5.2642	5.2345	5.2029	5.1808	5.1580	
util living area	0.9976	0.9941	0.9836	0.9472	0.8515	0.6763	0.5069	0.5566	0.8093	0.9676	0.9946	0.9982	(86)
MIT	19.8124	19.9816	20.2444	20.5732	20.8307	20.9629	20.9932	20.9891	20.9049	20.5612	20.1258	19.7863	(87)
Th 2	19.7096	19.7129	19.7161	19.7313	19.7341	19.7474	19.7474	19.7499	19.7423	19.7341	19.7284	19.7224	(88)
util rest of house	0.9966	0.9915	0.9759	0.9223	0.7868	0.5623	0.3669	0.4125	0.7092	0.9470	0.9918	0.9975	(89)
MIT 2	18.1700	18.4185	18.7995	19.2682	19.5905	19.7286	19.7458	19.7470	19.6817	19.2649	18.6408	18.1411	(90)
Living area fraction	19.0048	19.2130	19.5339	19.9315	20.2208	20.3559	20.3798	20.3783	20.3034	19.9238	19.3956	18.9773	(91)
Temperature adjustment	18.8548	19.0630	19.3839	19.7815	20.0708	20.2059	20.2298	20.2283	20.1534	19.7738	19.2456	-0.1500	(92)
adjusted MIT												18.8273	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9956	0.9897	0.9734	0.9235	0.8061	0.6062	0.4219	0.4692	0.7456	0.9479	0.9902	0.9967	(94)
Ext temp.	284.4202	332.6246	373.5103	395.7321	366.9138	270.0470	179.8573	188.4953	276.2243	306.4308	280.8956	268.5060	(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	751.3075	728.9202	661.1611	550.7540	422.5784	279.5672	181.0185	190.4842	303.3113	463.1144	616.3693	746.3803	(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	(98)
Space heating per m2	347.3642	266.3106	214.0121	111.6158	41.4145	0.0000	0.0000	0.0000	0.0000	116.5726	241.5410	355.5384	(98)
												1694.3693	(98)
												48.2726	(99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1878.4582 (211)
Space heating requirement	347.3642	266.3106	214.0121	111.6158	41.4145	0.0000	0.0000	0.0000	0.0000	116.5726	241.5410	355.5384	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	385.1044	295.2446	237.2640	123.7426	45.9141	0.0000	0.0000	0.0000	0.0000	129.2379	267.7839	394.1668	(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	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(64)
Efficiency of water heater (217)m	89.3920	89.3095	89.1392	88.7609	88.1079	87.3000	87.3000	87.3000	87.3000	88.7658	89.2295	89.4205	(217)
Fuel for water heating, kWh/month	145.2467	127.8935	134.0195	119.8918	117.8026	105.4361	100.5150	111.3394	111.4811	124.3690	131.7721	141.4582	(219)
Water heating fuel used													1471.2251 (219)
Annual totals kWh/year													
Space heating fuel - main system													1878.4582 (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)													172.2997 (232)
Total delivered energy for all uses													3596.9829 (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	1878.4582	0.2160	405.7470	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1471.2251	0.2160	317.7846	(264)
Space and water heating			723.5316	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	172.2997	0.5190	89.4235	(268)
Total CO2, kg/year			851.8801	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			24.2700	(273)

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

DER			24.2700	ZC1
Total Floor Area		TFA	35.1000	
Assumed number of occupants		N	1.2831	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			18.4757	ZC2
CO2 emissions from cooking, equation (L16)			4.2676	ZC3
Total CO2 emissions			47.0133	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			47.0133	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	35.1000 (1b)	2.9000 (2b)	101.7900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	101.7900 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1965 (8)
Pressure test				Yes	
Measured/design q50					5.0000
Infiltration rate					0.4465 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3795 (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	0.4839	0.4744	0.4649	0.4175	0.4080	0.3605	0.3605	0.3510	0.3795	0.4080	0.4269	0.4459 (22b)
Effective ac	0.6171	0.6125	0.6081	0.5871	0.5832	0.5650	0.5650	0.5616	0.5720	0.5832	0.5911	0.5994 (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			1.8600	1.0000	1.8600		(26)
TER Opening Type (Uw = 1.40)			6.9100	1.3258	9.1610		(27)
Main wall	55.5400	6.9100	48.6300	0.1800	8.7534		(29a)
Wall to Stairs	17.1100	1.8600	15.2500	0.1800	2.7450		(29a)
Plane	4.4700		4.4700	0.1300	0.5811		(30)
Total net area of external elements Aum(A, m ²)			77.1200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.1005	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.1913 (36)
Total fabric heat loss (33) + (36) = 27.2918 (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
Jan	20.7277	20.5750	20.4254	19.7223	19.5908	18.9785	18.9785	18.8651	19.2144	19.5908	19.8569	20.1351 (38)
Heat transfer coeff	48.0195	47.8668	47.7172	47.0141	46.8826	46.2703	46.2703	46.1569	46.5061	46.8826	47.1487	47.4269 (39)
Average = Sum(39)m / 12 =												47.0135 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3681	1.3637	1.3595	1.3394	1.3357	1.3182	1.3182	1.3150	1.3250	1.3357	1.3433	1.3512 (40)
HLP (average)												1.3394 (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 1.2831 (42)
Average daily hot water use (litres/day) 64.6727 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	71.1400	68.5531	65.9662	63.3793	60.7924	58.2055	58.2055	60.7924	63.3793	65.9662	68.5531	71.1400 (44)
Energy conte	105.4986	92.2697	95.2141	83.0099	79.6500	68.7319	63.6902	73.0855	73.9583	86.1913	94.0845	102.1697 (45)
Energy content (annual)												Total = Sum(45)m = 1017.5538 (45)
Distribution loss (46)m = 0.15 x (45)m	15.8248	13.8405	14.2821	12.4515	11.9475	10.3098	9.5535	10.9628	11.0937	12.9287	14.1127	15.3255 (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	36.2522	31.5532	33.6156	31.2555	30.9791	28.7041	29.6609	30.9791	31.2555	33.6156	33.8070	36.2522 (61)
Total heat required for water heating calculated for each month	141.7507	123.8229	128.8297	114.2655	110.6291	97.4360	93.3511	104.0646	105.2139	119.8069	127.8915	138.4219 (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	141.7507	123.8229	128.8297	114.2655	110.6291	97.4360	93.3511	104.0646	105.2139	119.8069	127.8915	138.4219 (64)
Heat gains from water heating, kWh/month	44.1413	38.5680	40.0626	35.4147	34.2284	30.0294	28.5922	32.0457	32.4050	37.0625	39.7349	43.0345 (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	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	9.8420	8.7416	7.1091	5.3821	4.0232	3.3965	3.6701	4.7705	6.4029	8.1300	9.4889	10.1156 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4362	110.5719	107.7102	101.6180	93.9277	86.6999	81.8712	80.7356	83.5973	89.6895	97.3798	104.6076 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153 (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)	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225 (71)
Water heating gains (Table 5)	59.3297	57.3928	53.8476	49.1871	46.0059	41.7075	38.4304	43.0722	45.0070	49.8152	55.1873	57.8420 (72)
Total internal gains	223.8539	221.9522	213.9128	201.4330	189.2027	177.0498	169.2176	173.8242	180.2532	192.8807	207.3020	217.8112 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	0.7000	10.6334	0.6300	0.7000	0.7700	2.2748 (74)
East	1.6600	19.6403	0.6300	0.7000	0.7700	9.9639 (76)
South	2.1000	46.7521	0.6300	0.7000	0.7700	30.0049 (78)
West	2.4500	19.6403	0.6300	0.7000	0.7700	14.7057 (80)

Solar gains	56.9492	101.7464	149.4585	198.5227	231.7590	233.4752	223.7379	198.9139	166.7037	115.4404	69.1323	48.1104 (83)
Total gains	280.8031	323.6986	363.3713	399.9557	420.9616	410.5249	392.9556	372.7381	346.9569	308.3211	276.4343	265.9215 (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	50.7606	50.9225	51.0823	51.8461	51.9916	52.6796	52.6796	52.8090	52.4124	51.9916	51.6982	51.3949	
alpha	4.3840	4.3948	4.4055	4.4564	4.4661	4.5120	4.5120	4.5206	4.4942	4.4661	4.4465	4.4263	
util living area	0.9934	0.9871	0.9713	0.9276	0.8311	0.6662	0.5049	0.5495	0.7847	0.9483	0.9874	0.9948 (86)	
MIT	19.6542	19.8381	20.1264	20.4883	20.7770	20.9412	20.9865	20.9805	20.8739	20.4948	20.0116	19.6263 (87)	
Th 2	19.7879	19.7913	19.7945	19.8101	19.8130	19.8266	19.8266	19.8291	19.8213	19.8130	19.8071	19.8010 (88)	
util rest of house	0.9913	0.9828	0.9614	0.9021	0.7734	0.5656	0.3769	0.4195	0.6962	0.9246	0.9825	0.9931 (89)	
MIT 2	18.0338	18.3025	18.7186	19.2338	19.6053	19.7899	19.8221	19.8218	19.7282	19.2562	18.5672	18.0021 (90)	
Living area fraction	fLA = Living area / (4) = 0.5083 (91)												
MIT	18.8574	19.0830	19.4341	19.8714	20.2008	20.3751	20.4139	20.4107	20.3105	19.8858	19.3013	18.8276 (92)	
Temperature adjustment	0.0000												
adjusted MIT	18.8574	19.0830	19.4341	19.8714	20.2008	20.3751	20.4139	20.4107	20.3105	19.8858	19.3013	18.8276 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9889	0.9794	0.9577	0.9037	0.7940	0.6148	0.4423	0.4859	0.7361	0.9263	0.9797	0.9911 (94)
Useful gains	277.6984	317.0425	348.0097	361.4270	334.2497	252.3828	173.8146	181.0997	255.3934	285.6033	270.8110	263.5562 (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	699.0385	678.8948	617.1797	515.8114	398.5410	267.2138	176.4716	185.1225	288.8263	435.3404	575.2759	693.7425 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	313.4770	243.1648	200.2625	111.1568	47.8327	0.0000	0.0000	0.0000	0.0000	111.4044	219.2147	320.0586 (98)
Space heating	1566.5716 (98)											
Space heating per m2	(98) / (4) = 44.6317 (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													1677.2715 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	313.4770	243.1648	200.2625	111.1568	47.8327	0.0000	0.0000	0.0000	0.0000	111.4044	219.2147	320.0586	(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)	335.6285	260.3477	214.4138	119.0116	51.2128	0.0000	0.0000	0.0000	0.0000	119.2767	234.7053	342.6752	(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	141.7507	123.8229	128.8297	114.2655	110.6291	97.4360	93.3511	104.0646	105.2139	119.8069	127.8915	138.4219	(64)
Efficiency of water heater (217)m	86.9929	86.7198	86.1577	84.9819	83.1026	80.3000	80.3000	80.3000	80.3000	84.8687	86.3961	80.3000	(216)
Fuel for water heating, kWh/month	162.9452	142.7851	149.5278	134.4587	133.1235	121.3399	116.2529	129.5947	131.0260	141.1674	148.0292	158.9362	(219)
Water heating fuel used													1669.1866 (219)
Annual totals kWh/year													
Space heating fuel - main system													1677.2715 (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)													173.8131 (232)
Total delivered energy for all uses													3595.2712 (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	1677.2715	0.2160	362.2906 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1669.1866	0.2160	360.5443 (264)
Space and water heating			722.8349 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	173.8131	0.5190	90.2090 (268)
Total CO2, kg/m2/year			851.9690 (272)
Emissions per m2 for space and water heating			20.5936 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5701 (272b)
Emissions per m2 for pumps and fans			1.1090 (272c)
Target Carbon Dioxide Emission Rate (TER) = (20.5936 * 1.00) + 2.5701 + 1.1090, rounded to 2 d.p.			24.2700 (273)

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1000 (1b)	2.9000 (2b)	101.7900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	101.7900 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1965 (8)
Pressure test				Yes	
Measured/design q50					5.0000
Infiltration rate					0.4465 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3795 (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	0.4839	0.4744	0.4649	0.4175	0.4080	0.3605	0.3605	0.3510	0.3795	0.4080	0.4269	0.4459 (22b)
Effective ac	0.6171	0.6125	0.6081	0.5871	0.5832	0.5650	0.5650	0.5616	0.5720	0.5832	0.5911	0.5994 (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
Door to Hall			1.8600	1.4000	2.6040		(26)
Windows (Uw = 1.40)			8.0000	1.3258	10.6061		(27)
Main wall	55.5400	8.0000	47.5400	0.1800	8.5572	110.0000	5229.4000 (29a)
Wall to Stairs	17.1100	1.8600	15.2500	0.1864	2.8423	70.0000	1067.5000 (29a)
Plane	4.4700		4.4700	0.0900	0.4023	9.0000	40.2300 (30)
Total net area of external elements Aum(A, m ²)			77.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.0118		(33)
Party Wall 1			16.0400	0.0000	0.0000	180.0000	2887.2000 (32)
Party Floor 1			35.1000			30.0000	1053.0000 (32d)
Party Ceilings 1			30.6300			20.0000	612.6000 (32b)
Internal Wall 1			29.0000			9.0000	261.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	11150.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							317.6903 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8797 (36)
Total fabric heat loss						(33) + (36) =	30.8915 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.7277	20.5750	20.4254	19.7223	19.5908	18.9785	18.9785	18.8651	19.2144	19.5908	19.8569	20.1351 (38)
Heat transfer coeff	51.6193	51.4666	51.3169	50.6139	50.4823	49.8700	49.8700	49.7566	50.1059	50.4823	50.7484	51.0266 (39)
Average = Sum(39)m / 12 =												50.6132 (39)
HLP	1.4706	1.4663	1.4620	1.4420	1.4382	1.4208	1.4208	1.4176	1.4275	1.4382	1.4458	1.4537 (40)
HLP (average)												1.4420 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.2831 (42)
Average daily hot water use (litres/day)												64.6727 (43)
Daily hot water use	71.1400	68.5531	65.9662	63.3793	60.7924	58.2055	58.2055	60.7924	63.3793	65.9662	68.5531	71.1400 (44)
Energy conte	105.4986	92.2697	95.2141	83.0099	79.6500	68.7319	63.6902	73.0855	73.9583	86.1913	94.0845	102.1697 (45)
Energy content (annual)										Total = Sum(45)m =		1017.5538 (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)

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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	22.4184	19.6073	20.2330	17.6396	16.9256	14.6055	13.5342	15.5307	15.7161	18.3157	19.9930	21.7111	(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	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	9.7563	8.6655	7.0472	5.3352	3.9881	3.3670	3.6381	4.7290	6.3472	8.0592	9.4063	10.0275	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4362	110.5719	107.7102	101.6180	93.9277	86.6999	81.8712	80.7356	83.5973	89.6895	97.3798	104.6076	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	(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)	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	(71)
Water heating gains (Table 5)	30.1323	29.1776	27.1949	24.4995	22.7495	20.2855	18.1911	20.8745	21.8280	24.6178	27.7680	29.1815	(72)
Total internal gains	191.5708	190.6608	184.1982	173.6986	162.9112	152.5982	145.9464	148.5851	154.0184	164.6125	176.8001	186.0626	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W
North	0.8100	10.6334	0.6300	0.7000	0.7700	2.6323 (74)
East	1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (76)
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)
West	2.8400	19.6403	0.6300	0.7000	0.7700	17.0466 (80)

Solar gains	65.9232	117.7837	173.0249	229.8360	268.3214	270.3107	259.0363	230.2917	192.9932	133.6388	80.0269	55.6910	(83)
Total gains	257.4941	308.4445	357.2231	403.5345	431.2326	422.9089	404.9827	378.8768	347.0116	298.2512	256.8270	241.7536	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.0063	60.1843	60.3599	61.1983	61.3577	62.1111	62.1111	62.2526	61.8187	61.3577	61.0360	60.7032	
alpha	5.0004	5.0123	5.0240	5.0799	5.0905	5.1407	5.1407	5.1502	5.1212	5.0905	5.0691	5.0469	
util living area	0.9983	0.9956	0.9868	0.9555	0.8692	0.7017	0.5309	0.5854	0.8351	0.9749	0.9962	0.9988	(86)
MIT	19.7279	19.9026	20.1756	20.5210	20.8000	20.9526	20.9907	20.9850	20.8816	20.5051	20.0513	19.7020	(87)
Th 2	19.7096	19.7129	19.7161	19.7313	19.7341	19.7474	19.7474	19.7499	19.7423	19.7341	19.7284	19.7224	(88)
util rest of house	0.9976	0.9936	0.9807	0.9341	0.8092	0.5878	0.3858	0.4363	0.7408	0.9587	0.9942	0.9983	(89)
MIT 2	18.5771	18.7536	19.0258	19.3697	19.6145	19.7302	19.7459	19.7470	19.6880	19.3640	18.9148	18.5615	(90)
Living area fraction									fLA = Living area / (4) =			0.5083	(91)
MIT	19.1620	19.3376	19.6102	19.9549	20.2170	20.3515	20.3785	20.3762	20.2947	19.9440	19.4924	19.1412	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1620	19.3376	19.6102	19.9549	20.2170	20.3515	20.3785	20.3762	20.2947	19.9440	19.4924	19.1412	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9972	0.9928	0.9801	0.9386	0.8346	0.6456	0.4604	0.5132	0.7867	0.9620	0.9937	0.9979	(94)
Useful gains	256.7646	306.2337	350.1013	378.7516	359.8947	273.0134	186.4449	194.4521	272.9905	286.9247	255.1976	241.2516	(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	767.1659	743.0550	672.7739	559.5293	429.9595	286.8265	188.4362	197.8436	310.3897	471.7075	628.8968	762.3979	(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	379.7385	293.5439	240.0684	130.1600	52.1282	0.0000	0.0000	0.0000	0.0000	137.4784	269.0634	387.7329	(98)
Space heating												1889.9137	(98)
Space heating per m2										(98) / (4) =		53.8437	(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	468.7782	369.0381	378.1504	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8924	0.9440	0.9256	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	418.3417	348.3804	350.0157	0.0000	0.0000	0.0000	0.0000	(102)

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Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	543.6958	521.8946	492.0127	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												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	90.2550	129.0946	105.6457	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												324.9953 (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	22.5638	32.2736	26.4114	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												81.2488 (107)
Space cooling per m2												2.3148 (108)
Energy for space heating												53.8437 (99)
Energy for space cooling												2.3148 (108)
Total												56.1585 (109)
Dwelling Fabric Energy Efficiency (DFEE)												56.2 (109)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	35.1000 (1b)	2.9000 (2b)	101.7900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.1000		101.7900 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	101.7900 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1965 (8)
Pressure test				Yes	
Measured/design q50					5.0000
Infiltration rate					0.4465 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3795 (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	0.4839	0.4744	0.4649	0.4175	0.4080	0.3605	0.3605	0.3510	0.3795	0.4080	0.4269	0.4459 (22b)
Effective ac	0.6171	0.6125	0.6081	0.5871	0.5832	0.5650	0.5650	0.5616	0.5720	0.5832	0.5911	0.5994 (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			1.8600	1.0000	1.8600		(26)	
TER Opening Type (Uw = 1.40)			6.9100	1.3258	9.1610		(27)	
Main wall	55.5400	6.9100	48.6300	0.1800	8.7534		(29a)	
Wall to Stairs	17.1100	1.8600	15.2500	0.1800	2.7450		(29a)	
Plane	4.4700		4.4700	0.1300	0.5811		(30)	
Total net area of external elements Aum(A, m2)			77.1200				(31)	
Fabric heat loss, W/K = Sum (A x U)					23.1005		(32)	
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							4.1913 (36)	
							(33) + (36) =	27.2918 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	20.7277	20.5750	20.4254	19.7223	19.5908	18.9785	18.9785	18.8651	19.2144	19.5908	19.8569	20.1351 (38)
Average = Sum(39)m / 12 =	48.0195	47.8668	47.7172	47.0141	46.8826	46.2703	46.2703	46.1569	46.5061	46.8826	47.1487	47.4269 (39)
47.0135 (39)												

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.3681	1.3637	1.3595	1.3394	1.3357	1.3182	1.3182	1.3150	1.3250	1.3357	1.3433	1.3512 (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	1.2831 (42)											
Average daily hot water use (litres/day)	64.6727 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	71.1400	68.5531	65.9662	63.3793	60.7924	58.2055	58.2055	60.7924	63.3793	65.9662	68.5531	71.1400 (44)
Energy content (annual)	105.4986	92.2697	95.2141	83.0099	79.6500	68.7319	63.6902	73.0855	73.9583	86.1913	94.0845	102.1697 (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	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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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	0.0000	(59)
Heat gains from water heating, kWh/month	22.4184	19.6073	20.2330	17.6396	16.9256	14.6055	13.5342	15.5307	15.7161	18.3157	19.9930	21.7111	21.7111	(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		
	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	64.1531	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	9.8420	8.7416	7.1091	5.3821	4.0232	3.3965	3.6701	4.7705	6.4029	8.1300	9.4889	10.1156	10.1156	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	109.4362	110.5719	107.7102	101.6180	93.9277	86.6999	81.8712	80.7356	83.5973	89.6895	97.3798	104.6076	104.6076	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	29.4153	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)														
	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	(71)
Water heating gains (Table 5)														
	30.1323	29.1776	27.1949	24.4995	22.7495	20.2855	18.1911	20.8745	21.8280	24.6178	27.7680	29.1815	29.1815	(72)
Total internal gains														
	191.6565	190.7369	184.2601	173.7454	162.9463	152.6278	145.9783	148.6266	154.0742	164.6833	176.8827	186.1507	186.1507	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North		0.7000	10.6334	0.6300	0.7000	0.7700	2.2748	(74)						
East		1.6600	19.6403	0.6300	0.7000	0.7700	9.9639	(76)						
South		2.1000	46.7521	0.6300	0.7000	0.7700	30.0049	(78)						
West		2.4500	19.6403	0.6300	0.7000	0.7700	14.7057	(80)						
Solar gains	56.9492	101.7464	149.4585	198.5227	231.7590	233.4752	223.7379	198.9139	166.7037	115.4404	69.1323	48.1104	48.1104	(83)
Total gains	248.6057	292.4833	333.7186	372.2681	394.7052	386.1029	369.7163	347.5405	320.7779	280.1237	246.0150	234.2610	234.2610	(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)														
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
alpha	50.7606	50.9225	51.0823	51.8461	51.9916	52.6796	52.6796	52.8090	52.4124	51.9916	51.6982	51.3949	51.3949	
util living area	4.3840	4.3948	4.4055	4.4564	4.4661	4.5120	4.5120	4.5206	4.4942	4.4661	4.4465	4.4263	4.4263	
	0.9959	0.9912	0.9787	0.9420	0.8552	0.6967	0.5333	0.5835	0.8181	0.9624	0.9920	0.9969	0.9969	(86)
MIT	19.5735	19.7619	20.0586	20.4357	20.7452	20.9296	20.9833	20.9752	20.8484	20.4358	19.9368	19.5462	19.5462	(87)
Th 2	19.7879	19.7913	19.7945	19.8101	19.8130	19.8266	19.8266	19.8291	19.8213	19.8130	19.8071	19.8010	19.8010	(88)
util rest of house	0.9945	0.9881	0.9711	0.9204	0.8016	0.5957	0.3998	0.4482	0.7344	0.9439	0.9887	0.9958	0.9958	(89)
MIT 2	18.5102	18.6998	18.9948	19.3696	19.6475	19.7958	19.8227	19.8226	19.7422	19.3794	18.8872	18.4933	18.4933	(90)
Living area fraction	fLA = Living area / (4) =													
MIT	19.0506	19.2396	19.5355	19.9115	20.2054	20.3721	20.4126	20.4085	20.3045	19.9164	19.4207	19.0285	19.0285	(92)
Temperature adjustment	0.0000													
adjusted MIT	19.0506	19.2396	19.5355	19.9115	20.2054	20.3721	20.4126	20.4085	20.3045	19.9164	19.4207	19.0285	19.0285	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9934	0.9864	0.9691	0.9226	0.8212	0.6452	0.4681	0.5175	0.7722	0.9459	0.9872	0.9948	0.9948	(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	4.2000	(96)
Heat loss rate W	708.3182	686.3923	622.0159	517.6951	398.7557	267.0749	176.4089	185.0176	288.5460	436.7747	580.9046	703.2673	703.2673	(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	1.0000	(97a)
Space heating kWh	343.2490	267.3892	222.1654	125.4587	55.5199	0.0000	0.0000	0.0000	0.0000	127.8245	243.3797	349.8385	349.8385	(98)
Space heating per m2												1734.8249	(98)	
												49.4252	(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	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	434.9407	342.4001	350.7924	0.0000	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8711	0.9264	0.9075	0.0000	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	378.8805	317.2040	318.3540	0.0000	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	500.7153	480.7167	455.4412	0.0000	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	87.7210	121.6534	101.9929	0.0000	0.0000	0.0000	0.0000	0.0000	(104)
												311.3673	(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		0.0000 (106)
Space cooling kWh														
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	21.9303	30.4134	25.4982	0.0000	0.0000	0.0000	0.0000		0.0000 (107)
Space cooling per m2														77.8418 (107)
Energy for space heating														2.2177 (108)
Energy for space cooling														49.4252 (99)
Total														2.2177 (108)
Target Fabric Energy Efficiency (TFEE)														51.6429 (109)
														59.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1000 (1b)	2.9000 (2b)	101.7900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	101.7900 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1965 (8)
Pressure test				Yes	
Measured/design q50					5.0000
Infiltration rate					0.4465 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3795 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.4000	4.4000	4.0000	3.9000	3.3000	3.4000	3.5000	3.5000	3.8000	3.8000	4.2000 (22)
Wind factor	1.1250	1.1000	1.1000	1.0000	0.9750	0.8250	0.8500	0.8750	0.8750	0.9500	0.9500	1.0500 (22a)
Adj infilt rate	0.4269	0.4175	0.4175	0.3795	0.3700	0.3131	0.3226	0.3321	0.3321	0.3605	0.3605	0.3985 (22b)
Effective ac	0.5911	0.5871	0.5871	0.5720	0.5685	0.5490	0.5520	0.5551	0.5551	0.5650	0.5650	0.5794 (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
Door to Hall			1.8600	1.4000	2.6040		(26)
Windows (Uw = 1.40)			8.0000	1.3258	10.6061		(27)
Main wall	55.5400	8.0000	47.5400	0.1800	8.5572	110.0000	5229.4000 (29a)
Wall to Stairs	17.1100	1.8600	15.2500	0.1864	2.8423	70.0000	1067.5000 (29a)
Plane	4.4700		4.4700	0.0900	0.4023	9.0000	40.2300 (30)
Total net area of external elements Aum, m ²			77.1200				(31)
Fabric heat loss, W/K = Sum (A x U)					25.0118		(32)
Party Wall 1			16.0400	0.0000	0.0000	180.0000	2887.2000 (32)
Party Floor 1			35.1000			30.0000	1053.0000 (32d)
Party Ceilings 1			30.6300			30.0000	918.9000 (32b)
Internal Wall 1			29.0000			9.0000	261.0000 (32c)
Heat capacity Cm = Sum (A x k)							(28)...(30) + (32) + (32a)...(32e) = 11457.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							326.4168 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8797 (36)
Total fabric heat loss							(33) + (36) = 30.8915 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	19.8569	19.7223	19.7223	19.2144	19.0949	18.4418	18.5431	18.6474	18.6474	18.9785	18.9785	19.4623 (38)
Heat transfer coeff	50.7484	50.6139	50.6139	50.1059	49.9864	49.3333	49.4346	49.5389	49.5389	49.8700	49.8700	50.3538 (39)
Average = Sum(39)m / 12 =												50.0007 (39)
HLP	1.4458	1.4420	1.4420	1.4275	1.4241	1.4055	1.4084	1.4114	1.4114	1.4208	1.4208	1.4346 (40)
HLP (average)												1.4245 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.2831 (42)
Average daily hot water use (litres/day)												64.6727 (43)
Daily hot water use	71.1400	68.5531	65.9662	63.3793	60.7924	58.2055	58.2055	60.7924	63.3793	65.9662	68.5531	71.1400 (44)
Energy conte	105.4986	92.2697	95.2141	83.0099	79.6500	68.7319	63.6902	73.0855	73.9583	86.1913	94.0845	102.1697 (45)
Energy content (annual)												Total = Sum(45)m = 1017.5538 (45)
Distribution loss (46)m = 0.15 x (45)m	15.8248	13.8405	14.2821	12.4515	11.9475	10.3098	9.5535	10.9628	11.0937	12.9287	14.1127	15.3255 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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)
Combi loss	24.3404	21.9514	24.2498	23.4071	24.1434	23.3138	24.0594	24.1138	23.3647	24.2058	23.4951	24.3229	(61)
Total heat required for water heating calculated for each month	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(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	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(64)
RHI water heating demand													(64)
Heat gains from water heating, kWh/month	41.1634	36.1675	37.7211	33.4526	32.5195	28.6818	27.1918	30.3294	30.4323	34.7101	37.1569	40.0522	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3908	21.6637	17.6181	13.3380	9.9703	8.4174	9.0953	11.8224	15.8680	20.1480	23.5157	25.0687	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	163.3377	165.0326	160.7614	151.6686	140.1905	129.4028	122.1959	120.5009	124.7721	133.8650	145.3430	156.1308	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	(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)	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	(71)
Water heating gains (Table 5)	55.3271	53.8207	50.7005	46.4619	43.7090	39.8359	36.5482	40.7653	42.2671	46.6533	51.6068	53.8336	(72)
Total internal gains	315.6983	313.1597	301.7227	284.1112	266.5125	250.2987	240.4820	245.7313	255.5499	273.3090	293.1082	307.6757	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
North	0.8100	12.4557	0.6300	0.7000	0.7700	3.0834	(74)						
East	1.9200	23.1647	0.6300	0.7000	0.7700	13.5925	(76)						
South	2.4300	53.4754	0.6300	0.7000	0.7700	39.7130	(78)						
West	2.8400	23.1647	0.6300	0.7000	0.7700	20.1056	(80)						
Solar gains	76.4945	125.4168	181.6029	244.2040	280.4198	298.5469	280.7677	250.1681	212.2351	148.1730	92.0699	64.5091	(83)
Total gains	392.1927	438.5765	483.3256	528.3153	546.9323	548.8455	521.2497	495.8994	467.7850	421.4819	385.1781	372.1848	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
tau	62.7126	62.8793	62.8793	63.5168	63.6686	64.5115	64.3793	64.2437	64.2437	63.8172	63.8172	63.2040		
alpha	5.1808	5.1920	5.1920	5.2345	5.2446	5.3008	5.2920	5.2829	5.2829	5.2545	5.2545	5.2136		
util living area	0.9892	0.9795	0.9519	0.8768	0.7308	0.5133	0.3500	0.3684	0.6303	0.8953	0.9772	0.9916	(86)	
MIT	20.0823	20.2352	20.4864	20.7557	20.9271	20.9908	20.9990	20.9987	20.9745	20.7692	20.3744	20.0447	(87)	
Th 2	19.7284	19.7313	19.7313	19.7423	19.7449	19.7591	19.7569	19.7546	19.7546	19.7474	19.7474	19.7369	(88)	
util rest of house	0.9847	0.9713	0.9325	0.8314	0.6487	0.4077	0.2329	0.2451	0.5163	0.8448	0.9664	0.9880	(89)	
MIT 2	18.5742	18.7945	19.1451	19.5028	19.6922	19.7555	19.7568	19.7545	19.7427	19.5344	19.0081	18.5265	(90)	
Living area fraction									fLA = Living area / (4) =				0.5083	(91)
MIT	19.3407	19.5268	19.8268	20.1396	20.3199	20.3834	20.3882	20.3869	20.3687	20.1620	19.7026	19.2982	(92)	
Temperature adjustment													-0.1500	
adjusted MIT	19.1907	19.3768	19.6768	19.9896	20.1699	20.2334	20.2382	20.2369	20.2187	20.0120	19.5526	19.1482	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.9822	0.9683	0.9315	0.8414	0.6781	0.4487	0.2784	0.2931	0.5604	0.8571	0.9642	0.9858	(94)	
Useful gains	385.2003	424.6831	450.2027	444.5285	370.9016	246.2696	145.1259	145.3322	262.1638	361.2614	371.3980	366.8976	(95)	
Ext temp.	4.6000	5.2000	7.0000	9.4000	12.3000	15.2000	17.3000	17.3000	14.8000	11.2000	7.4000	4.5000	(96)	
Heat loss rate W	740.4558	717.5415	641.6235	530.6007	393.3875	248.3139	145.2472	145.4902	268.4389	439.4531	606.0492	737.5907	(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	264.3101	196.8008	142.4171	61.9720	16.7295	0.0000	0.0000	0.0000	0.0000	58.1746	168.9488	275.7956	(98)	
Space heating													1185.1487	(98)
RHI space heating demand													1185	(98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Energy Calculations Ltd
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CALCULATION OF HEAT DEMAND 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1000 (1b)	2.9000 (2b)	101.7900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	101.7900 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1965 (8)
Pressure test				Yes	
Measured/design q50				5.0000	
Infiltration rate					0.4465 (18)
Number of sides sheltered				2	(19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3795 (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	0.4839	0.4744	0.4649	0.4175	0.4080	0.3605	0.3605	0.3510	0.3795	0.4080	0.4269	0.4459 (22b)
Effective ac	0.6171	0.6125	0.6081	0.5871	0.5832	0.5650	0.5650	0.5616	0.5720	0.5832	0.5911	0.5994 (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
Door to Hall			1.8600	1.4000	2.6040		(26)
Windows (Uw = 1.40)			8.0000	1.3258	10.6061		(27)
Main wall	55.5400	8.0000	47.5400	0.1800	8.5572	110.0000	5229.4000 (29a)
Wall to Stairs	17.1100	1.8600	15.2500	0.1864	2.8423	70.0000	1067.5000 (29a)
Plane	4.4700		4.4700	0.0900	0.4023	9.0000	40.2300 (30)
Total net area of external elements Aum, m ²			77.1200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.0118		(33)
Party Wall 1			16.0400	0.0000	0.0000	180.0000	2887.2000 (32)
Party Floor 1			35.1000			30.0000	1053.0000 (32d)
Party Ceilings 1			30.6300			30.0000	918.9000 (32b)
Internal Wall 1			29.0000			9.0000	261.0000 (32c)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	11457.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							326.4168 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8797 (36)
Total fabric heat loss						(33) + (36) =	30.8915 (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
(38)m	20.7277	20.5750	20.4254	19.7223	19.5908	18.9785	18.9785	18.8651	19.2144	19.5908	19.8569	20.1351 (38)
Heat transfer coeff	51.6193	51.4666	51.3169	50.6139	50.4823	49.8700	49.8700	49.7566	50.1059	50.4823	50.7484	51.0266 (39)
Average = Sum(39)m / 12 =	50.6132 (39)											
HLP	1.4706	1.4663	1.4620	1.4420	1.4382	1.4208	1.4208	1.4176	1.4275	1.4382	1.4458	1.4537 (40)
HLP (average)	1.4420 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy	1.2831 (42)											
Average daily hot water use (litres/day)	64.6727 (43)											
Daily hot water use	71.1400	68.5531	65.9662	63.3793	60.7924	58.2055	58.2055	60.7924	63.3793	65.9662	68.5531	71.1400 (44)
Energy conte	105.4986	92.2697	95.2141	83.0099	79.6500	68.7319	63.6902	73.0855	73.9583	86.1913	94.0845	102.1697 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m	15.8248	13.8405	14.2821	12.4515	11.9475	10.3098	9.5535	10.9628	11.0937	12.9287	14.1127	15.3255 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

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)
Combi loss	24.3404	21.9514	24.2498	23.4071	24.1434	23.3138	24.0594	24.1138	23.3647	24.2058	23.4951	24.3229	(61)
Total heat required for water heating calculated for each month	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(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	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(64)
Heat gains from water heating, kWh/month	41.1634	36.1675	37.7211	33.4526	32.5195	28.6818	27.1918	30.3294	30.4323	34.7101	37.1569	40.0522	(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	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3908	21.6637	17.6181	13.3380	9.9703	8.4174	9.0953	11.8224	15.8680	20.1480	23.5157	25.0687	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	163.3377	165.0326	160.7614	151.6686	140.1905	129.4028	122.1959	120.5009	124.7721	133.8650	145.3430	156.1308	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	(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)	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	(71)
Water heating gains (Table 5)	55.3271	53.8207	50.7005	46.4619	43.7090	39.8359	36.5482	40.7653	42.2671	46.6533	51.6068	53.8336	(72)
Total internal gains	315.6983	313.1597	301.7227	284.1112	266.5125	250.2987	240.4820	245.7313	255.5499	273.3090	293.1082	307.6757	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
North	0.8100	10.6334	0.6300	0.7000	0.7700	2.6323 (74)							
East	1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (76)							
South	2.4300	46.7521	0.6300	0.7000	0.7700	34.7199 (78)							
West	2.8400	19.6403	0.6300	0.7000	0.7700	17.0466 (80)							
Solar gains	65.9232	117.7837	173.0249	229.8360	268.3214	270.3107	259.0363	230.2917	192.9932	133.6388	80.0269	55.6910	(83)
Total gains	381.6215	430.9434	474.7476	513.9472	534.8339	520.6094	499.5183	476.0230	448.5431	406.9477	373.1351	363.3668	(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	61.6546	61.8375	62.0179	62.8793	63.0431	63.8172	63.8172	63.9626	63.5168	63.0431	62.7126	62.3707	
alpha	5.1103	5.1225	5.1345	5.1920	5.2029	5.2545	5.2545	5.2642	5.2345	5.2029	5.1808	5.1580	
util living area	0.9913	0.9828	0.9615	0.9023	0.7796	0.5940	0.4360	0.4755	0.7145	0.9248	0.9823	0.9931	(86)
MIT	20.0044	20.1658	20.4073	20.6927	20.8914	20.9795	20.9966	20.9947	20.9477	20.6926	20.3001	19.9759	(87)
Th 2	19.7096	19.7129	19.7161	19.7313	19.7341	19.7474	19.7474	19.7499	19.7423	19.7341	19.7284	19.7224	(88)
util rest of house	0.9877	0.9759	0.9459	0.8643	0.7054	0.4869	0.3137	0.3492	0.6082	0.8863	0.9737	0.9902	(89)
MIT 2	18.4480	18.6818	19.0245	19.4165	19.6483	19.7377	19.7467	19.7486	19.7123	19.4300	18.8888	18.4163	(90)
Living area fraction	19.2390	19.4361	19.7273	20.0651	20.2801	20.3688	20.3820	20.3819	20.3402	20.0717	19.6061	19.2090	(91)
Temperature adjustment	19.0890	19.2861	19.5773	19.9151	20.1301	20.2188	20.2320	20.2319	20.1902	19.9217	19.4561	-0.1500	(92)
adjusted MIT												19.0590	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9853	0.9729	0.9438	0.8706	0.7304	0.5284	0.3615	0.3986	0.6485	0.8931	0.9713	0.9882	(94)	
Ext temp.	376.0213	419.2586	448.0650	447.4382	390.6288	275.1132	180.5661	189.7365	290.8716	363.4381	362.4393	359.0615	(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	763.3997	740.4024	671.0883	557.5192	425.5733	280.2115	181.1261	190.6648	305.1549	470.5827	627.0537	758.2039	(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	288.2095	215.8086	165.9293	79.2584	25.9987	0.0000	0.0000	0.0000	0.0000	79.7156	190.5224	296.9619	(98)	
												1342.4044	(98)	
													(98) / (4) =	38.2451 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1488.2532 (211)
Space heating requirement	288.2095	215.8086	165.9293	79.2584	25.9987	0.0000	0.0000	0.0000	0.0000	79.7156	190.5224	296.9619	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	319.5227	239.2557	183.9571	87.8696	28.8234	0.0000	0.0000	0.0000	0.0000	88.3765	211.2221	329.2261	(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	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(64)
Efficiency of water heater (217)m	89.2789	89.1748	88.9630	88.5148	87.8659	87.3000	87.3000	87.3000	87.3000	88.4930	89.0708	89.3137	(217)
Fuel for water heating, kWh/month	145.4308	128.0867	134.2850	120.2252	118.1271	105.4361	100.5150	111.3394	111.4811	124.7524	132.0069	141.6273	(219)
Water heating fuel used													1473.3131 (219)
Annual totals kWh/year													
Space heating fuel - main system													1488.2532 (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)													172.2997 (232)
Total delivered energy for all uses													3208.8659 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1488.2532	3.4800	51.7912 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1473.3131	3.4800	51.2713 (247)
Pumps and fans for heating	75.0000	13.1900	9.8925 (249)
Energy for lighting	172.2997	13.1900	22.7263 (250)
Additional standing charges			120.0000 (251)
Total energy cost			255.6813 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3407 (257)
SAP value		81.2979
SAP rating (Section 12)		81 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1488.2532	0.2160	321.4627 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1473.3131	0.2160	318.2356 (264)
Space and water heating			639.6983 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	172.2997	0.5190	89.4235 (268)
Total kg/year			768.0468 (272)
CO2 emissions per m2			21.8800 (273)
EI value			87.1513
EI rating			87 (274)
EI band			B

Calculation of stars for heating and DHW

Main heating energy efficiency	$3.48 \times (1 + 0.29 \times 0.00) / 0.9020 = 3.858$, stars = 4
Main heating environmental impact	$0.216 \times (1 + 0.29 \times 0.00) / 0.9020 = 0.2395$, stars = 4
Water heating energy efficiency	$3.48 / 0.8832 = 3.940$, stars = 4
Water heating environmental impact	$0.216 / 0.8832 = 0.2446$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS 09 Jan 2014

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	35.1000 (1b)	2.9000 (2b)	101.7900 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	35.1000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	101.7900 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1965 (8)
Pressure test				Yes	
Measured/design q50					5.0000
Infiltration rate					0.4465 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3795 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.4000	4.4000	4.0000	3.9000	3.3000	3.4000	3.5000	3.5000	3.8000	3.8000	4.2000 (22)
Wind factor	1.1250	1.1000	1.1000	1.0000	0.9750	0.8250	0.8500	0.8750	0.8750	0.9500	0.9500	1.0500 (22a)
Adj infilt rate	0.4269	0.4175	0.4175	0.3795	0.3700	0.3131	0.3226	0.3321	0.3321	0.3605	0.3605	0.3985 (22b)
Effective ac	0.5911	0.5871	0.5871	0.5720	0.5685	0.5490	0.5520	0.5551	0.5551	0.5650	0.5650	0.5794 (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
Door to Hall			1.8600	1.4000	2.6040		(26)
Windows (Uw = 1.40)			8.0000	1.3258	10.6061		(27)
Main wall	55.5400	8.0000	47.5400	0.1800	8.5572	110.0000	5229.4000 (29a)
Wall to Stairs	17.1100	1.8600	15.2500	0.1864	2.8423	70.0000	1067.5000 (29a)
Plane	4.4700		4.4700	0.0900	0.4023	9.0000	40.2300 (30)
Total net area of external elements Aum, m ²			77.1200				(31)
Fabric heat loss, W/K = Sum (A x U)					25.0118		(32)
Party Wall 1			16.0400	0.0000	0.0000	180.0000	2887.2000 (32)
Party Floor 1			35.1000			30.0000	1053.0000 (32d)
Party Ceilings 1			30.6300			30.0000	918.9000 (32b)
Internal Wall 1			29.0000			9.0000	261.0000 (32c)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 11457.2300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							326.4168 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8797 (36)
Total fabric heat loss							(33) + (36) = 30.8915 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	19.8569	19.7223	19.7223	19.2144	19.0949	18.4418	18.5431	18.6474	18.6474	18.9785	18.9785	19.4623 (38)
Heat transfer coeff	50.7484	50.6139	50.6139	50.1059	49.9864	49.3333	49.4346	49.5389	49.5389	49.8700	49.8700	50.3538 (39)
Average = Sum(39)m / 12 =												50.0007 (39)
HLP	1.4458	1.4420	1.4420	1.4275	1.4241	1.4055	1.4084	1.4114	1.4114	1.4208	1.4208	1.4346 (40)
HLP (average)												1.4245 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.2831 (42)
Average daily hot water use (litres/day)												64.6727 (43)
Daily hot water use	71.1400	68.5531	65.9662	63.3793	60.7924	58.2055	58.2055	60.7924	63.3793	65.9662	68.5531	71.1400 (44)
Energy conte	105.4986	92.2697	95.2141	83.0099	79.6500	68.7319	63.6902	73.0855	73.9583	86.1913	94.0845	102.1697 (45)
Energy content (annual)												Total = Sum(45)m = 1017.5538 (45)
Distribution loss (46)m = 0.15 x (45)m	15.8248	13.8405	14.2821	12.4515	11.9475	10.3098	9.5535	10.9628	11.0937	12.9287	14.1127	15.3255 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

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)
Combi loss	24.3404	21.9514	24.2498	23.4071	24.1434	23.3138	24.0594	24.1138	23.3647	24.2058	23.4951	24.3229	(61)
Total heat required for water heating calculated for each month	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(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	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(64)
Heat gains from water heating, kWh/month	41.1634	36.1675	37.7211	33.4526	32.5195	28.6818	27.1918	30.3294	30.4323	34.7101	37.1569	40.0522	(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	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	76.9837	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3908	21.6637	17.6181	13.3380	9.9703	8.4174	9.0953	11.8224	15.8680	20.1480	23.5157	25.0687	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	163.3377	165.0326	160.7614	151.6686	140.1905	129.4028	122.1959	120.5009	124.7721	133.8650	145.3430	156.1308	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	43.9814	(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)	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	-51.3225	(71)
Water heating gains (Table 5)	55.3271	53.8207	50.7005	46.4619	43.7090	39.8359	36.5482	40.7653	42.2671	46.6533	51.6068	53.8336	(72)
Total internal gains	315.6983	313.1597	301.7227	284.1112	266.5125	250.2987	240.4820	245.7313	255.5499	273.3090	293.1082	307.6757	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m ²	Table 6a	Specific data	Specific data	factor	W
		W/m ²	or Table 6b	or Table 6c	Table 6d	
North	0.8100	12.4557	0.6300	0.7000	0.7700	3.0834 (74)
East	1.9200	23.1647	0.6300	0.7000	0.7700	13.5925 (76)
South	2.4300	53.4754	0.6300	0.7000	0.7700	39.7130 (78)
West	2.8400	23.1647	0.6300	0.7000	0.7700	20.1056 (80)
Solar gains	76.4945	125.4168	181.6029	244.2040	280.4198	298.5469
Total gains	392.1927	438.5765	483.3256	528.3153	546.9323	548.8455

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	62.7126	62.8793	62.8793	63.5168	63.6686	64.5115	64.3793	64.2437	64.2437	63.8172	63.8172	63.2040	
alpha	5.1808	5.1920	5.1920	5.2345	5.2446	5.3008	5.2920	5.2829	5.2829	5.2545	5.2545	5.2136	
util living area	0.9892	0.9795	0.9519	0.8768	0.7308	0.5133	0.3500	0.3684	0.6303	0.8953	0.9772	0.9916	(86)
MIT	20.0823	20.2352	20.4864	20.7557	20.9271	20.9908	20.9990	20.9987	20.9745	20.7692	20.3744	20.0447	(87)
Th 2	19.7284	19.7313	19.7313	19.7423	19.7449	19.7591	19.7569	19.7546	19.7546	19.7474	19.7474	19.7369	(88)
util rest of house	0.9847	0.9713	0.9325	0.8314	0.6487	0.4077	0.2329	0.2451	0.5163	0.8448	0.9664	0.9880	(89)
MIT 2	18.5742	18.7945	19.1451	19.5028	19.6922	19.7555	19.7568	19.7545	19.7427	19.5344	19.0081	18.5265	(90)
Living area fraction	19.3407	19.5268	19.8268	20.1396	20.3199	20.3834	20.3882	20.3869	20.3687	20.1620	19.7026	19.2982	(91)
Temperature adjustment	19.1907	19.3768	19.6768	19.9896	20.1699	20.2334	20.2382	20.2369	20.2187	20.0120	19.5526	-0.1500	(92)
adjusted MIT												19.1482	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9822	0.9683	0.9315	0.8414	0.6781	0.4487	0.2784	0.2931	0.5604	0.8571	0.9642	0.9858	(94)	
Ext temp.	385.2003	424.6831	450.2027	444.5285	370.9016	246.2696	145.1259	145.3322	262.1638	361.2614	371.3980	366.8976	(95)	
Heat loss rate W	4.6000	5.2000	7.0000	9.4000	12.3000	15.2000	17.3000	17.3000	14.8000	11.2000	7.4000	4.5000	(96)	
Month fracti	740.4558	717.5415	641.6235	530.6007	393.3875	248.3139	145.2472	145.4902	268.4389	439.4531	606.0492	737.5907	(97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(98)	
Space heating per m2	264.3101	196.8008	142.4171	61.9720	16.7295	0.0000	0.0000	0.0000	0.0000	58.1746	168.9488	275.7956	(98)	
												1185.1487	(98)	
													(98) / (4) =	33.7649 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.2000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1313.9120 (211)
Space heating requirement	264.3101	196.8008	142.4171	61.9720	16.7295	0.0000	0.0000	0.0000	0.0000	58.1746	168.9488	275.7956	(98)
Space heating efficiency (main heating system 1)	90.2000	90.2000	90.2000	90.2000	90.2000	0.0000	0.0000	0.0000	0.0000	90.2000	90.2000	90.2000	(210)
Space heating fuel (main heating system)	293.0268	218.1827	157.8903	68.7051	18.5471	0.0000	0.0000	0.0000	0.0000	64.4952	187.3047	305.7601	(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	129.8390	114.2211	119.4639	106.4171	103.7934	92.0457	87.7496	97.1993	97.3230	110.3971	117.5796	126.4926	(64)
Efficiency of water heater (217)m	89.2236	89.1129	88.8535	88.3453	87.6913	87.3000	87.3000	87.3000	87.3000	88.2795	88.9870	89.2676	(217)
Fuel for water heating, kWh/month	145.5208	128.1757	134.4504	120.4558	118.3622	105.4361	100.5150	111.3394	111.4811	125.0541	132.1313	141.7005	(219)
Water heating fuel used													1474.6224 (219)
Annual totals kWh/year													
Space heating fuel - main system													1313.9120 (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)													172.2997 (232)
Total delivered energy for all uses													3035.8342 (238)

10a. Fuel costs - using BEDF prices (426)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1313.9120	4.0100	52.6879 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1474.6224	4.0100	59.1324 (247)
Pumps and fans for heating	75.0000	16.1200	12.0900 (249)
Energy for lighting	172.2997	16.1200	27.7747 (250)
Additional standing charges			87.0000 (251)
Total energy cost			238.6849 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1313.9120	0.2160	283.8050 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1474.6224	0.2160	318.5184 (264)
Space and water heating			602.3234 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	172.2997	0.5190	89.4235 (268)
Total kg/year			730.6720 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1313.9120	1.2200	1602.9727 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1474.6224	1.2200	1799.0394 (264)
Space and water heating			3402.0121 (265)
Pumps and fans	75.0000	3.0700	230.2500 (267)
Energy for lighting	172.2997	3.0700	528.9600 (268)
Primary energy kWh/year			4161.2221 (272)
Primary energy kWh/m2/year			118.5533 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 81
Current environmental impact rating: B 87

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)	Total Savings £0	0.00 kg/m ²	
Potential energy efficiency rating:		B 81	
Potential environmental impact rating:			B 87

Fuel prices for cost data on this page from database revision number 426 TEST (21 Mar 2018)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£40	£40	£0
Mains gas	£199	£199	£0
Space heating	£152	£152	£0
Water heating	£59	£59	£0
Lighting	£28	£28	£0
Total cost of fuels	£239	£239	£0
Total cost of uses	£239	£239	£0
Delivered energy	86 kWh/m ²	86 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m ²	21 kg/m ²	21 kg/m ²	0 kg/m ²
Primary energy	119 kWh/m ²	119 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

No improvements selected / applicable

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

Overheating Calculation Input Data

Dwelling type	SemiDetached Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	West
Overshading	Average or unknown
Thermal mass parameter	326.4 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	6.00 (Windows fully open)

Overheating Calculation

Summer ventilation heat loss coefficient	201.54 (P1)
Transmission heat loss coefficient	30.89 (37)
Summer heat loss coefficient	232.44 (P2)

Overhangs

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

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	1.000	0.90	1.000	0.900 (P8)
East	1.000	0.90	1.000	0.900 (P8)
South	1.000	0.90	1.000	0.900 (P8)
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
North	0.8100	81.1852	0.6300	0.7000	0.9000	23.4901
East	1.9200	117.5071	0.6300	0.7000	0.9000	80.5914
South	2.4300	112.2060	0.6300	0.7000	0.9000	97.3971
West	2.8400	117.5071	0.6300	0.7000	0.9000	119.2081
total:						320.6868

	Jun	Jul	Aug	
Solar gains	338	321	291	(P3)
Internal gains	247	237	243	
Total summer gains	586	558	534	(P5)
Summer gain/loss ratio	2.52	2.40	2.30	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 326.4)	0.00	0.00	0.00	
Threshold temperature	18.52	20.30	20.10	(P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant	
Assessment of likelihood of high internal temperature:	Not significant			

U-VALUE CALCULATOR REPORT

Property Reference	005395	Issued on Date	10/04/2018
Survey Reference	001	Prop Type Ref	
Project	Flat 3, Adj: 81, Goldington Avenue, BEDFORD, MK40 3DB		
Calculation Type	New Build (As Designed)		

SAP Rating	81 B	DER	24.27	TER	24.27
Environmental	87 B	% DER<TER	0.01		
CO ₂ Emissions (t/year)	0.73	DFEE	56.16	TFEE	59.39
General Requirements Compliance	Pass	% DFEE<TFEE	5.44		

Surveyor	Matthew Carter, Tel: 01754 761035	Surveyor ID	7869-0001
Client			

Building Elements

Roof 000005 - Pitched roof - insulated at ceiling

Roof Type: Pitched Roof, insulated flat ceiling

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Roof space				
	Main construction	0	0.0000	0.0000	100.00
Layer 2	Mineral wool				
	Main construction	300	0.0370	8.1081	100.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 3	Mineral wool quilt				
	Main construction	100	0.0370	2.7027	91.00
	Main construction	100	0.1300	0.7692	9.00
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer 4	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1000	

Total resistance: Upper limit = 10.803 m² K/W Lower limit = 10.512 m² K/W Average = 10.657 m² K/W
Total correction = 0.0000 m² K/W U-value (unrounded) = 0.09 W/m² K

Unheated space: None

Total thickness: 413 mm

U-value: 0.09 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	005395	Issued on Date	10/04/2018
Survey Reference	001	Prop Type Ref	
Project	Flat 3, Adj: 81, Goldington Avenue, BEDFORD, MK40 3DB		
Calculation Type	New Build (As Designed)		

SAP Rating	81 B	DER	24.27	TER	24.27
Environmental	87 B	% DER<TER	0.01		
CO ₂ Emissions (t/year)	0.73	DFEE	56.16	TFEE	59.39
General Requirements Compliance	Pass	% DFEE<TFEE	5.44		

Surveyor	Matthew Carter, Tel: 01754 761035	Surveyor ID	7869-0001
Client			

Building Elements

Wall 000001 - Masonry wall full cavity fill-slabs

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Brick, outer leaf				
	Main construction	100	0.7700	0.1299	100.00
Layer 2	Earthwool Dritherm 32 Ultimate				
	Main construction	75	0.0320	2.3438	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 3	Earthwool Dritherm 32 Ultimate				
	Main construction	75	0.0320	2.3438	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	Celcon Hi-Seven - Normal - Trad joint 10mm				
	Main construction	100	0.1900	0.5263	93.18
	Main construction	100	0.8803	0.1136	6.82
Layer 5	airspace/plaster dabs				
	Main construction	15	0.0882	0.1700	80.00
	Main construction	15	0.0882	0.1700	20.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 6	Plasterboard (standard wallboard)				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 5.713 m² K/W Lower limit = 5.639 m² K/W Average = 5.676 m² K/W
Total correction = 0.0034 m² K/W U-value (unrounded) = 0.18 W/m² K

Unheated space: None

Total thickness: 378 mm

U-value: 0.18 W/m² K

Kappa: n/a

U-VALUE CALCULATOR REPORT

Property Reference	005395	Issued on Date	10/04/2018
Survey Reference	001	Prop Type Ref	
Project	Flat 3, Adj: 81, Goldington Avenue, BEDFORD, MK40 3DB		
Calculation Type	New Build (As Designed)		

SAP Rating	81 B	DER	24.27	TER	24.27
Environmental	87 B	% DER<TER	0.01		
CO ₂ Emissions (t/year)	0.73	DFEE	56.16	TFEE	59.39
General Requirements Compliance	Pass	% DFEE<TFEE	5.44		

Surveyor	Matthew Carter, Tel: 01754 761035	Surveyor ID	7869-0001
Client			

Building Elements

Wall 000002 - Masonry wall full cavity fill-slabs

Wall Type: Standard Wall

Layer	Description	Thickness (mm)	Conductivity (W/m ² K)	Resistance (m ² K/W)	Fraction (%)
Ext surface				0.0400	
Layer 1	Plasterboard, standard				
	Main construction	13	0.2100	0.0619	100.00
Layer 2	Celcon Hi-Seven - Normal - Trad joint 10mm				
	Main construction	100	0.1900	0.5263	93.18
	Main construction	100	0.8803	0.1136	6.82
Layer 3	Earthwool Dritherm 32 Ultimate				
	Main construction	100	0.0320	3.1250	100.00
	Corrections - Air Gap: Level 1, Fasteners: None or plastic				
Layer 4	Celcon Hi-Seven - Normal - Trad joint 10mm				
	Main construction	100	0.1900	0.5263	93.18
	Main construction	100	0.8803	0.1136	6.82
Layer 5	airspace/plaster dabs				
	Main construction	15	0.0882	0.1700	80.00
	Main construction	15	0.0882	0.1700	20.00
	Corrections - Cavity Unventilated, Emissivity: Normal				
Layer 6	Plasterboard, standard				
	Main construction	12.5	0.2100	0.0595	100.00
Int surface				0.1300	

Total resistance: Upper limit = 4.578 m² K/W Lower limit = 4.430 m² K/W Average = 4.504 m² K/W
Total correction = 0.0048 m² K/W U-value (unrounded) = 0.22 W/m² K

Unheated space: None

Total thickness: 341 mm

U-value: 0.22 W/m² K

Kappa: n/a

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

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Property Reference	005395	Issued on Date	10/04/2018
Survey Reference	001	Prop Type Ref	
Property	Flat 3, Adj: 81, Goldington Avenue, BEDFORD, MK40 3DB		
SAP Rating	81 B	DER	24.27
Environmental	87 B	TER	24.27
CO ₂ Emissions (t/year)	0.73	% DER<TER	0.01
General Requirements Compliance	Pass	DFEE	56.16
		TFEE	59.39
		% DFEE<TFEE	5.44
Surveyor	Matthew Carter, Tel: 01754 761035	Surveyor ID	7869-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	24.27	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	24.27	kgCO ₂ /m ²	Pass
	0.00 (0.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.39	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	56.16	kWh/m ² /yr	
	-3.2 (-5.4%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.19 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.09 (max. 0.20)	0.09 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	5.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Ideal Vogue c32 Combi boiler Efficiency: 89.3% SEDBUK2009 Minimum: 88.0%	Pass
Secondary heating system	None	

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

5 Cylinder insulation

Hot water storage

6 Controls

Space heating controls

Hot water controls

Boiler interlock

7 Low energy lights

Percentage of fixed lights with low-energy fittings %

Minimum %

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)

Based on:

Overshading

Windows facing North

Windows facing East

Windows facing South

Windows facing West

Air change rate

Blinds/curtains

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value	W/m ² K	
Filled Cavity with Edge Sealing	<input type="text" value="0.00"/>	W/m ² K	<input type="text" value="Pass"/>

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

Maximum

10 Key features

Party wall U-value W/m²K

Roof U-value W/m²K

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	005395	Issued on Date	10/04/2018
Survey Reference	001	Prop Type Ref	
Property	Flat 3, Adj: 81, Goldington Avenue, BEDFORD, MK40 3DB		
SAP Rating	81 B	DER	24.27
Environmental	87 B	TER	24.27
CO ₂ Emissions (t/year)	0.73	% DER<TER	0.01
General Requirements Compliance	Pass	DFEE	56.16
		TFEE	59.39
		% DFEE<TFEE	5.44
Surveyor	Matthew Carter, Tel: 01754 761035	Surveyor ID	7869-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West
Property Tenure	Unknown
Transaction Type	New dwelling
1.0 Property Type	Flat, Semi-Detached
2.0 Number of Storeys	1
3.0 Date Built	2017
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Ground Floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
		25.05 m	35.10 m ²	2.90 m
7.0 Living Area	17.84		m ²	
8.0 Thermal Mass Parameter	Precise calculation			
Thermal Mass	326.42		kJ/m ² K	

9.0 External Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Main wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.18	110.00	55.54	47.54
Wall to Stairs	Cavity Wall	Cavity wall : dense plaster, AAC block, filled cavity, any outside structure	0.22	70.00	17.11	15.25

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Area (m ²)
Party Wall 1	Filled Cavity with Edge Sealing	Dense plaster both sides, dense blocks, cavity or cavity fill	0.00	180.00	16.04

9.2 Internal Walls

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Plasterboard on timber frame	9.00	29.00

10.0 External Roofs

Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	4.47	4.47

10.1 Party Ceilings

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Ceilings 1	Timber I-joists, carpeted	20.00	30.63

11.1 Party Floors

Description	Construction	Kappa (kJ/m ² K)	Area (m ²)
Party Floor 1	Timber I-joists, carpeted	30.00	35.10

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	Solar Trans	Frame Type	Frame Factor	U Value (W/m ² K)
Door to Hall	SAP table	Door to Corridor							1.40
Windows	Manufacture	Window	Double Low-E Soft 0.05			0.63		0.70	1.40
Roof lights	Manufacture	Roof Window	Double Low-E Soft 0.05			0.63		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m ²)	Curtain Closed
Door to Stairs	Door to Corridor	[2] Wall to Stairs	South							1.86	
Front Windows	Window	[1] Main wall	West	None	0.00					2.84	
Side Windows	Window	[1] Main wall	South	None	0.00					2.43	
Side Windows	Window	[1] Main wall	North	None	0.00					0.81	
Rear Windows	Window	[1] Main wall	East	None	0.00					1.92	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

Yes

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported
Table K1 - Approved	E2 Other lintels (including other steel lintels)	6.96	0.300	No
Table K1 - Approved	E3 Sill	5.16	0.040	No
Table K1 - Approved	E4 Jamb	17.10	0.050	No
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	25.05	0.070	No
Table K1 - Approved	E10 Eaves (insulation at ceiling level)	4.68	0.060	No
Table K1 - Approved	E16 Corner (normal)	11.60	0.090	No
Table K1 - Approved	E17 Corner (inverted – internal area greater than external area)	11.60	-0.090	No
Table K1 - Approved	E18 Party wall between dwellings	11.60	0.060	No

Y-value 0.076 W/m²K

18.0 Pressure Testing

Yes

Designed q50 5.00 m³/m²/hr @ 50 Pa

Property Tested ?

As Built q50

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows fully open

Cross ventilation possible Yes

Night Ventilation No

Air change rate 6.00

Mechanical Ventilation

Mechanical Ventilation System Present No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				2
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	9	
Total number of L.E.L. fittings	9	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted No

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Percentage of Heat	100	%
Database Ref. No.	17038	
Fuel Type	Mains gas	
Main Heating	BGW	
SAP Code	104	
In Winter	90.2	
In Summer	87.3	
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	Yes	
Sap Code	2110	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators	
Flow Temperature	Normal (> 45°C)	
Combi boiler type	Standard Combi	
Combi keep hot type	Gas/Oil, time clock	

25.0 Main Heating 2

None

Community Heating None

28.0 Water Heating

	HWP From main heating 1	
Water Heating	Main Heating 1	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Waste Water Heat Recovery Storage System	<input type="text" value="No"/>
Solar Panel	<input type="text" value="No"/>
Water use <= 125 litres/person/day	<input type="text" value="Yes"/>
SAP Code	<input type="text" value="901"/>

29.0 Hot Water Cylinder	<input type="text" value="None"/>
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Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

BLOCK COMPLIANCE

Energy Calculations Ltd
SAP • CODE • SBEM • DESIGN

Calculation Type: New Build (As Designed)

Block Reference	000225	Issued on Date	10/04/2018
Block Name	Adj 81 Goldington Road		
Surveyor	Matthew Carter, Tel: 01754 761035	Surveyor ID	7869-0001
Client			

Block Compliance Report - DER

Block Reference: 000225		Block Name: Adj 81 Goldington Road		
Property-Survey Reference	Multiplier	Floor Area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)
005393-001	1	33.66	28.28	29.25
005395-001	1	35.1	24.27	24.27
005396-001	1	37.29	24.39	24.26
005397-001	1	31.31	27.33	27.50
005398-001	1	31.94	26.44	26.78
005394-001	1	33.66	27.39	28.72
Totals:	6	202.96	158.10	160.77
Average DER = 26.29 kgCO ₂ /m ²			PASS	
Average TER = 26.72 kgCO ₂ /m ²				

Block Compliance Report - DFEE

Block Reference: 000225		Block Name: Adj 81 Goldington Road		
Property-Survey Reference	Multiplier	Floor Area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)
005393-001	1	33.66	78.94	83.28
005395-001	1	35.1	56.16	59.39
005396-001	1	37.29	58.72	61.78
005397-001	1	31.31	61.79	67.12
005398-001	1	31.94	59.77	65.52
005394-001	1	33.66	75.26	80.60
Totals:	6	202.96	390.64	417.69
Average DFEE = 65.01 kWh/m ² /yr			PASS	
Average TFEE = 69.47 kWh/m ² /yr				